

2019 Soybean Meal Demand Assessment

UNITED STATES

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for:



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Contents

Acknowledgements.....	5
Executive Summary.....	6
Summary of Results.....	6
Purpose of Analysis	7
Competitiveness of Soybean Meal	9
Soybean Meal.....	12
Canola Meal.....	17
Cottonseed Meal.....	21
Dried Distillers Grains with Solubles (DDGs).....	24
Synthetic Amino Acids.....	28
Competitiveness of Soybean Meal Results.....	29
Broilers	29
Layers	36
Turkeys	43
Hogs.....	50
Dairy Cows.....	58
Beef Cows.....	66
Companion Animals	71
Aquaculture.....	75
Sheep.....	78
Meat Goats.....	79
Competitiveness of Soybean Meal Remarks.....	79
National Results	83
U.S. Economic Impact of Animal Agriculture	83
U.S. Total Animal Agriculture Soybean Meal Consumption	95
U.S. Total Animal Unit (AU) Trends.....	111
U.S. Additional Information and Methodology.....	128
State Level Results	129
2008-2018 Animal Agriculture: ALABAMA.....	129

2008-2018 Animal Agriculture: ALASKA.....	143
2008-2018 Animal Agriculture: ARIZONA	157
2008-2018 Animal Agriculture: ARKANSAS.....	171
2008-2018 Animal Agriculture: CALIFORNIA	185
2008-2018 Animal Agriculture: COLORADO	199
2008-2018 Animal Agriculture: CONNECTICUT.....	213
2008-2018 Animal Agriculture: DELAWARE.....	227
2008-2018 Animal Agriculture: FLORIDA	241
2008-2018 Animal Agriculture: GEORGIA.....	255
2008-2018 Animal Agriculture: HAWAII.....	269
2008-2018 Animal Agriculture: IDAHO	283
2008-2018 Animal Agriculture: ILLINOIS.....	297
2008-2018 Animal Agriculture: INDIANA	311
2008-2018 Animal Agriculture: IOWA.....	325
2008-2018 Animal Agriculture: KANSAS	339
2008-2018 Animal Agriculture: KENTUCKY	353
2008-2018 Animal Agriculture: LOUISIANA	367
2008-2018 Animal Agriculture: MAINE.....	381
2008-2018 Animal Agriculture: MARYLAND	395
2008-2018 Animal Agriculture: MASSACHUSETTS.....	409
2008-2018 Animal Agriculture: MICHIGAN.....	423
2008-2018 Animal Agriculture: MINNESOTA.....	437
2008-2018 Animal Agriculture: MISSISSIPPI	451
2008-2018 Animal Agriculture: MISSOURI.....	465
2008-2018 Animal Agriculture: MONTANA	479
2008-2018 Animal Agriculture: NEBRASKA.....	493
2008-2018 Animal Agriculture: NEVADA	507
2008-2018 Animal Agriculture: NEW HAMPSHIRE	521
2008-2018 Animal Agriculture: NEW JERSEY	535

2008-2018 Animal Agriculture: NEW MEXICO	549
2008-2018 Animal Agriculture: NEW YORK	563
2008-2018 Animal Agriculture: NORTH CAROLINA.....	577
2008-2018 Animal Agriculture: NORTH DAKOTA.....	591
2008-2018 Animal Agriculture: OHIO	605
2008-2018 Animal Agriculture: OKLAHOMA.....	619
2008-2018 Animal Agriculture: OREGON.....	633
2008-2018 Animal Agriculture: PENNSYLVANIA	647
2008-2018 Animal Agriculture: RHODE ISLAND.....	661
2008-2018 Animal Agriculture: SOUTH CAROLINA.....	675
2008-2018 Animal Agriculture: SOUTH DAKOTA	689
2008-2018 Animal Agriculture: TENNESSEE.....	703
2008-2018 Animal Agriculture: TEXAS	717
2008-2018 Animal Agriculture: UTAH.....	731
2008-2018 Animal Agriculture: VERMONT	745
2008-2018 Animal Agriculture: VIRGINIA	759
2008-2018 Animal Agriculture: WASHINGTON.....	773
2008-2018 Animal Agriculture: WEST VIRGINIA	787
2008-2018 Animal Agriculture: WISCONSIN	801
2008-2018 Animal Agriculture: WYOMING.....	815
Methodology.....	829
Competitiveness of Soybean Meal, Price Elasticities.....	829
Competitiveness of Soybean Meal, Component Price Elasticities.....	830
Economic Impact Analysis.....	831
Animal Agriculture Soybean Meal Use.....	836
Animal Unit Trends.....	846
Appendix A, 2018 State by Species Soybean Meal Usage	848
Appendix B, Subject Matter Experts.....	851

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A full list of subject matter experts who provided excellent assistance can be found in Appendix B.

Executive Summary

As mentioned in previous iterations of this report, changing market conditions, consumer tastes and preferences, regulatory hurdles, environmental challenges, major animal diseases and regulatory burdens placed upon the animal feed and animal production industries continues to test animal agriculture's ability to remain viable. Furthermore, the spread of African Swine Fever in southeast Asia and trade disruptions with China have both caused significant strain on the entire animal agriculture value chain.

Soybean meal (SBM) has long been the predominant vegetable protein source in livestock and poultry feed in the U.S. Alternative protein sources include dried distillers grains with solubles (DDGs), relatively cheaper vegetable proteins (canola meal and cottonseed meal), limited varieties of animal-based protein and increasingly, synthetic amino acid substitutes.

Access to competing vegetable and animal protein sources for livestock and poultry diets continues to expand in geography and type. Synthetic amino acids continue to come down in price, improvements in consistency and availability of some alternative feedstuffs continue to improve. These two trends apply pressure to replace some soybean meal in diets. On the contrary, animal disease outbreaks and trade disruptions can provide opportunities for adding U.S. soy to animal diets.

Summary of Results

This current research suggests that **32.3 million short tons** of SBM was fed to animal agriculture during the 2017/18 soybean marketing year. A combined total of 2.9 million tons of soy hulls were fed to hogs, dairy and beef cattle. Of the total 32.3 million SBM short tons amount, ranking from highest consumer to lowest:

1. Broilers consumed **15.8 million tons** (nearly forty-nine percent)
2. Hogs consumed **7.5 million tons** (slightly more than twenty-three percent)
3. Layers consumed **3.0 million tons** (slightly more than nine percent)
4. Dairy consumed **2.8 million tons** (nearly nine percent)
5. Turkeys consumed **2.3 million tons** (slightly more than seven percent)
6. The rest of animal agriculture (beef cattle, companion animals, aquaculture, sheep and meat goats) round out the last three percent.

This study brings out very important findings related to the competitive position of SBM in livestock and poultry diets in the United States with the results helping to examine the potential for SBM to compete on component levels. With respect to the lysine component in SBM, animal protein sources have become more competitive, in general, compared to prior years. Synthetic lysine is still competitive as a provider of the lysine component in livestock and poultry rations. The competitive position of DDGs has become mixed with it being significantly

competitive as a substitute for SBM in broiler and layer rations and somewhat competitive in hog rations, but not a competitor in turkey rations.

Surprisingly, corn was not found to be a significant competitor to SBM in any of the rations but may have become complementary to SBM. This may be a short-term effect due to trade disruptions in commodity market pricing but could be something to keep an eye on to see if it persists in future years.

Animal agriculture continues to be an important driver of economic activity in the United States. Through purchases from and sales to many other industries, U.S. animal agriculture in turn has a large impact on the rest of the national and global economies. In the U.S. during 2018 animal agriculture's support of the national economy included:

- \$348.7 billion in economic output
- 1,843,789 jobs
- \$75.3 billion in earnings
- \$18.2 billion in income taxes
- \$9.4 billion in the form of property taxes

In addition, from 2008-2018, U.S. animal agriculture increased gross national product by \$16.6 billion in economic output, boosted household earnings by over \$3.2 billion and supported an additional 73,366 jobs.

Purpose of Analysis

To better understand how to match its competing substitutes, the United Soybean Board has commissioned research be conducted by Decision Innovation Solutions to provide the following regarding soybean meal:

1. A spatial understanding of feed potential by species and stage of life.
2. Estimates of current volumes of SBM and other feedstuffs utilized based on volumes of multiple species diets by region.
3. A depiction of the livestock and poultry feed landscape including:
 - a. Animal unit trends
 - b. Species production practices and trends (including weights, feed conversion, etc.)
 - c. Competitive value proposition of soybeans and alternative feedstuffs (e.g., DDGs, synthetic amino acids, canola meal) by price, availability and characteristics
4. Evaluation of soybean component levels elasticities identified that would provide for analysis of its competitive position within livestock and poultry diets.

Evaluation of the competitive position of soybean (SBM) by geography to provide insights into potential market strategy analysis, which includes examining such areas with traditionally lower crude protein content.

Competitiveness of Soybean Meal

SBM continues to face increased competition from canola meal, cottonseed meal, meat and bone meal, blood meal, and synthetic amino acids such as lysine and methionine. New competitors produced from algae and insects are gaining acceptance in some markets.

Animal agriculture uses the majority of soybean meal (SBM) production, which is used primarily as a protein source (more specifically, amino acids) in diets. Consequently, soybeans are an integral component of the U.S. agriculture industry and the use of SBM in animal feed formulations is important to the continued international competitiveness of the agriculture industry. The continued prevalence of SBM use in animal feed is dependent upon a soybean composition that benefits livestock and poultry production. Understanding the limitations of SBM use in the livestock industry is a helpful step towards capturing additional benefits from animal agriculture.

There are numerous opportunities for SBM to enhance animal production and therefore increase soybean use and value. Because SBM is usually the most cost-effective source of these amino acids, SBM is used to satisfy the animal's requirement for essential amino acids in livestock and poultry, typically without the use of synthetic amino acids, because the ratio of these amino acids are in a balanced ratio to each other. When used, synthetic amino acids are typically used in conjunction with another competing (to SBM) protein source that 1) does not offer enough of a limiting amino acid and/or 2) does not offer the balance of amino acids at the correct ratio.

As shown in Figure 1, broilers were the highest consumer of SBM (forty-nine percent), followed by hogs (twenty-three percent), layers (nine percent), dairy (nine percent), turkeys (seven percent) and the rest of animal agriculture (beef cattle, companion animals, aquaculture, sheep and meat goats) rounding out the last three percent. In total, the poultry (broilers, layers and turkeys) industry utilized sixty-five percent (21.0 million tons) of total SBM consumed by animal agriculture during the 2017/18 soybean marketing year.

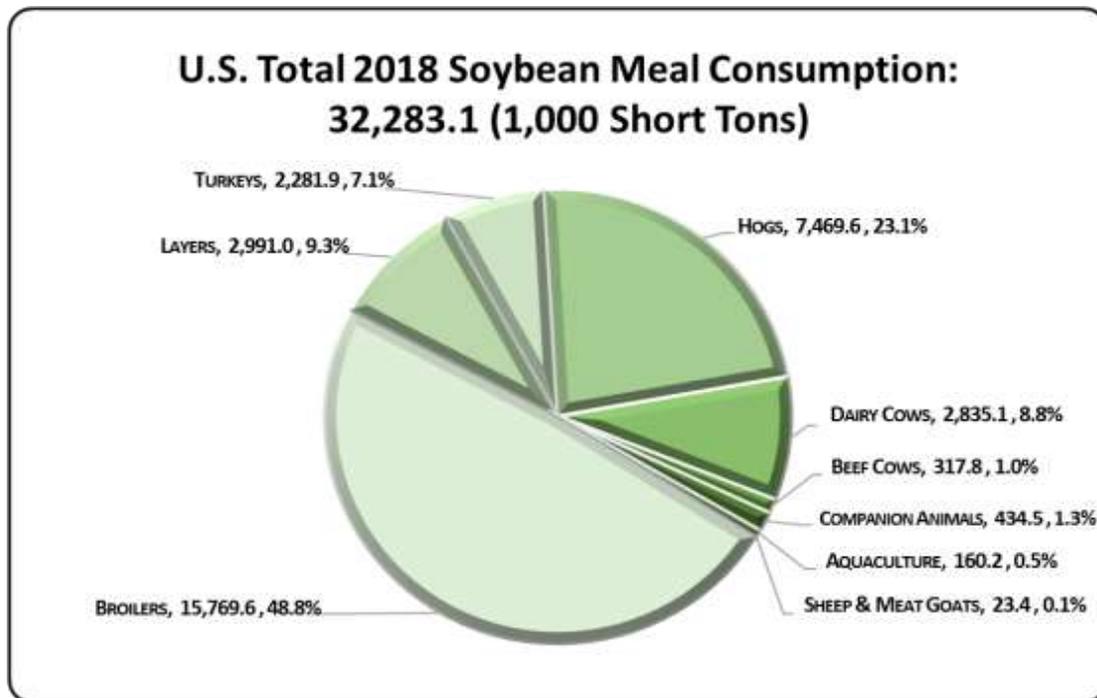


Figure 1, Total Soybean Meal by Major Species 2017/18 (Short Tons)

In order to adequately compare the merits of various protein sources within animal agriculture diets, nutritional profiles of SBM and its competing substitutes need to be properly quantified. In our research, key determinants of a potential substitute for SBM are related to protein levels in general, but more specifically, the degree to which essential amino acids are available, digestible and in the right ratio for use by animal agriculture. As outlined within this report on several occasions, just because a feed ingredient has high protein or essential amino acids does not necessarily mean it competes well with SBM. Other nutritional characteristics related to potential inclusion livestock and poultry diets include metabolizable energy, crude fiber and crude fat. Table 1 provides a comparison of these nutritional characteristics for the protein sources included in this analysis.

Table 1, Nutritional Composition of Soybean Meal and Other Competing Feed Ingredients

Ingredients	Species	Metabolizable Energy (kcal/lb)	Crude Protein (%)	Lysine (%)	Threonine (%)	Methionine (%)	Crude Fiber (%)	Crude Fat (%)
Soybean Meal, dehulled	Swine	1,575	48.27	3.02	1.85	0.67	3.49	3.00
	Poultry	1,140						
Corn, Grain (yellow dent)	Swine	1,542	7.92	0.26	0.28	0.17	1.95	3.90
	Poultry	1,522						
Distillers Dried Grains w/Solubles	Swine	1,551	27.50	0.84	1.00	0.55	7.62	9.90
	Poultry	1,058						
Canola Meal	Swine	1,292	37.70	2.09	1.50	0.73	10.15	3.50
	Poultry	1,279						
Cottonseed Meal	Swine	1,090	39.92	1.49	1.25	0.55	13.40	2.90
	Poultry	1,090						
Meat and Bone Meal	Swine	1,225	51.42	2.74	1.65	0.72	7.91	2.80
	Poultry	1,303						
Wheat Middlings	Swine	1,199	16.06	0.65	0.53	0.25	8.25	3.09
	Poultry	1,199						
Alfalfa Meal	Dairy	1,242	17.22	0.79	0.74	0.28	30.00	2.90

Source: http://nutrition.ansci.illinois.edu/feed_database.html

Note: High protein canola meal was not included as high protein canola meal was not widely available in major livestock producing areas in 2017/18.

Also key to understanding the dynamic at play for inclusion of certain feed ingredients over others are their relative prices to each other. Average SBM price was \$317 per short ton during the 2016/17 marketing year but increased to \$345 during 2017/18. Figure 2 shows the average annual prices for SBM, corn, DDGs, canola meal, and cottonseed meal from the 2008/09 marketing year to 2017/18. Canola meal has also drifted higher going from \$268/short ton in 2016/17 to \$291 in 2017/18, a 9% increase. (see Figure 2).

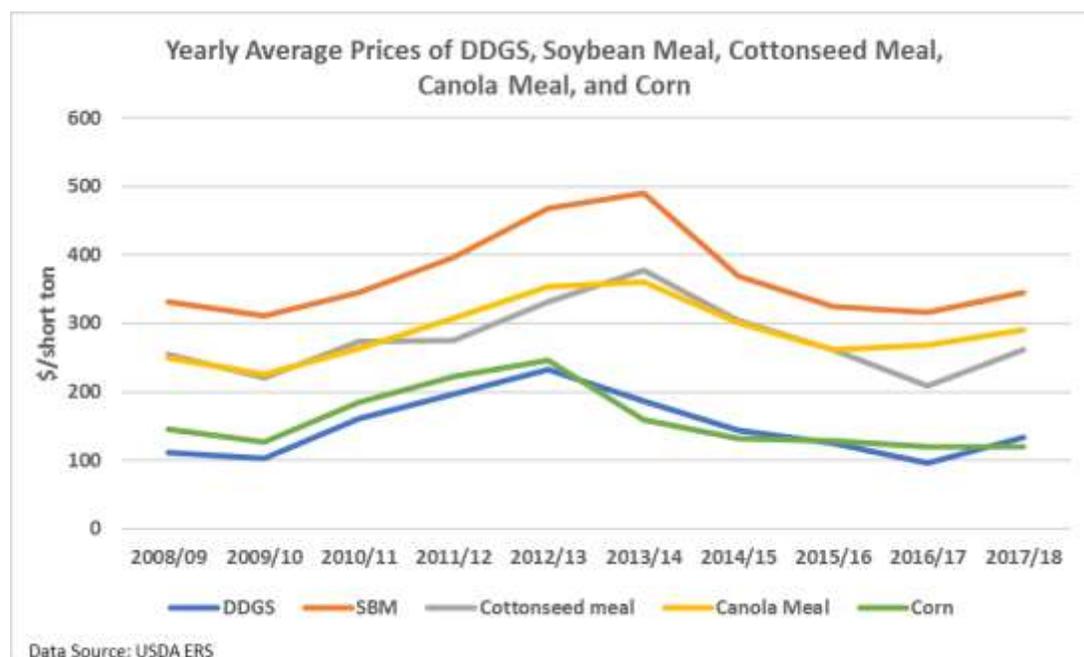


Figure 2, Monthly Average Prices of Major Feedstuffs

From this point forward, context related to specific feed ingredients with particular importance related to the competitive proposition of SBM in livestock and poultry diets is presented.

Soybean Meal

Domestic animal agriculture continues to make important contributions to the global food supply and, as a result, the production and consumption of animal feed have become an increasingly critical component of the U.S. agricultural economy. SBM continues to be the most prevalent and preferred source of high-quality plant protein for animal agriculture in the U.S. As shown in Table 1, SBM has the highest average crude protein content of 47.5 percent among other plant protein sources. SBM also has the highest average lysine (3.02%) and threonine content (1.85%) compared to the other vegetable protein sources. SBM has the highest ileal digestibility¹ of all essential amino acids among any other protein sources. These key quality characteristics enable SBM to be the most balanced protein source for livestock and poultry.

While there are great strengths to SBM's nutritional profile, there are some limitations with SBM. One of the limitations in SBM is a relatively lower percentage of methionine compared to canola meal. Additionally, all feed ingredients contain some toxic properties that limit their use to some degree. Legumes like SBM contain quite high levels of protease inhibitors (proteins that inhibit the function of digestive enzymes an animal would use to break-down the proteins in the SBM) as well as carbohydrate-binding proteins called lectins. Fortunately, since both of these are proteins, these can be denatured with heat treatment (just like the denaturing of egg albumin through cooking). This is the primary reason SBM is heat-treated before being used in poultry feeds.

The carbohydrate fraction of SBM also limits its use. SBM contains relatively high levels (especially when compared to something like corn) of "non-starch polysaccharides". These are carbohydrates that are not simply just strings of glucose joined by alpha-linkages (i.e., starch). There is a variety of non-starch polysaccharides, but they're basically the "fiber" that poultry can't digest, which will cause the digestive contents to become thicker or more viscous, which reduces the digestibility of every nutrient in the diet.

Figure 3 illustrates 2017/18 SBM prices compared to the years prior. As shown, 2017/18 SBM prices are forecast at \$345/short ton, slightly higher than the prior two years.

¹Ileal digestibility refers to the degree to which essential amino acids are available in the ileal, the last division of the small intestine extending between the jejunum and large intestine. Ileal digestibility is a key measurement of the value of essential amino acids provided by a protein source.

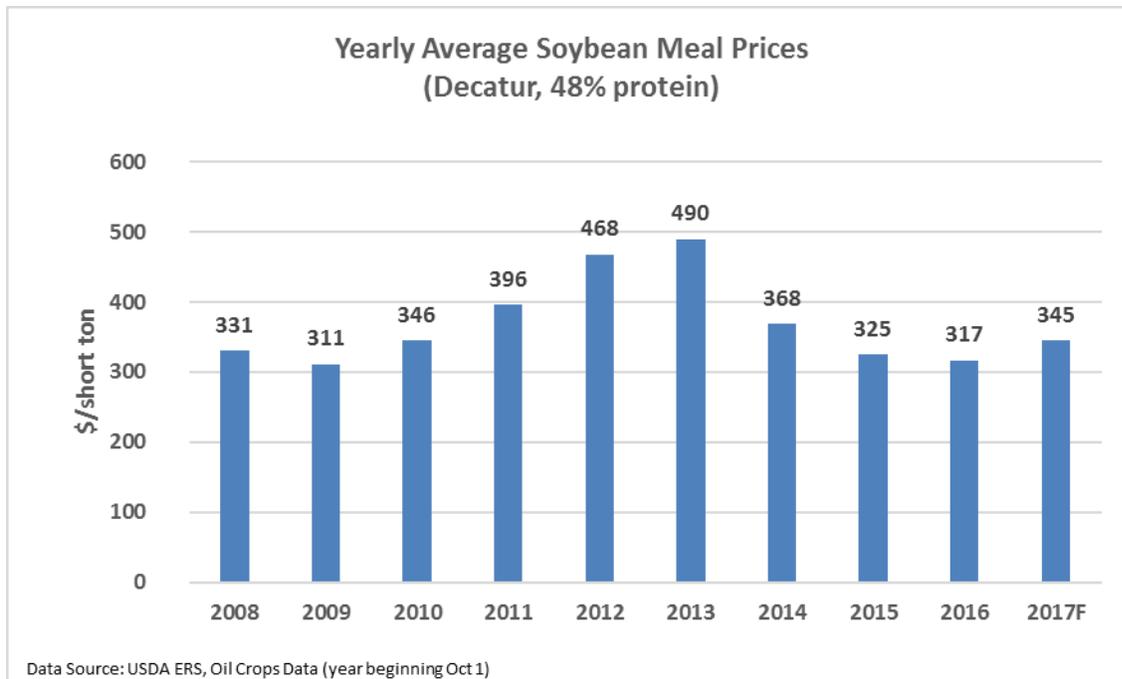


Figure 3, Yearly Average Soybean Meal Prices

Spatial Differences

Regarding whether the nutritional profile of SBM differs spatially, there is verifiable research that has taken place which documents differences in nutritional characteristics within SBM produced in the U.S. These differences have implications for feeding livestock and poultry.

Dr. Jill Miller-Garvin, Dr. James H. Orf, and Dr. Seth L. Naeve from the University of Minnesota have worked with the United States Soybean Export Council (USSEC) to do annual assessments of key quality characteristics of SBM for many years. Over the last nine years, on average, soybeans grown in the Midwest and parts of the south tend to have lower protein content than soybeans grown in the eastern corn belt, some parts of the south and eastern U.S. Figure 4 presents average protein content by state from the 2010-2018 surveys. A nine-year average was used so as to not skew results from years such as the drought of 2012. For purposes of this analysis, we have segregated the production of soybeans spatially according to what is shown in Figure 4. Figure 5 shows the same data, but in map format.

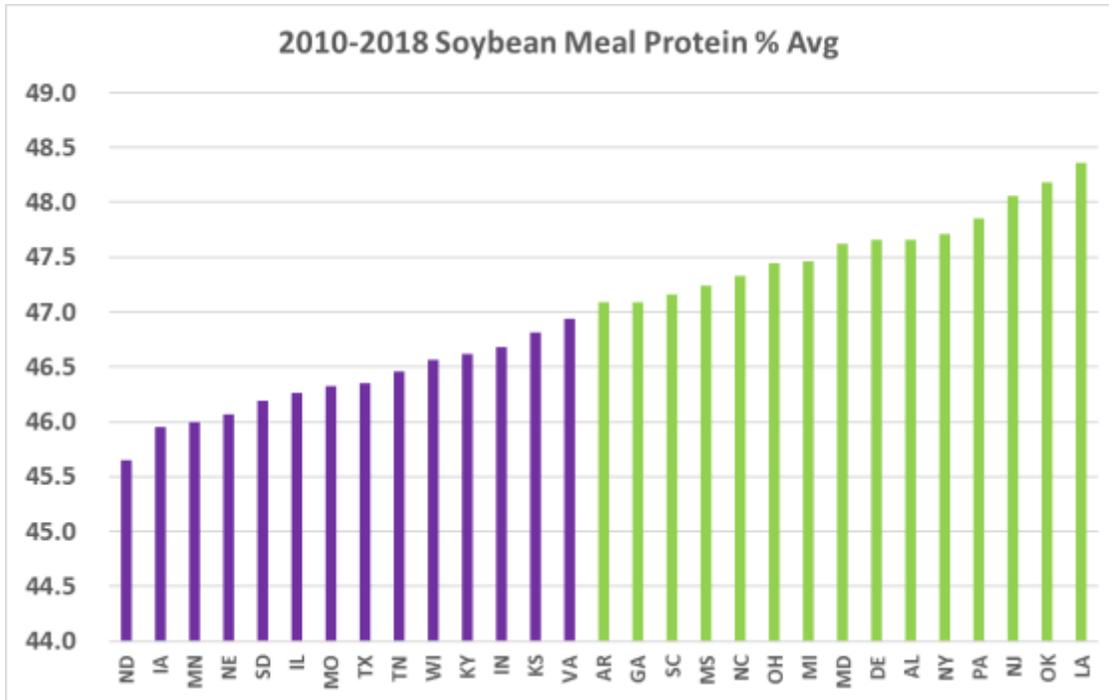


Figure 4, 2010-2018 Soybean Meal Protein % Average

Note: Survey results are presented as percent protein of the soybean. These values have been adjusted for the SBM yield per bushel of soybeans.

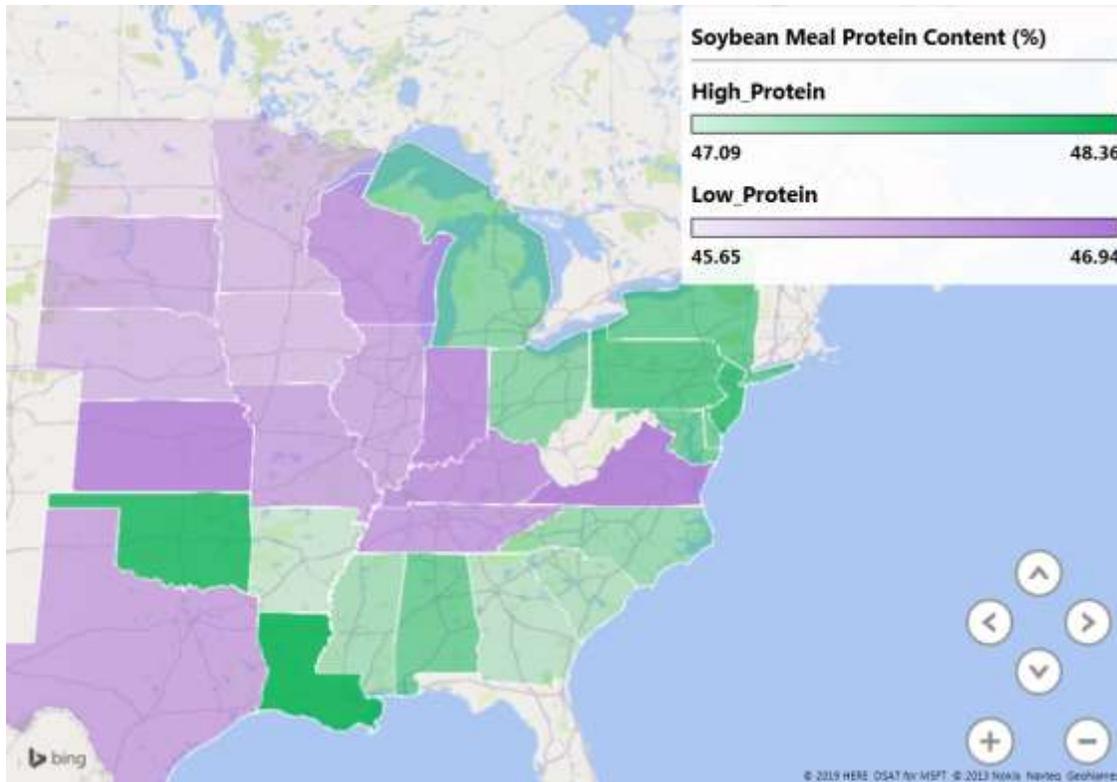


Figure 5, Soybean Protein Content by Region

Note: Survey results are presented as percent protein of the soybean. These values have been adjusted for the SBM yield per bushel of soybeans.

Depending on species, there are 18-20 amino acids that together make up total crude protein for a given feedstuff. Some of these amino acids are considered “limiting” and are therefore of more interest when balancing rations for livestock and poultry. The term “limiting” is derived from them being naturally in the shortest supply in proteins commonly used in feed. While limiting amino acids can vary across livestock and poultry species, the most common limiting amino acids are lysine, threonine, methionine and tryptophan. The remaining amino acids are generally available enough (or the dietary need is low enough) through the course of balancing rations for these limiting amino acids. Lysine is one of the most (“first”) limiting and is often the primary goal of nutritionists to balance rations for.

Using the same data as that which Figure 4 and Figure 5 rely upon, Figure 6 shows the spatial variance of lysine content in soybean meal. While there is some variation, average 2013-2018 lysine content is actually very consistent across the U.S. soybean growing region, varying only 0.15% between a high of 6.78% in North Dakota to a low of 6.63% in New Jersey and Louisiana. As in earlier iterations of this analysis, low variability in lysine content is assumed to be constant throughout the primary soybean growing region.

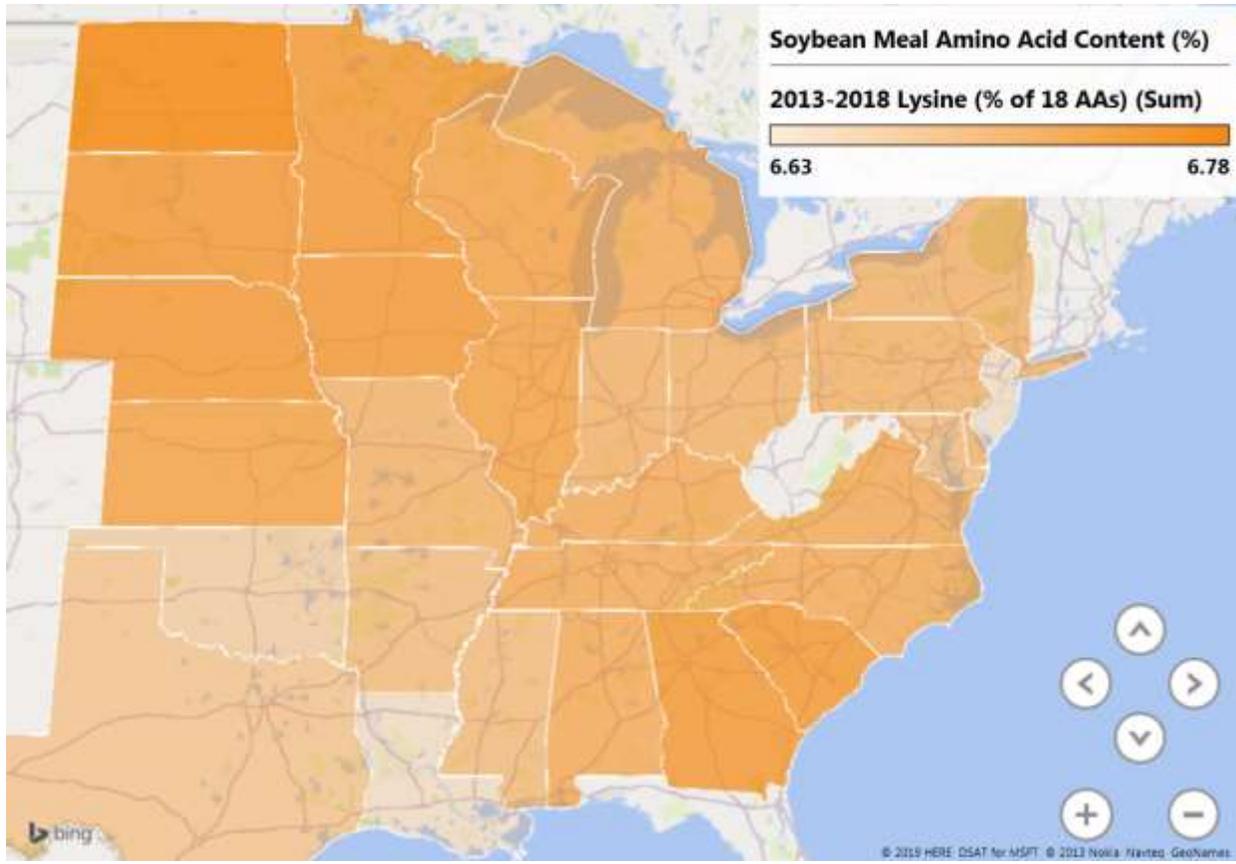


Figure 6, Soybean Lysine Content by Region

Soybeans are grown primarily in twenty-nine states in the U.S. with nearly eighty percent of production occurring in ten states in 2018. These ten states are in the eastern and western “corn belt”. Figure 7 depicts the number of soybean crushers by state, the locations of which are highly correlated to soybean production.

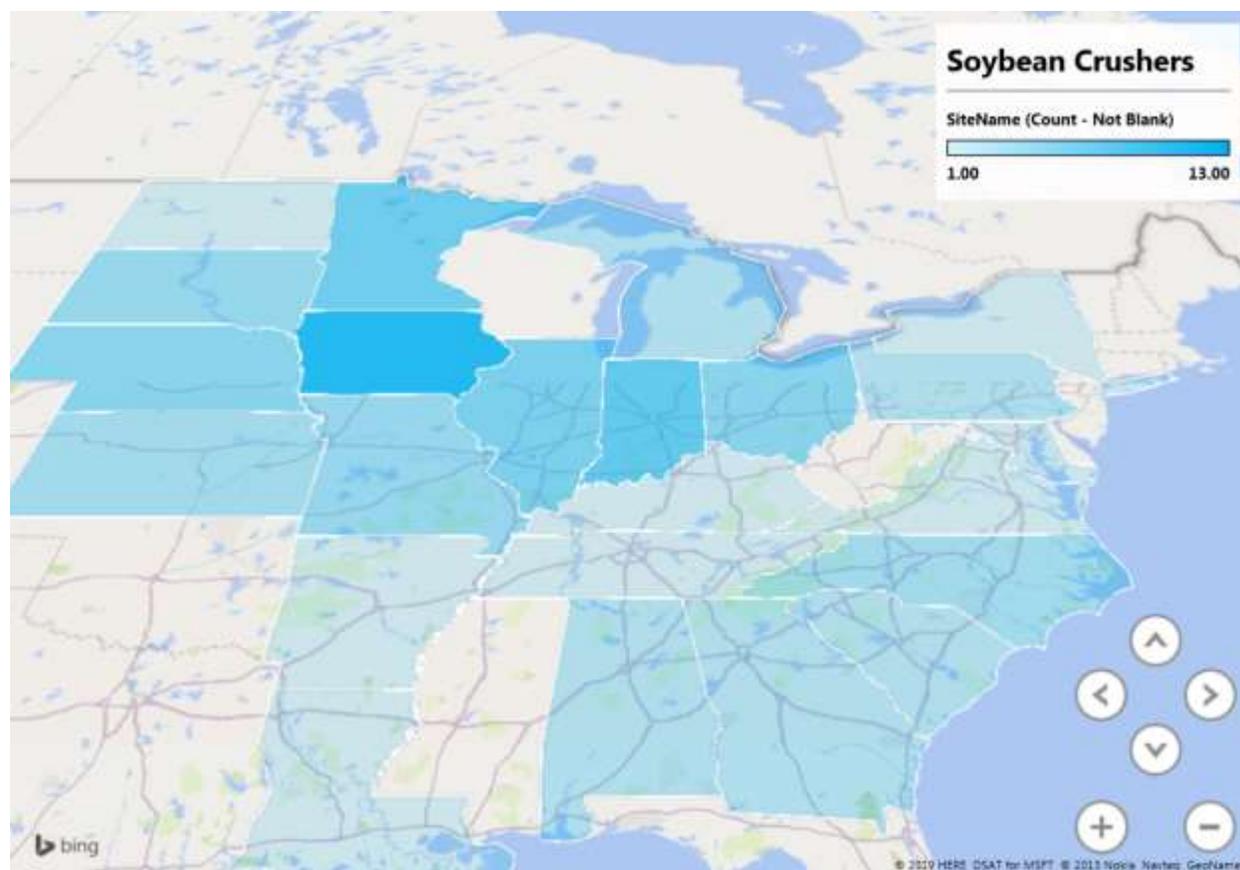


Figure 7, Soybean Meal Crushers by State

Soybean varieties with quality characteristics designed to enhance the balance of amino acids and improve performance characteristics of livestock and poultry production continue to be introduced and offered to the market. Recent examples include soybean meal with low concentration of oligosaccharides (beneficial for hogs) and high protein soybean meal.

Canola Meal

While there are efforts to improve total crude protein in canola meal, total crude protein (36 percent) in canola meal continues to be substantially less when compared to SBM (47.5 percent). Generally speaking, canola meal is produced and sold primarily for its oil and not meal, which is opposite that for SBM. Despite this, canola meal is used in some livestock and poultry diets.

According to the latest “Oil Crops Yearbook” (USDA, Economic Research Service), about 77 percent (3.6 million tons) of the canola meal supply in the U.S. was imported during the 2017/18 soybean marketing year. Since 2008/09, total U.S. canola meal imports have ranged from 1.3 million short tons in 2009/10 to as high as 4.0 million short tons in 2015/16; import shares of total supply less beginning stocks has ranged from 64% to 80% in these same years.

The import percentage has stabilized in recent years at 77% (see Figure 8). The vast majority (99% in 2017/18) of canola meal supply is consumed domestically by livestock and poultry.

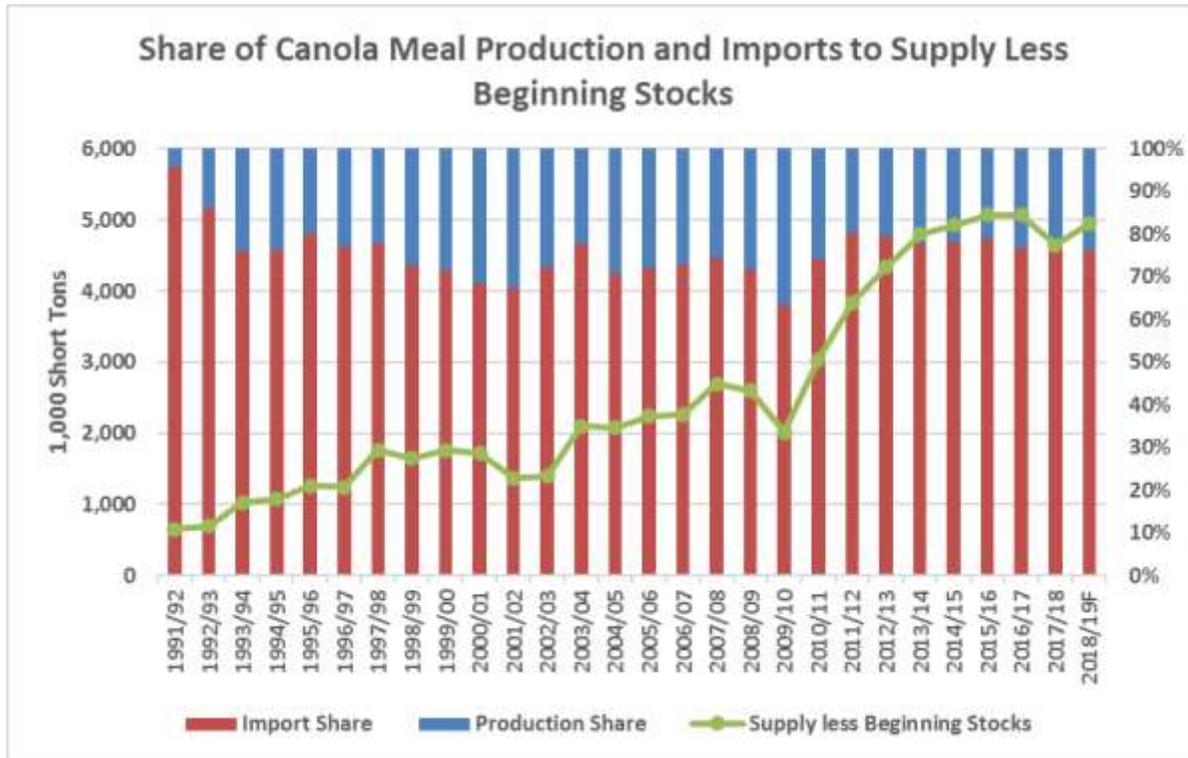


Figure 8, U.S. Canola Meal Supply 2017/18

Source: USDA-ERS, Oil Crops Yearbook

When compared with Figure 2, the seasonal pattern of canola meal prices (Figure 9) follow SBM very closely. The correlation coefficient between the price of SBM and the price of canola meal is 0.95 from 2008/09 to 2017/18. Canola meal has increasingly become a competing protein source to SBM. Canola meal prices in 2017/18 increased slightly over the prior two marketing years.

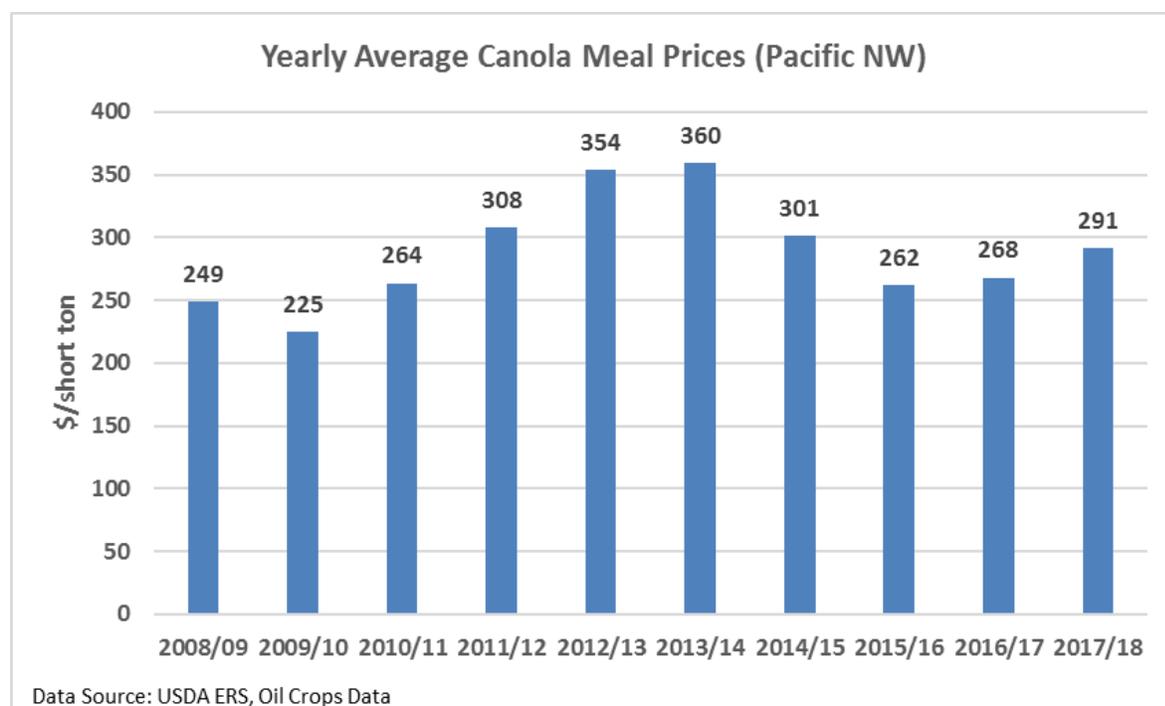


Figure 9, Yearly Average Canola Meal Prices (Pacific NW)

Canola is grown extensively in temperate regions (e.g., Prairie Provinces of Canada) and is a good source of protein (see Figure 10). While economics and other forces have an impact on the size of the North American growing region, the area depicted in this map represents the area most consistently used for growing canola; this growing region has not changed significantly for many years. Although the lysine content is lower than in SBM, it provides a much higher proportion of sulphur-containing amino acids (e.g., methionine) as shown in Table 1.

Overall protein digestibility of canola meal is lower compared to the protein in SBM (78% in canola meal vs. 90% in SBM). Because canola meal contains more methionine and cysteine, but less lysine, both meals tend to complement each other when used together in poultry diets.

With respect to energy content in canola meal, one of the criticisms of canola meal is its lower (78% percent of SBM) metabolizable energy content. Much of this can be attributed to the higher proportion of hulls compared to what is included in high protein SBM. Canola meal contains more than three times as much crude fiber as SBM. Fiber is lower in digestibility and consequently results in lowering the energy content of the meal. Another factor affecting the nutritive value of canola meal is the presence of glucosinolates. Glucosinolates are discussed mostly from the aspect of their anti-nutrition factor for poultry and swine and are toxic to birds. Recent improvements in canola genetics have mitigated this weakness to a certain extent, but it does still exist.



Figure 10, North American Canola Growing Regions

A variety of factors, including environmental conditions during plant growth, harvest conditions, bulk density and others, influence the nutrient content of canola meal. Minor factors influencing the nutrient content of the meal include varietal differences in canola seed and processing of the seed and meal during oil extraction and meal production.

High Protein Canola Meal

There remains continued research into a canola meal offering a protein content of 44%. However, the acreage devoted to higher protein canola remains small and market prices for high protein canola meal is not generally available, which makes it difficult to assess its impact on soybean meal demand at this point. Much of the research (primarily on pigs) being done on high protein canola meal is being done by Hans H. Stein with the University of Illinois, but higher protein canola has implications for other livestock and poultry species. Continued monitoring of this newer variety of canola is important.

Spatial Differences

Regarding whether nutritional profiles of canola differ spatially, as in previous iterations of this research, nutritional consistency has been assumed. This assumption is founded upon the fact that quality standards must be met by countries (primarily Canada) to export canola to the United States. Meeting these standards essentially creates uniformity for all canola meal imported to the U.S., regardless of where it was grown. The nutritional profile for canola meal

listed in Table 1 reflects the standards met by imported canola meal. Figure 11 shows the number of canola crushers by state/province; the number of canola crushers continues to remain stable.

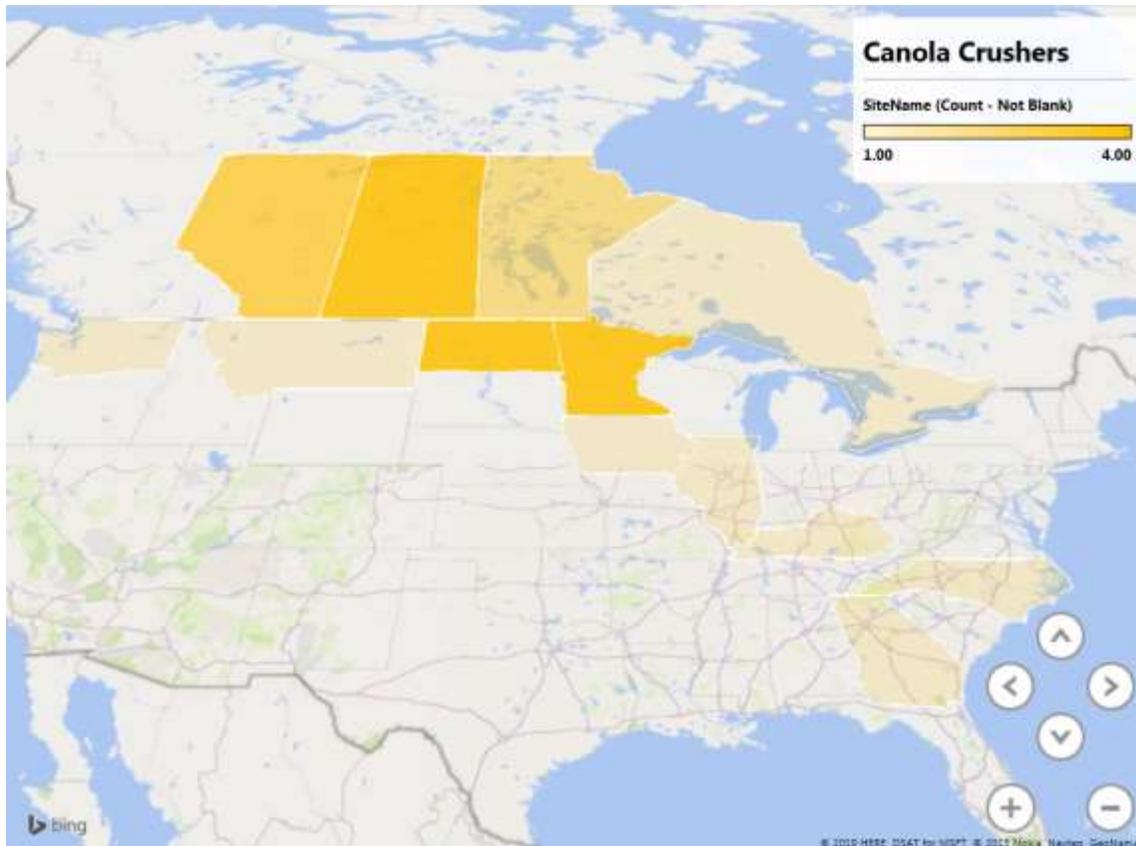


Figure 11, Canola Crushers by State/Province

Cottonseed Meal

Another protein source that competes with SBM is cottonseed meal, especially in broiler diets in the southern states. Where available, cottonseed meal is an important feed source for the domestic livestock and poultry industry. The correlation coefficient between annual SBM price and annual cottonseed meal price is 0.92. As shown in Figure 12, cottonseed meal prices moved down during 2016/17, but up in 2017/18. According to the Oil Crops Yearbook (USDA/ERS), there have been no cottonseed meal imports for more than twenty years. More than 85 percent of cottonseed meal was domestically consumed during the 2017/18 soybean marketing year, which is below the ten-year average (see Figure 13). The primary reason for a lower share of disappearance by domestic consumption is because exports have remained constant while domestic consumption has generally fallen.

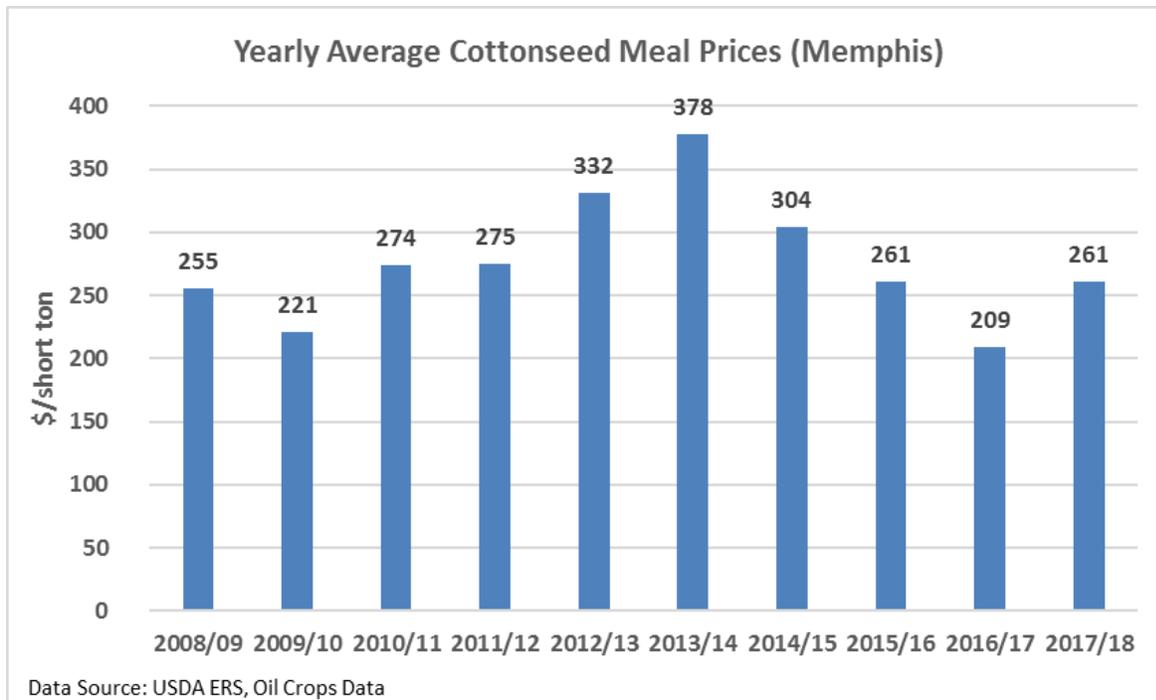


Figure 12, Yearly Average Cottonseed Meal Prices (Memphis)

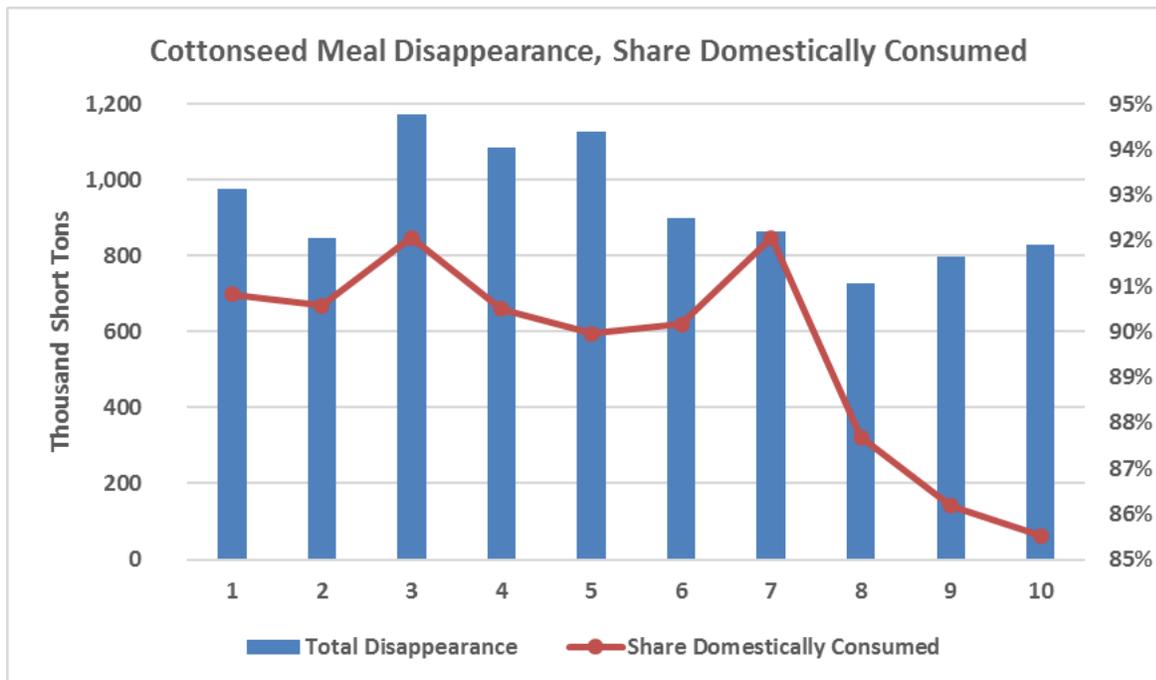


Figure 13, Cottonseed Meal Disappearance, Share Domestically Consumed

Cottonseed meal is a common type of oil meal that is palatable and commonly used in livestock and poultry rations in cotton growing regions of the United States. As shown in, Table 1 cottonseed meal has relatively high crude protein content (40%) compared to canola meal (36%), but still less than SBM. The crude fiber level of cottonseed meal is significantly higher

than that of SBM, which is the primary reason for the energy content of cottonseed meal being lower than SBM. Essential amino acids content and their ileal digestibility are lower compared to both soybean and canola meal.

There are some anti-nutritive fatty-acids and carbohydrates in cottonseed meal. For example, cottonseed meal contains cyclopropene fatty-acids (CPFA), which intensify the effect of the phenolic acid "gossypol", which can be toxic. It is this combination of CPFA, gossypol, and its low digestibility of lysine that limits the use of cottonseed meal for chickens even if the meal is less expensive than alternatives. In addition, with respect to laying hens specifically, CPFA and gossypol can cause a discoloration of the albumin and yolk of the hen's eggs, rendering cottonseed meal almost universally avoided as a feed ingredient for table-egg-laying birds.

Spatial Differences

Regarding whether nutritional profiles of cottonseed meal differ spatially, we continue to make the assumption that nutrition is consistent in terms of what is fed to U.S. animal agriculture. We have based this assumption on the fact that the production of cotton is spatially dense, meaning that the growing region for cotton is confined to the Delta states. Whereas SBM nutritional profiles can vary due to a wide north to south planting area, cotton, to the extent that it does spatially vary, would be from west to east, which implies lower variability in nutrition. See Figure 14, which depicts cottonseed crushers per state. The nutritional profile for cottonseed meal listed in Table 1 reflects what would be considered available for the feeding of livestock and poultry. Because the USDA/ERS has not recorded any cottonseed meal imports for more than twenty years, the need to account for availability from areas other than the U.S. is not a worthwhile exercise.

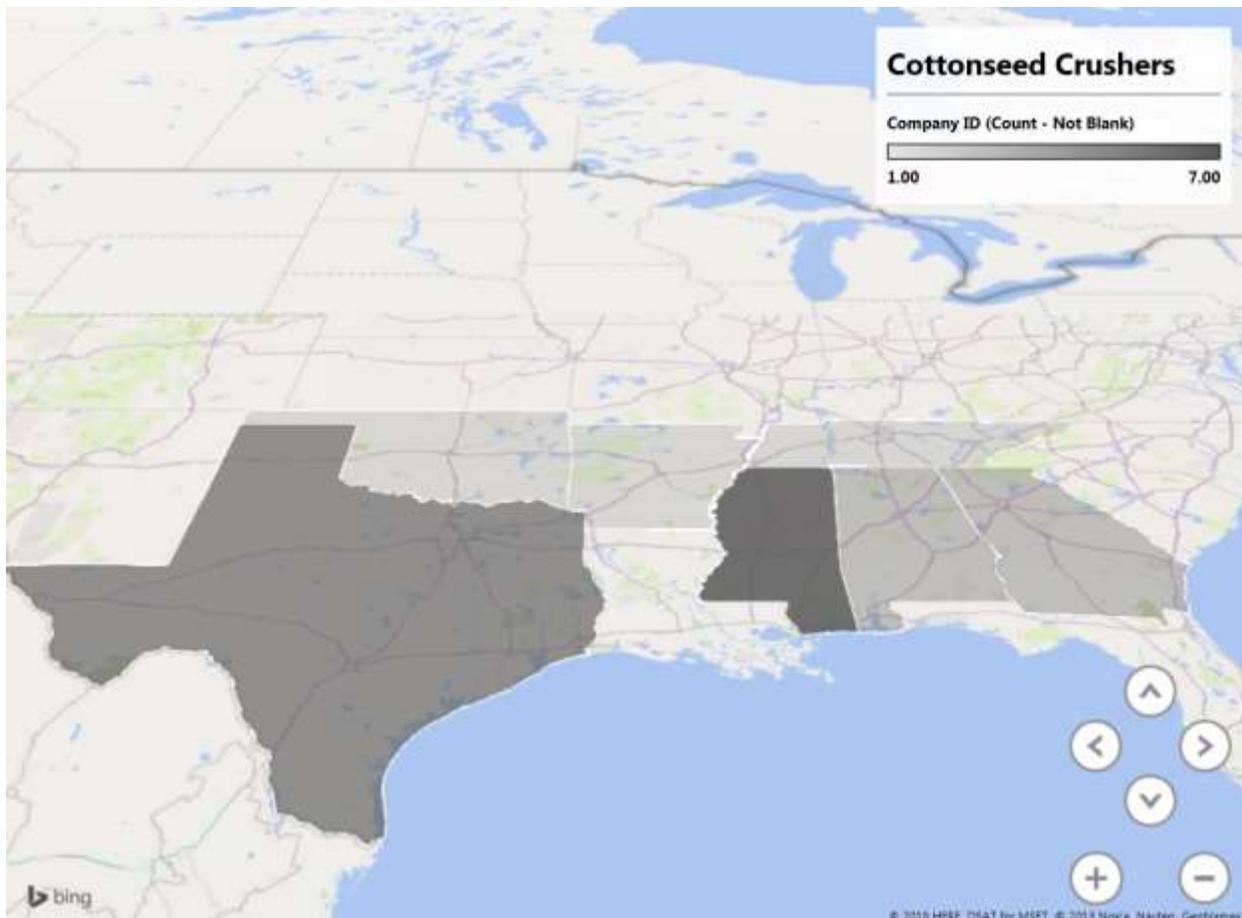


Figure 14, Cottonseed Crushers by State

Dried Distillers Grains with Solubles (DDGs)

The rapid expansion of the U.S. ethanol industry during 2006-2013 and the resulting increased production of DDGs during the same time have offered livestock and poultry producers a feed ingredient that, under the correct price relationships, can reduce overall diet costs. When ethanol margins are tight, DDGs is treated as more of a co-product than a byproduct, thereby drawing more attention to quality control. Because improvements in consistency have been made and almost universal removal of corn oil prior to the production of ethanol, current DDGs are often a strong competing substitute to SBM for use in livestock and poultry rations.

DDGs continues to be an attractive partial replacement ingredient for other traditional energy and protein sources such as corn and grain sorghum (energy) and SBM (protein) in livestock and poultry diets for many reasons. First, it can be a lower cost alternative that continues to be produced in large quantities by the dry-mill ethanol industry. DDGs also have high energy, protein, fat, and more importantly, high phosphorous content. Having high phosphorous in DDGs makes it a very cheap substitute for mono- or dicalcium phosphate which are relatively high cost ingredients (albeit at low inclusion rates) used in animal feeds. Phosphorus is an essential nutrient in livestock diets. It affects growth, reproduction and feed use.

DDGs have higher levels of phosphorus which provides the monocalcium phosphate needed in hogs and other livestock diets. Monocalcium phosphate is very expensive, so replacing even a small proportion of it will have an impact on final diet cost. This extra phosphorus value in DDGs compared to SBM can make DDGs very competitive with SBM. Although the DDGs price typically moves with corn, as with most ration ingredients, it must be valued in terms of what it replaces in a diet, not necessarily its unit cost. DDGs can replace some corn as an energy supplement and some SBM as a crude protein (see Table 1) supplement.

There are some noticeable weaknesses and limitations in DDGs. When it comes to hogs, meat quality levels have been questioned with pigs fed with the high concentration DDGs diets. Meat packers are increasingly using iodine values to measure the levels of unsaturated carcass fat. Excessive DDGs levels in swine feed can push fat iodine values past acceptable levels, generating discounts in sales values. Due to the use of sulphuric acid in the process of producing ethanol, DDGs may be high in sulphate, which increases the risk of sulphur toxicity in poultry diets. In addition, if present, mycotoxin in corn grain concentrates through the ethanol production process, presenting another risk factor.

Earlier generations of DDGs had higher oil content. However, with a high number of ethanol plants removing corn oil prior to producing ethanol, current DDGs contain much less oil (i.e., 3-5%) and have different characteristics and feeding values than earlier DDGs did. On the flipside, low-oil DDGs don't contain as high metabolizable energy content compared to earlier DDGs, which can be a limitation for increased usage. Variability among different DDGs suppliers can be common, but is somewhat mitigated through continued consolidation of the ethanol industry.

DDGs Market

During 2017/18, approximately 71 percent of the total DDGs supply are estimated to have been domestically consumed with the rest being exported (see Figure 15). As shown in Figure 15, approximately 28.1 million metric tons of DDGs are estimated to have been used in the livestock and poultry industries during the 2017/18 marketing year. DDGs prices in 2017/18 marketing year have almost universally increased compared to the previous three-year average from January 2017 to September 2017 (see Figure 16).

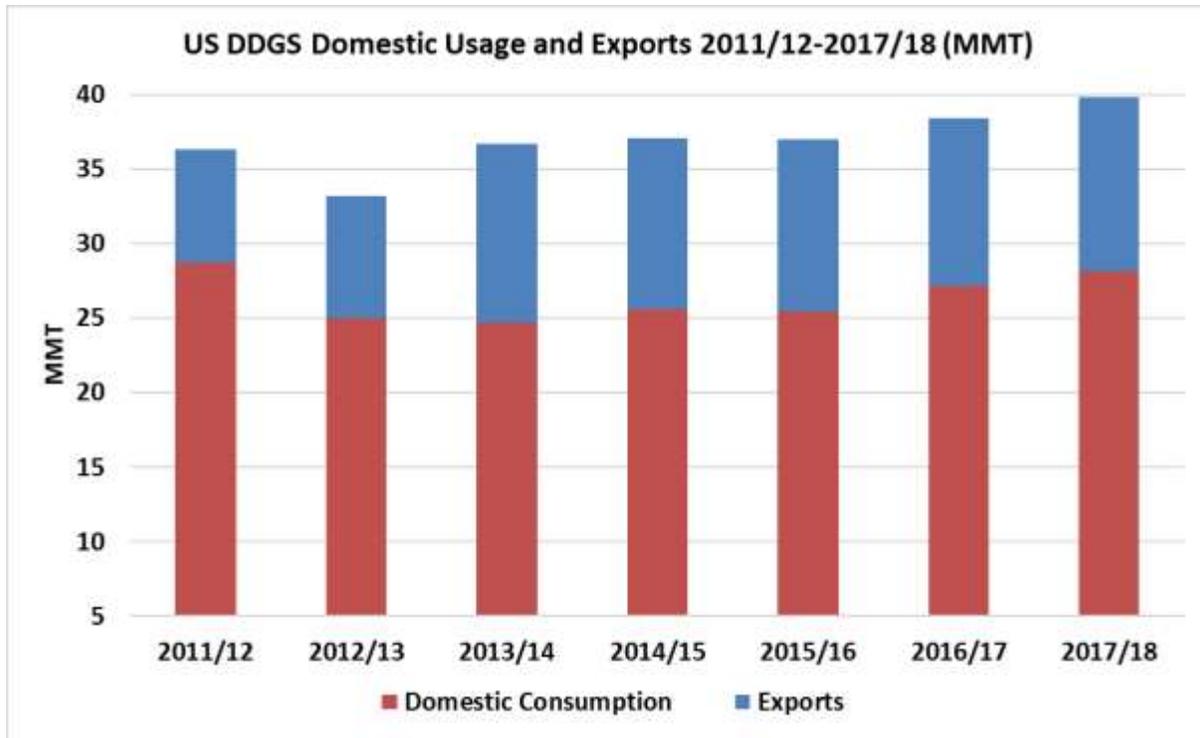


Figure 15, Estimated U.S. Dried Distillers Grains with Solubles (DDGs) Domestic Usage and Exports

(Source: USDA-ERS)

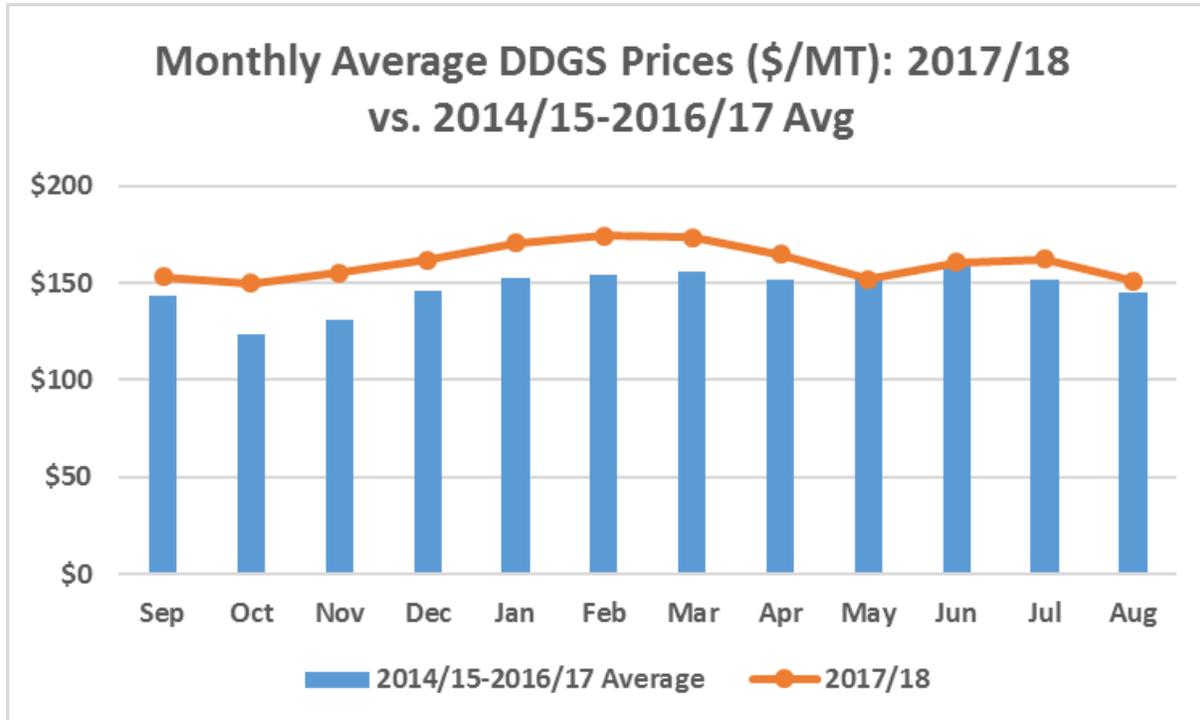


Figure 16, Monthly Average DDGS Prices During 2017/18 Compared to Previous Three-Year Average

Source: USDA-ERS

Spatial Differences

Regarding whether nutritional profiles of DDGs differ spatially, in our discussions with our subject matter experts, they view DDGs as a consistent feed ingredient that conforms to the specifications in Table 1. This is due to the increasingly consolidated nature of the ethanol industry, which implies a standardization of technology used in the production of DDGs. We understand that similar to SBM, there can be differences in nutritional profiles for corn, but the variability that does occur seems to be absorbed by the ethanol distillation process. However, to the extent that differences in nutritional characteristics does vary spatially, the component elasticities generated in this analysis can help describe the impact of these changes in terms of the relative value of components such as protein, metabolizable energy, and essential amino acids.

Figure 17 illustrates the production of DDGs by state. Note that there is no official data on the magnitude of production of DDGs. Production estimates are generally based on estimates of the amount of corn used to produce ethanol. As expected, those states which have high corn production have high ethanol production, which leads to large supplies of DDGs.

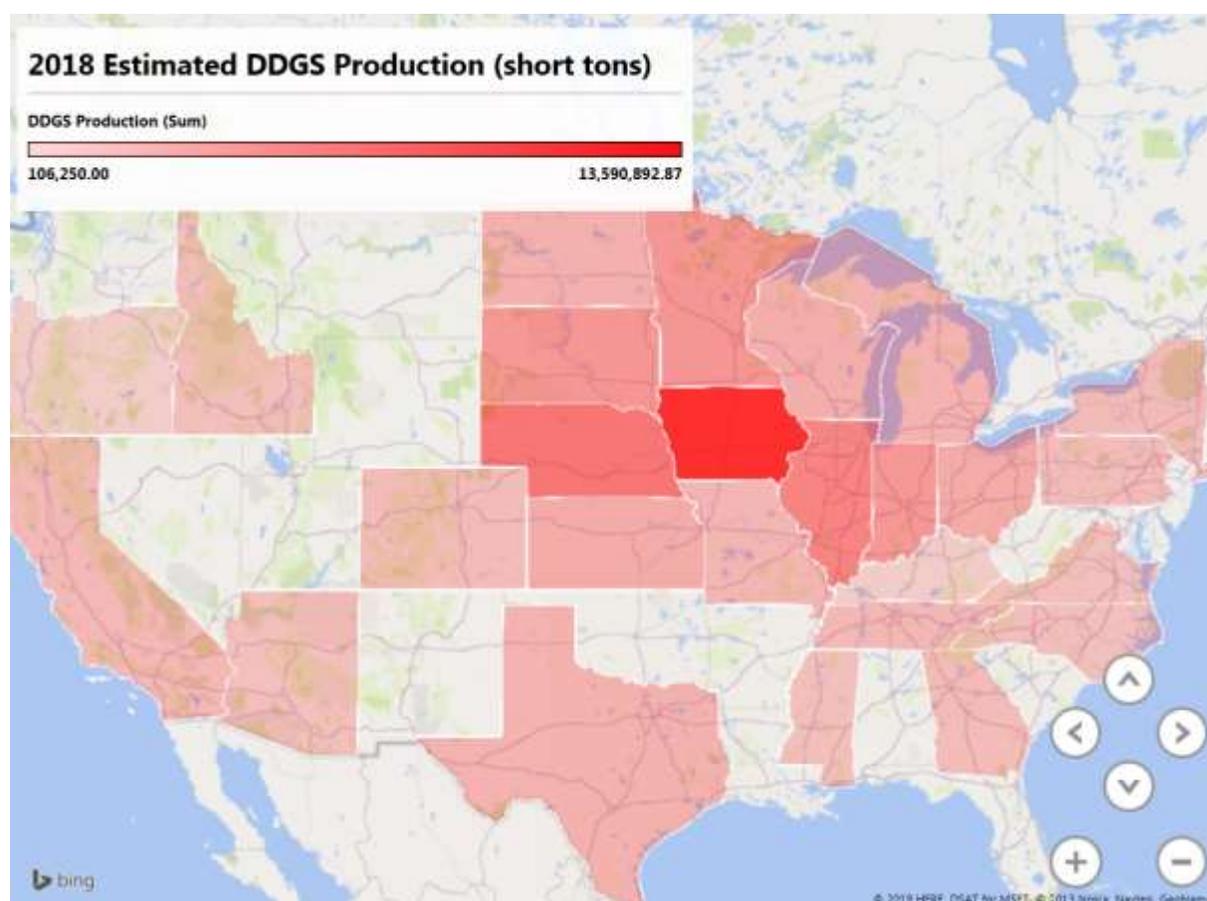


Figure 17, 2018 Estimated DDGs Production

Synthetic Amino Acids

The use of industrially-produced amino acids in animal feed is not new. The adoption of modern biotechnology has revolutionized the production process and led to a reduction in cost of producing most essential amino acids. With reduced prices, it is apparent the economics of producing and using synthetic amino acids has changed dramatically, providing much greater availability and cost-effective ways to use them in the U.S. feed market. Lower prices have allowed them to become very competitive with plant protein meals such as SBM. Further development of synthetic amino acid production could pose a more pronounced threat to SBM as they can replace not only lysine, but other essential and non-essential amino acids supplied by SBM. As shown in Figure 18, synthetic lysine prices fluctuated between \$0.68 per lb. and \$0.79 per lb. during 2018.

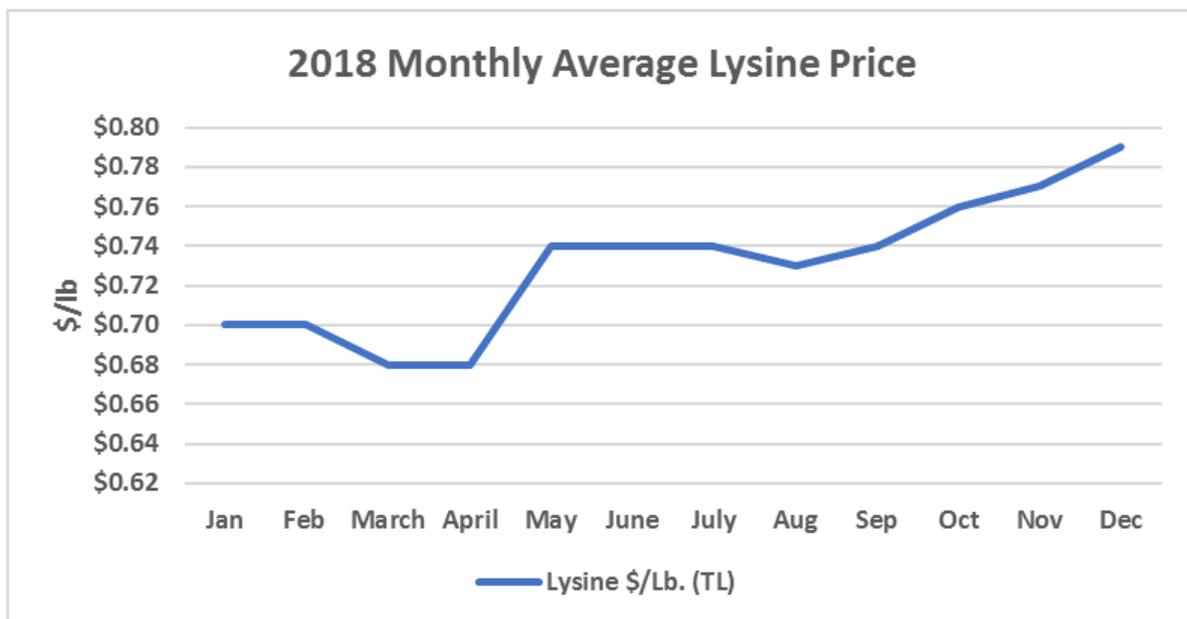


Figure 18, Monthly Average Lysine Prices

Spatial Differences

Because of the scientifically-controlled production process used to manufacture synthetic amino acids, there are no spatial differences for which to account.

Competitiveness of Soybean Meal Results

Following are results for each of the animal species under study. Results for SBM consumption, feed ingredient price elasticities and component price elasticities (where applicable) are presented.

Broilers

During the last few decades, the U.S. broiler industry has progressed from fragmented, locally-based businesses into a highly efficient, vertically-integrated industry. Much of the success of the broiler industry can be attributed to a more efficient structural organization and improved production and processing technologies.

Table 2 shows two key production performance indicators analyzed for broilers from 2008-2018: market weight (live weight) and feed to meat gain (feed conversion). Market weights have increased over time and feed conversion have generally improved for the U.S. broiler industry.

Table 2: U.S. Broiler Chicken Average Productivity from 2008-2018

Performance Measure	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Market Weight	5.58	5.59	5.7	5.8	5.85	5.92	6.01	6.12	6.16	6.2	6.26
Feed to Meat Gain	1.93	1.92	1.92	1.92	1.9	1.88	1.89	1.89	1.86	1.83	1.82

Note: Feed to meat gain is defined by the pounds of feed to one pound of broiler (live weight)

Source: National Chicken Council (<http://www.nationalchickencouncil.org>)

Competing Feedstuff Analysis

There are many possible sources of plant protein for broiler rations in the U.S. These include SBM, canola meal, cottonseed meal, meat and bone meal, and synthetic amino acids. SBM is attractive to broiler producers because of its high crude protein content with an excellent balance of essential amino acids. SBM continues to be the dominant meal source of protein for the broiler industry in the U.S.

Canola meal provides a crude protein source with an excellent balance of essential amino acids. However, lysine content of canola tends to be lower than SBM, but canola has a higher proportion of the methionine amino acid. Depending on its price compared to SBM prices, canola meal can present a cost-effective alternative plant protein sources in the northern part of the U.S.

Cottonseed meal is commonly used in livestock and poultry rations in cotton growing regions of the United States. Cottonseed meal is a relatively cost-effective source of plant protein compared to both SBM and canola meal, but it's lack of a balanced mix of essential amino acids (low in both lysine and methionine) and inferiority in terms of digestibility for broilers limit its competitiveness with SBM.

As seen Figure 19, across all ration regions, SBM generally accounts for twenty-eight percent of broiler diets, forty-nine percent corn, five percent DDGs, six percent sorghum, two percent meat and bone meal and one percent each of bakery meal and canola meal during the 2017/18 marketing year. This figure is based upon data contained in Table 3, which further breaks down the key ration ingredients by state.

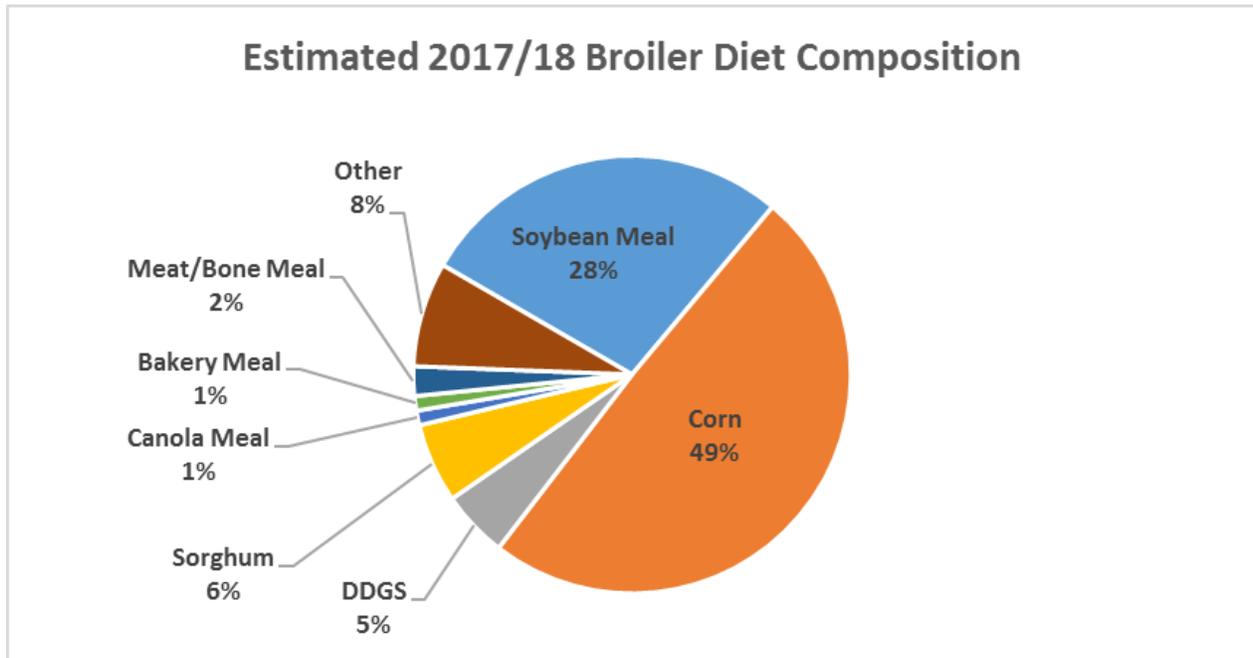


Figure 19, Estimated 2017/18 Broiler Diet Composition

Table 3, 2017/18 Broiler Ration Ingredient Estimates (Short Tons)

State	Soybean Meal	Corn	DDGS	Sorghum	Canola Meal	Bakery Meal	Meat/Bone Meal	DL-Met	Lysine	Other	Total
ALABAMA	1,853,160	3,438,997	348,077	556,923	-	-	208,846	19,492	18,100	588,250	7,031,845
ALASKA	4,318	6,764	699	1,398	-	-	420	39	29	455	14,122
ARIZONA	8,763	13,727	1,419	2,838	-	-	851	79	58	924	28,660
ARKANSAS	1,936,643	3,440,914	337,659	405,191	-	-	151,947	18,521	15,836	514,525	6,821,234
CALIFORNIA	46,484	72,812	7,527	15,053	-	-	4,516	417	310	4,903	152,022
COLORADO	40,900	64,392	6,416	9,624	-	-	2,887	349	249	4,779	129,596
CONNECTICUT	14,686	24,858	2,776	-	5,552	5,552	-	117	122	2,421	56,085
DELAWARE	433,576	733,883	81,961	-	163,923	163,923	-	3,442	3,606	71,470	1,655,786
FLORIDA	108,693	201,707	20,416	32,665	-	-	12,249	1,143	1,062	34,503	412,439
GEORGIA	2,266,188	4,205,473	425,655	681,048	-	-	255,393	23,837	22,134	719,357	8,599,085
HAWAII	3,937	6,167	637	1,275	-	-	382	35	26	415	12,876
IDAHO	27,052	42,374	4,380	8,760	-	-	2,628	243	180	2,853	88,472
ILLINOIS	31,104	49,632	4,462	-	-	-	-	229	141	4,575	90,143
INDIANA	106,641	170,166	15,300	-	-	-	-	786	483	15,686	309,063
IOWA	149,211	238,096	21,408	-	-	-	-	1,100	676	21,947	432,439
KANSAS	28,863	47,579	4,401	1,760	-	-	660	231	162	5,243	88,899
KENTUCKY	616,270	1,015,904	93,965	37,586	-	-	14,095	4,938	3,449	111,950	1,898,156
LOUISIANA	39,305	72,941	7,383	11,812	-	-	4,430	413	384	12,477	149,144
MAINE	39,816	67,393	7,527	-	15,053	15,053	-	316	331	6,563	152,052
MARYLAND	488,373	826,634	92,320	-	184,640	184,640	-	3,877	4,062	80,503	1,865,050
MASSACHUSETTS	20,452	34,617	3,866	-	7,732	7,732	-	162	170	3,371	78,103
MICHIGAN	226,755	361,832	32,533	-	-	-	-	1,672	1,028	33,353	657,174
MINNESOTA	129,182	206,136	18,534	-	-	-	-	953	586	19,001	374,391
MISSISSIPPI	1,240,271	2,301,629	232,958	372,733	-	-	139,775	13,046	12,114	393,700	4,706,226
MISSOURI	636,891	1,016,285	91,376	-	-	-	-	4,697	2,887	93,679	1,845,816
MONTANA	13,240	20,845	2,077	3,116	-	-	935	113	81	1,547	41,953
NEBRASKA	43,029	68,374	6,354	3,177	-	-	953	333	216	5,921	128,357
NEVADA	2,413	3,780	391	781	-	-	234	22	16	255	7,892
NEW HAMPSHIRE	16,971	28,725	3,208	-	6,416	6,416	-	135	141	2,797	64,809
NEW JERSEY	11,314	19,150	2,139	-	4,277	4,277	-	90	94	1,865	43,206
NEW MEXICO	8,255	12,931	1,337	2,673	-	-	802	74	55	871	26,999
NEW YORK	60,376	102,195	11,413	-	22,827	22,827	-	479	502	9,952	230,571
NORTH CAROLINA	1,428,656	2,651,224	268,343	429,348	-	-	161,006	15,027	13,954	453,499	5,421,056
NORTH DAKOTA	11,836	18,808	1,748	874	-	-	262	92	59	1,629	35,309
OHIO	214,728	346,843	32,783	-	16,391	16,391	-	1,608	1,138	32,353	662,236
OKLAHOMA	357,539	635,254	62,338	74,805	-	-	28,052	3,419	2,924	94,991	1,259,322
OREGON	69,472	108,821	11,249	22,498	-	-	6,749	623	463	7,327	227,203
PENNSYLVANIA	347,795	578,400	60,910	-	91,365	91,365	-	2,701	2,491	55,446	1,230,473
RHODE ISLAND	2,937	4,972	555	-	1,110	1,110	-	23	24	484	11,217
SOUTH CAROLINA	398,710	739,906	74,889	119,823	-	-	44,934	4,194	3,894	126,563	1,512,912
SOUTH DAKOTA	14,064	22,349	2,077	1,039	-	-	312	109	71	1,935	41,955
TENNESSEE	314,163	558,186	54,775	65,730	-	-	24,649	3,004	2,569	83,466	1,106,542
TEXAS	1,129,373	2,004,704	203,968	346,746	-	-	122,381	11,392	10,056	291,746	4,120,367
UTAH	10,033	15,716	1,625	3,249	-	-	975	90	67	1,058	32,814
VERMONT	27,849	47,138	5,265	-	10,529	10,529	-	221	232	4,591	106,354
VIRGINIA	462,411	839,352	86,993	104,392	43,497	43,497	39,147	4,567	4,350	129,228	1,757,433
WASHINGTON	47,881	75,001	7,753	15,506	-	-	4,652	430	319	5,050	156,591
WEST VIRGINIA	150,378	250,086	26,336	-	39,504	39,504	-	1,168	1,077	23,974	532,027
WISCONSIN	120,022	191,519	17,220	-	-	-	-	885	544	17,654	347,845
WYOMING	8,652	13,621	1,357	2,036	-	-	611	74	53	1,011	27,415
U.S. Total	15,769,637	28,018,814	2,810,758	3,334,461	612,817	612,817	1,235,732	151,008	133,577	4,102,116	56,781,737

Soybean Meal Price Elasticity Estimates for Broilers

In this section, the own-price demand elasticity of SBM and the cross-price demand elasticities of SBM with corn and competing protein sources are presented. These are aggregate measures of how soybean meal is substituted or complemented with corn and competing protein meal sources. Estimated coefficients are provided for the net effects of both protein and energy, not the individual components of SBM.

It is expected that the demand for SBM should be inversely related to the price of SBM and positively related to corn and other substitute prices. Hence, we anticipate SBM prices to have negative estimated coefficients and the rest of the estimated coefficients to be positive. A component with a negative coefficient may be functioning as a complement to SBM rather than as a substitute.

Table 4, Estimated Elasticities for Broilers (SBM)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.02301		Wrong Sign
Corn	0.17055		Substitute
DDGS	0.13087	**	Substitute
Wheat	-0.10972		Complement
Canola Meal	-0.06995		Complement
MBM50	0.04922		Substitute
D-Met	-0.13387		Complement
L-Lysine HCl	0.22835		Substitute
Threonine	0.13503		Substitute
NOTES:			
Dependent Variable is the quantity of SBM included in the broiler ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The elasticity analysis for broiler diets resulted in mixed results with a positive sign on the own-price coefficient for soybean meal and several feed ingredients with negative signs rather than the expected positive signs. The only variable that is statistically significant is DDGs which is significant at the 5% level. Corn, DDGs, meat and bone meal, L-Lysine HCL and threonine all have positive signs indicating that they function as substitutes for soybean meal in broiler diets. Wheat, canola meal and D-met have negative coefficients indicating that they are not functioning as substitutes and may be functioning as complements to soybean meal.

Table 5, Estimated Elasticities for Broilers: Major Feed Ingredients (SBM)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.04820		Wrong Sign
CORN	0.16827		Substitute
DDGS	0.14161	**	Substitute
NOTES:			
Dependent Variable is the quantity of SBM included in the broiler ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

An analysis was conducted with just the major feed ingredients of soybean meal, corn and DDGs as shown in Table 5. The sign for soybean meal price was still positive at 0.04820 and statistically insignificant. Corn and DDGs have the expected positive sign indicating that there is some level of substitution between soybean meal and corn and between soybean meal and DDGs in broiler rations. Based on this elasticity of substitution estimate, a 10% increase in the price of corn would increase the inclusion rate of soybean meal in broiler diets by 1.7% and a 10% increase in the price of DDGs would increase the inclusion rate of soybean meal in broiler rations by 1.4%. Both of these elasticities of substitution are slightly lower than the elasticities estimated from 2016-17 broiler diets.

In the monthly broiler rations there was substantial stability in soybean meal inclusion rates despite price changes to soybean meal and several other feed ingredients. It is possible that the trade distortions which are particularly affecting soybeans in a price-depressing manner may be affecting these results. It is also possible that the consumer preferences for product labeled with “raised with plant-based diets” is enhancing plant-based protein use in broiler rations rather than animal-based protein sources.

Component Price Elasticities for Broilers

In addition to the above elasticity estimates of SBM at an aggregate level, the tables below show the estimated elasticities for the key components of SBM: metabolizable energy content, crude protein and derived value for lysine. These analyses examine the perceived value of the characteristics of SBM compared to these components in other feedstuffs. It is vital to know what soybean components are worth when compared to alternative ingredients.

Table 6, Estimated Elasticities for Broilers (Metabolizable Energy)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.02301		Wrong Sign
Corn	0.17055		Substitute
DDGS	0.13087	**	Substitute
Wheat	-0.10972		Complement
Canola Meal	-0.06995		Complement
MBM50	0.04922		Substitute
DL-Met	-0.13387		Complement
L-Lysine HCl	0.22835		Substitute
Threonine	0.13503		Substitute
NOTES:			
Dependent Variable is the quantity of Metabolizable Energy in SBM included in the broiler ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

As with the feed ingredient elasticity analysis, the own-price elasticity of metabolizable energy (ME) in soybean meal is positive rather than the expected negative sign. It is statistically insignificant. The elasticity of substitution for corn is positive, as expected, at 0.17055, but statistically insignificant. The elasticity of the ME in corn is a substitute for the metabolizable energy in soybean meal. A 10% increase in the value of ME in corn will result in a 1.7% increase in ME supplied by soybean meal. The coefficient for ME in DDGs, 0.13087 is statistically significant at the 5% level. Metabolizable energy in DDGs is a substitute for ME in soybean meal in broiler rations. A 10% increase in the price of ME in DDGs will result in a 1.3% increase in the amount of ME supplied by soybean meal in broiler diets. ME in meat and bone meal, L-Lysine HCL and threonine also have positive signs indicating that they are substitutes for ME in soybean meal, but the coefficients are statistically insignificant.

The signs on the coefficients for ME in wheat, canola meal and DL-Met are negative and statistically insignificant. Negative coefficients would indicate that these feed ingredients are functioning as complements to soybean meal rather than as substitutes.

Table 7, Estimated Elasticities for Broilers (Crude Protein)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.04753		Wrong Sign
Corn	0.15663		Substitute
DDGS	0.13566	**	Substitute
Wheat	-0.13280		Complement
Canola Meal	-0.06259		Complement
MBM50	0.05014		Substitute
NOTES:			
Dependent Variable is the quantity of Crude Protein in SBM included in the broiler ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The own-price elasticity of crude protein (CP) in soybean meal is 0.04753 (has a positive sign rather than the expected negative sign) and is statistically insignificant. The elasticity of substitution for CP in corn is 0.15663. It is positive, as expected, but statistically insignificant. A 10% increase in the value of CP in corn will result in a 1.57% increase in the amount CP supplied by soybean meal in broiler diets. The elasticity of substitution for CP in DDGs is 0.13566. It is positive, as expected, and statistically significant at the 5% level. A 10% increase in the value of CP in DDGs results in a 1.36% increase in CP supplied by soybean meal in broiler diets. The CP in meat and bone meal is also a minor substitute for CP in soybean meal. The coefficients of substitution for CP in wheat and canola meal are negative and statistically insignificant. These feed ingredients are functioning as complements to soybean meal rather than as substitutes.

Table 8, Estimated Elasticities for Broilers (Digestible Lysine)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.04663		Wrong Sign
Corn	0.15073		Substitute
DDGS	0.13603	**	Substitute
Wheat	-0.12564		Complement
Canola Meal	-0.06732		Complement
MBM50	0.04977		Substitute
L-Lysine HCl	0.22362		Substitute
NOTES:			
Dependent Variable is the quantity of Digestible Lysine in SBM included in the broiler ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The own-price elasticity for digestible lysine (DL) in soybean meal is 0.04663. It is not statistically significant and has a positive sign rather than the expected negative sign. The

elasticity of substitution for DL in corn is 0.15073. It is not statistically significant. A 10% change in the value of DL in corn results in a 1.5% increase in the amount of DL supplied by soybean meal in broiler rations. The elasticity of substitution for DL in DDGs is 0.13603. It is statistically significant at the 5% level. A 10% increase in the value of DL in DDGs results in a 1.3% increase in DL supplied by soybean meal in broiler rations. Meat and bone meal and synthetic lysine in the form of L-Lysine HCL are both substitutes for lysine from soybean meal in broiler diets. Neither of these are statistically significant.

In broiler rations, essential amino acids from SBM can compete with amino acids from corn, DDGs, cottonseed meal, canola meal and synthetic amino acids. Lysine is the amino acid that most limits the use of SBM in broiler diets. Thus, we included lysine in our broiler analysis. SBM has the highest content of lysine among plant protein sources listed above and lysine in SBM has the highest ileal digestibility compared to the other plant proteins

The estimated coefficients for lysine in SBM show positive (expected) signs for all competing ingredients. The estimated coefficient of synthetic lysine is 0.22362, indicating a relatively weak elastic nature with the lysine demand in SBM. A 10% change in the price of synthetic lysine will change the lysine quantity demanded from SBM by approximately 2.2% but is statistically insignificant. This shows that when synthetic lysine acid is included in diets of broilers, it will reduce the amount of SBM going into broiler diet.

Layers

Within the last ten years, the U.S. egg industry has grown significantly in general, but also in the use of alternative production systems of organic, cage-free and free-range egg production to satisfy consumer demands. The modern layer industry produces nutritious, high quality eggs that have become more affordable to consumers nationwide and around the globe. Much of the success of the layer industry can be attributed to a more efficient structural organization and improved production technologies.

Figure 20 shows a key production performance indicator analyzed for layers from 2008-2018: eggs per layer per day. Eggs per layer per year have significantly increased over time.

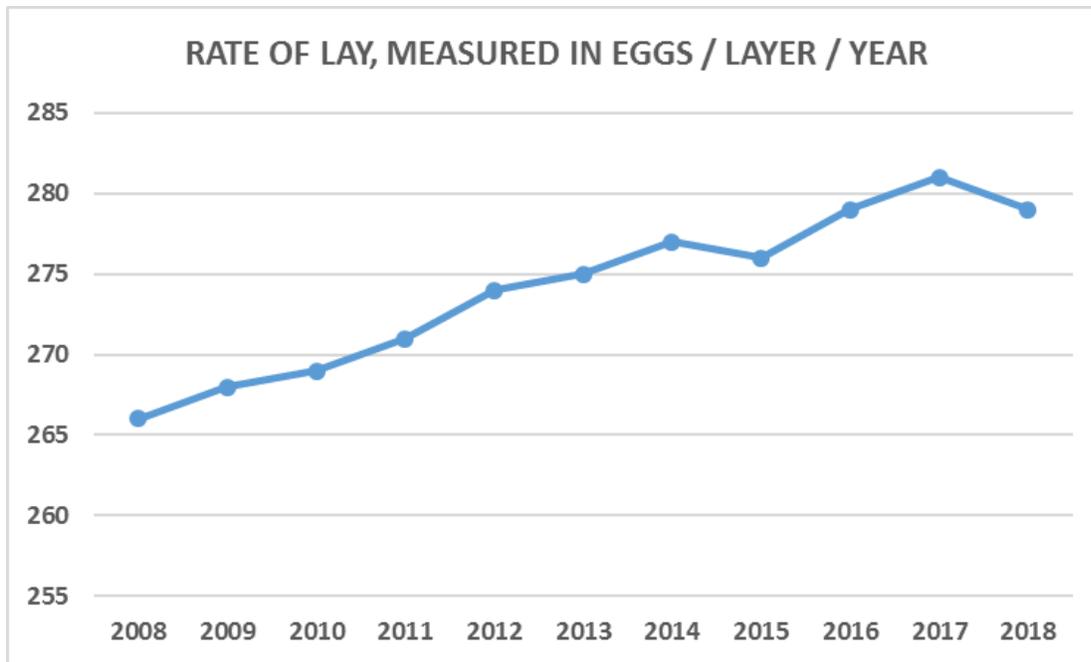


Figure 20, U.S. Layer Chickens Average Productivity from 2008-2018 (Source: USDA-NASS)

Competing Feedstuff Analysis

As shown in Figure 21, SBM accounts for sixteen percent in layer diets and nine percent of DDGs. Sorghum and canola meal two percent and three percent respectively. This figure is based upon data contained in Table 9, which further breaks down the key ration ingredients by state. There are many possible sources of plant protein for layer rations in the U.S. These include SBM, DDGs, canola meal, and synthetic amino acids. Compared to broiler rations, cottonseed meal is rarely used in layer diets.

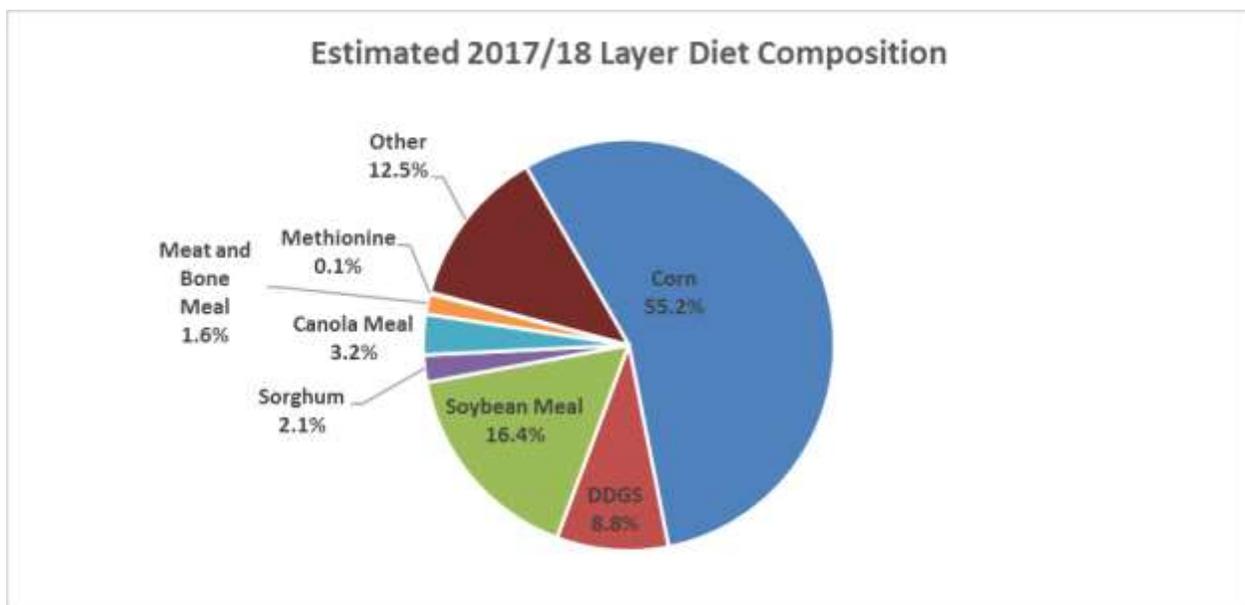


Figure 21, Estimated 2017/18 Layer Diet Composition

Table 9, 2017/18 Layer Ration Ingredient Estimates (Short Tons)

State	Corn	DDGS	Soybean Meal	Sorghum	Canola Meal	Meat and Bone Meal	Methionine	Other
Alabama	369,797	58,635	32,079	5,435	54,286	27,143	433	48,320
Alaska	2,560	429	726	285	201	101	4	498
Arizona	27,565	4,638	8,785	3,537	1,809	904	44	5,467
Arkansas	445,005	71,159	57,490	12,525	57,799	28,900	572	68,202
California	298,077	53,165	129,398	55,863	8,475	4,237	678	82,309
Colorado	100,009	16,965	40,126	12,980	3,119	1,559	214	25,827
Connecticut	14,049	2,232	4,131	-	706	353	29	3,302
Delaware	63,875	10,171	4,210	-	9,929	4,965	88	8,861
Florida	150,099	28,406	59,227	27,968	6,031	3,016	413	59,244
Georgia	599,888	100,247	103,891	37,711	70,079	35,039	965	122,533
Hawaii	5,770	1,023	2,374	1,016	210	105	13	1,548
Idaho	34,980	6,073	12,898	5,398	1,755	877	69	8,395
Illinois	122,033	18,242	47,392	-	1,313	657	256	30,607
Indiana	852,086	126,858	302,591	-	21,009	10,505	1,590	192,057
Iowa	1,415,627	210,835	512,700	-	30,663	15,332	2,702	325,815
Kansas	41,410	6,502	13,715	1,496	1,716	858	79	10,015
Kentucky	165,670	25,950	32,690	3,028	16,259	8,130	247	29,327
Louisiana	32,945	5,913	10,272	4,597	2,236	1,118	72	10,254
Maine	24,048	3,815	6,359	-	1,532	766	47	5,293
Maryland	138,033	21,892	25,730	-	13,748	6,874	234	25,634
Massachusetts	15,958	2,579	5,381	-	512	256	39	4,419
Michigan	393,753	58,862	137,129	-	11,025	5,513	745	89,203
Minnesota	276,575	41,276	94,445	-	8,505	4,253	506	60,918
Mississippi	249,338	40,026	25,552	5,893	35,311	17,655	322	36,769
Missouri	294,083	44,309	71,844	-	21,602	10,801	432	51,105
Montana	23,360	3,970	9,381	3,037	730	365	51	6,092
Nebraska	183,755	28,595	69,471	7,600	4,276	2,138	369	44,454
Nevada	5,330	920	1,937	807	274	137	10	1,234
New Hampshire	13,674	2,167	3,799	-	785	393	27	3,068
New Jersey	21,510	3,402	6,467	-	1,005	503	43	4,979
New Mexico	28,617	4,923	10,336	4,295	1,487	744	53	6,509
New York	123,724	19,834	42,641	-	3,445	1,722	292	33,310
North Carolina	414,167	69,331	74,943	27,744	47,136	23,568	664	85,699
North Dakota	8,322	1,295	2,655	280	399	199	15	1,802
Ohio	844,422	127,929	292,309	-	23,789	11,895	1,641	195,305
Oklahoma	127,247	21,781	34,749	11,191	9,844	4,922	265	34,668
Oregon	56,532	9,910	21,380	9,016	2,697	1,349	120	14,327
Pennsylvania	648,761	102,226	225,818	-	17,427	8,713	1,467	168,865
Rhode Island	2,778	440	789	-	152	76	6	629
South Carolina	123,377	21,498	29,259	12,195	11,742	5,871	248	32,743
South Dakota	64,627	10,024	23,472	2,544	1,883	941	123	14,940
Tennessee	112,180	19,229	30,924	9,988	8,575	4,288	236	30,838
Texas	535,505	95,469	165,334	72,191	37,716	18,858	1,184	158,376
Utah	102,101	18,307	45,514	19,742	2,514	1,257	239	28,933
Vermont	15,158	2,448	4,742	-	655	328	36	4,026
Virginia	96,107	15,518	11,629	2,485	12,867	6,433	135	15,550
Washington	144,279	25,851	63,421	27,462	3,882	1,941	338	40,772
West Virginia	63,166	9,920	15,666	-	4,534	2,267	116	13,123
Wisconsin	169,421	25,348	57,922	-	5,222	2,611	317	37,912
Wyoming	14,185	2,385	5,326	1,700	572	286	29	3,449
US Total	10,075,536	1,602,920	2,991,018	390,011	583,440	291,720	18,817	2,287,526

Soybean Meal Price Elasticity Estimates for Layers

In this section, the own-price demand elasticity of SBM and the cross-price demand elasticities of SBM with corn and competing protein sources are presented. These are aggregate measures of how soybean bean meal is substituted or complemented with corn and competing protein

meal sources. Estimated coefficients are provided for the net effects of both protein and energy, not the individual components of SBM.

It is expected that the demand for SBM should be inversely related to the price of SBM and positively related to corn and other substitute prices. Hence, we anticipate SBM prices to have negative estimated coefficients and the rest of the estimated coefficients to be positive. A component with a negative coefficient may be functioning as a complement to SBM rather than as a substitute.

Table 10, Estimated Elasticities for Layers (SBM)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.03780		Wrong Sign
Corn	0.02385		Substitute
DDGS	0.13316	**	Substitute
Wheat	-0.03999		Complement
Canola Meal	0.08949		Substitute
MBM50	-0.02901		Complement
D-Met	-0.05813		Complement
L-Lysine HCl	0.00080		Substitute
NOTES:			
Dependent Variable is the quantity of SBM included in the layer ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The own-price elasticity of SBM in layer rations is 0.04. It is statistically insignificant and positive, rather than negative which is what would be expected. The elasticity of substitution for corn is 0.02 but statistically insignificant. A 10% increase in corn price would result in a 0.2% increase in SBM inclusion in layer rations. The elasticity of substitution for DDGs is 0.13 and statistically significant at the 5% level. A 10% increase in the price of DDGs would result in a 1.3% increase in SBM inclusion in layer diets. The elasticity of substitution of canola meal is 0.09, but is statistically insignificant. A 10% increase in canola meal price would result in a 0.8% increase in SBM inclusion in layer diets.

Wheat and meat and bone meal had negative coefficients and were statistically insignificant suggesting that neither of these feed ingredients functions as a substitute for SBM in layer rations.

Table 11, Estimated Elasticities for Layers: Major Feed Ingredients (SBM)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.03336		Wrong Sign
CORN	0.03354		Substitute
DDGS	0.14011	**	Substitute
NOTES:			
Dependent Variable is the quantity of SBM included in the layer ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

A less specified equation looking at just the major ingredients, SBM, corn and DDGs produced similar results. The own-price elasticity of SBM is positive (0.03) rather than negative as would be expected and is still statistically insignificant. The elasticity of substitution for corn is 0.03 but is statistically insignificant. A 10% increase in corn price would result in a 0.3% increase in SBM inclusion in layer diets. The elasticity of substitution for DDGs is 0.14 and is statistically significant at the 5% level. A 10% increase in the price of DDGs would result in a 1.4% increase in SBM inclusion in layer diets.

Component Price Elasticities for Layers

In addition to the above elasticity estimates of SBM at an aggregate level, elasticities are estimated for the following components of SBM in layer diets: derived value for lysine, crude protein, and metabolizable energy content in the SBM. Here, we are looking for the perceived value of the characteristics of the SBM compared to other feedstuffs.

Table 12, Estimated Elasticities for Layers (Metabolizable Energy)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.03780		Wrong Sign
Corn	0.02385		Substitute
DDGS	0.13316	**	Substitute
Wheat	-0.03999		Complement
Canola Meal	0.08949		Substitute
MBM50	-0.02901		Complement
DL-Met	-0.05813		Complement
L-Lysine HCl	0.00080		Substitute
NOTES:			
Dependent Variable is the quantity of Metabolizable Energy in SBM included in the layer ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The own-price elasticity for metabolizable energy (ME) for layers is 0.04. It is positive, rather than negative as would be expected and is statistically insignificant. The elasticity of substitution of ME in corn is 0.02 but statistically insignificant suggesting that a 10% increase in the value of ME in corn would result in a 0.2% increase in ME supplied by SBM in layer diets. The elasticity of substitution for ME in DDGs is 0.13 and is statistically significant at the 5% level. This indicates that a 10% increase in the value of ME in DDGs would result in a 1.3% increase in ME supplied through SBM in layer diets. The elasticity of substitution for canola meal is 0.09 and is statistically insignificant. A 10% increase in the value of ME in canola meal results in a 0.9% increase in the value of ME supplied by SBM in layer diets.

The elasticity of substitution for ME in wheat and meat and bone meal are both negative and statistically insignificant indicating that they are not functioning as substitutes for SBM in layer rations.

Table 13, Estimated Elasticities for Layers (Crude Protein)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.03769		Wrong Sign
Corn	0.02604		Substitute
DDGS	0.13367	**	Substitute
Wheat	-0.03944		Complement
Canola Meal	0.08988		Substitute
MBM50	-0.02988		Complement
NOTES:			
Dependent Variable is the quantity of Crude Protein in SBM included in the layer ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The own-price elasticity for crude protein (CP) for layers is 0.04. It is positive, rather than negative as would be expected and is statistically insignificant. The elasticity of substitution of CP in corn is 0.03 but statistically insignificant suggesting that a 10% increase in the value of CP in corn would result in a 0.3% increase in CP supplied by SBM in layer diets. The elasticity of substitution for CP in DDGs is 0.13 and is statistically significant at the 5% level. This indicates that a 10% increase in the value of CP in DDGs would result in a 1.3% increase in CP supplied through SBM in layer diets. The elasticity of substitution for canola meal is 0.09 and is statistically insignificant. A 10% increase in the value of CP in canola meal results in a 0.9% increase in the value of CP supplied by SBM in layer diets.

The elasticity of substitution for CP in wheat and meat and bone meal are both negative and statistically insignificant indicating that they are not functioning as substitutes for SBM in layer rations.

Table 14, Estimated Elasticities for Layers (Digestible Lysine)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	0.03765		Wrong Sign
Corn	0.02618		Substitute
DDGS	0.13368	**	Substitute
Wheat	-0.03946		Complement
Canola Meal	0.08980		Substitute
MBM50	-0.02995		Complement
L-Lysine HCl	-0.00465		Complement
NOTES:			
Dependent Variable is the quantity of Digestible Lysine in SBM included in the layer ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

Essential amino acids from SBM can compete with amino acids from corn, DDGs, wheat, meat and bone meal, and canola meal, and synthetic amino acids. Lysine is the amino acid that most limits the use of SBM in layer diets.

We highlight the fact that SBM has the highest content of lysine among plant protein sources listed here in this layer analysis. In addition, lysine in SBM has the highest ileal digestibility compared to other plant proteins. The estimated coefficient for the lysine component of SBM is 0.04 and is statistically insignificant. The elasticity of substitution for lysine in corn is 0.03 and statistically insignificant. A 10% increase in the value of lysine in corn results in a 0.3% increase in the amount of lysine supplied by SBM inclusion in layer diets. The elasticity of substitution for lysine in DDGs is 0.13 and statistically significant at the 5% level. A 10% increase in the value of lysine contained in DDGs results in a 1.3% increase in the amount lysine supplied by SBM in layer diets. The lysine contained in canola meal also functions as a substitute for lysine in SBM in layer diets. Wheat, meat and bone meal and L-Lysine have negative signs indicating that they are not functioning as substitutes for lysine in SBM in layer diets.

Turkeys

The continued improvement in growth rate and feed efficiency in commercial turkeys has enabled the U.S. turkey industry to produce nutritious, high quality meat that has become more affordable to consumers nationwide and around the globe. According to USDA turkey production data, the average weight of turkeys in the United States was 30.3 pounds in 2013. In 2018, turkeys weighed an average 31.0 pounds, an increase of 0.7 pounds over the five-year period. In 2013, the United States raised 240 million turkeys. Total raised turkey numbers dropped slightly in 2014 and 2015 then rebounded with total production in 2018 at 244.8 million

The turkey meat market is over-supplied for the third year. Producers are looking for any alternative ingredient that can save them some feed costs. The diets included in this analysis are adequate for maintaining bird health, but are not pushing for breast meat yield or pounds of product. The industry is still waiting for L-isoleucine to become economically available. When this product becomes available, they will be able to reduce intact protein usage (i.e. SBM usage will decrease). This synthetic amino acid may becoming available in 2020.

Table 15, Turkey Inventory, Lbs (Billions), and Average Lbs Per Head

Year	Head (Millions)	LBS (Billions)	Avg Lbs Per Head
2018	244.8	7,598.3	31.0
2017	245.2	7,544.4	30.8
2016	244.0	7,487.0	30.7
2015	233.1	7,038.1	30.2
2014	237.5	7,217.0	30.4
2013	240.0	7,277.5	30.3

Source: USDA/NASS Survey

Competing Feedstuff Analysis

On a national average, turkey diets are comprised of twenty five percent SBM and forty eight percent corn. (see Figure 22). Meat and bone meal accounts for five percent. Sorghum is eleven percent. This figure is based upon data contained in Table 16, which further breaks down the key ration ingredients by state.

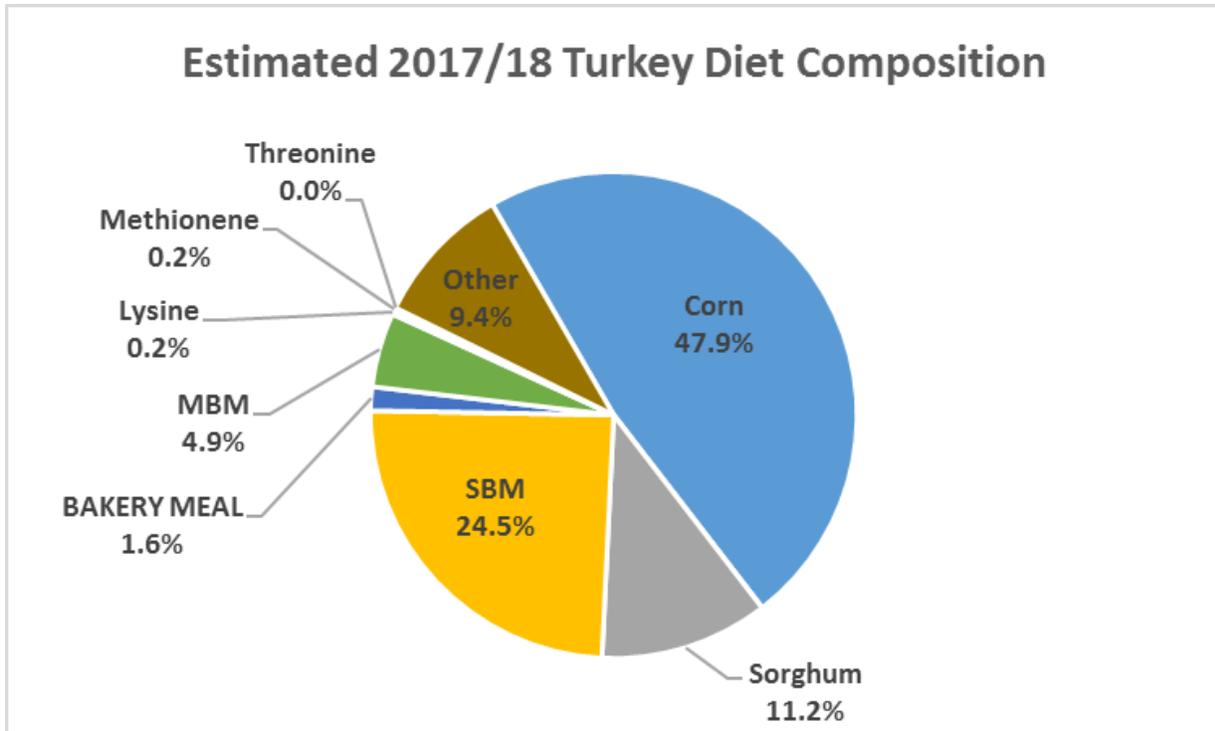


Figure 22, Estimated 2017/18 Turkey Diet Composition

Table 16, 2017/18 Turkey Ration Ingredient Estimates (Short Tons)

State	Corn	DDGS	Sorghum	SBM	Bakery Meal	MBM	Lysine	Methionine	Threonine	Other	Total
ALABAMA	10,796	3	3,043	5,324	-	1,060	43	58	3	2,494	22,823
ALASKA	3,610	-	1,501	2,010	-	519	16	22	2	766	8,445
ARIZONA	6,731	-	2,799	3,748	-	968	30	41	3	1,428	15,748
ARKANSAS	554,203	166	156,216	273,288	-	54,439	2,182	2,961	145	128,015	1,171,614
CALIFORNIA	181,437	-	75,457	101,026	-	26,088	807	1,107	79	38,479	424,480
COLORADO	26,687	-	9,335	14,631	726	3,710	113	156	14	5,110	60,482
CONNECTICUT	9,170	-	3,814	5,106	-	1,319	41	56	4	1,945	21,454
DELAWARE	1,951	-	811	1,086	-	281	9	12	1	414	4,565
FLORIDA	23,794	-	9,697	11,888	-	3,379	100	144	4	5,540	54,548
GEORGIA	12,523	4	3,530	6,176	-	1,230	49	67	3	2,893	26,475
HAWAII	488	-	203	272	-	70	2	3	0	103	1,141
IDAHO	16,584	-	6,897	9,234	-	2,385	74	101	7	3,517	38,800
ILLINOIS	19,609	-	3,415	10,305	1,950	2,477	73	101	15	2,681	40,626
INDIANA	386,060	107	47,925	197,675	27,359	34,758	1,387	1,836	261	62,772	760,141
IOWA	218,924	-	38,129	115,052	21,767	27,652	813	1,128	170	29,930	453,564
KANSAS	8,240	-	1,889	4,389	633	1,074	32	44	6	1,268	17,574
KENTUCKY	21,916	17	825	10,710	471	598	74	89	11	4,544	39,256
LOUISIANA	5,177	-	2,110	2,587	-	735	22	31	1	1,205	11,868
MAINE	22,145	-	9,210	12,330	-	3,184	98	135	10	4,696	51,809
MARYLAND	13,170	-	5,477	7,333	-	1,894	59	80	6	2,793	30,812
MASSACHUSETTS	10,829	-	4,503	6,029	-	1,557	48	66	5	2,297	25,334
MICHIGAN	101,005	28	12,539	51,718	7,158	9,094	363	480	68	16,423	198,877
MINNESOTA	748,447	-	171,585	398,668	57,455	97,517	2,903	4,019	523	115,179	1,596,297
MISSISSIPPI	5,074	2	1,430	2,502	-	498	20	27	1	1,172	10,727
MISSOURI	320,520	-	110,473	162,377	8,587	44,165	1,309	1,860	111	66,329	715,732
MONTANA	8,195	-	3,408	4,563	-	1,178	36	50	4	1,738	19,172
NEBRASKA	6,207	-	1,423	3,306	476	809	24	33	4	955	13,238
NEVADA	2,732	-	1,136	1,521	-	393	12	17	1	579	6,391
NEW HAMPSHIRE	13,755	-	5,721	7,659	-	1,978	61	84	6	2,917	32,181
NEW JERSEY	7,707	-	3,205	4,291	-	1,108	34	47	3	1,634	18,030
NEW MEXICO	8,041	-	3,327	4,360	-	1,153	35	49	3	1,748	18,715
NEW YORK	48,713	38	3,976	24,059	-	1,375	172	206	21	10,908	89,468
NORTH CAROLINA	584,295	175	164,698	288,127	-	57,395	2,300	3,121	153	134,966	1,235,230
NORTH DAKOTA	3,223	-	1,127	1,767	88	448	14	19	2	617	7,303
OHIO	129,330	36	16,055	66,221	9,165	11,644	465	615	87	21,029	254,647
OKLAHOMA	19,113	-	6,588	9,683	512	2,634	78	111	7	3,955	42,680
OREGON	34,730	-	14,444	19,338	-	4,994	154	212	15	7,365	81,251
PENNSYLVANIA	152,106	116	5,726	74,333	3,269	4,153	515	619	76	31,539	272,451
RHODE ISLAND	1,756	-	730	978	-	252	8	11	1	372	4,108
SOUTH CAROLINA	21,703	-	8,845	10,843	-	3,082	92	131	4	5,054	49,755
SOUTH DAKOTA	70,427	-	24,634	38,612	1,915	9,790	299	412	37	13,485	159,609
TENNESSEE	19,464	15	1,582	9,396	-	551	68	82	7	4,438	35,604
TEXAS	60,127	-	24,629	30,887	-	8,566	257	364	15	13,693	138,538
UTAH	28,459	-	11,836	15,846	-	4,092	127	174	12	6,036	66,581
VERMONT	11,804	-	4,909	6,573	-	1,697	52	72	5	2,503	27,616
VIRGINIA	349,059	271	28,379	168,504	-	9,890	1,216	1,474	132	79,595	638,519
WASHINGTON	31,803	-	13,226	17,708	-	4,573	141	194	14	6,745	74,404
WEST VIRGINIA	70,068	53	2,638	34,241	1,506	1,913	237	285	35	14,528	125,504
WISCONSIN	40,209	-	7,003	21,131	3,998	5,079	149	207	31	5,497	83,305
WYOMING	4,488	-	1,866	2,499	-	645	20	27	2	952	10,499
U.S. Total	4,456,602	1,030	1,043,926	2,281,911	147,033	460,040	17,233	23,243	2,130	874,843	9,307,990

Soybean Meal Price Elasticity Estimates for Turkeys

There are many possible sources of protein for turkey rations in the U.S. These include SBM, DDGs, meat and bone meal, feather meal, blood meal and synthetic amino acids. Cottonseed meal is rarely used in turkey diets because the main objective of the nutritionist is to target the growth and meat quality more than anything else. Cottonseed meal is too high in fiber and can inhibit growth.

In this section, the own-price demand elasticity of SBM and the cross-price demand elasticities of SBM with corn and competing protein sources are presented. These are aggregate measures of how soybean meal is substituted or complemented with corn and competing protein meal sources. Estimated coefficients are provided for the net effects of both protein and energy, not the individual components of SBM.

It is expected that the demand for SBM should be inversely related to the price of SBM and positively related to corn and other substitute prices. Hence, we anticipate SBM prices to have negative estimated coefficients and the rest of the estimated coefficients to be positive. A component with a negative coefficient may be functioning as a complement to SBM rather than as a substitute.

Table 17, Estimated Elasticities for Turkeys (SBM)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
Soybean Meal	0.02101		Wrong Sign
Meat & Bone Meal	0.00590		Substitute
Feather Meal	-0.00622		Complement
Blood Meal	0.01545		Substitute
Corn	-0.04730		Complement
Corn DDGs	-0.00893		Complement
Milo	-0.03034		Complement
Bakery Byproducts	0.02833		Substitute
Animal-Vegetable Fat	0.01741		Substitute
Choice White Grease	0.00391		Substitute
NOTES:			
Dependent Variable is the quantity of SBM included in the turkey ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The estimated coefficient of SBM price for turkey diets is 0.02101, but not statistically significant. The estimated coefficient of corn price for turkey diets is negative and not statistically significant. The fact that both soybean meal and corn have signs that are opposite of what is expected and that none of the variable were significant, other than the constant indicates that given this year's prices and combination of feed ingredients are not providing reliable elasticity estimates for this combination of feed ingredients.

Table 18, Estimated Elasticities for Turkeys: Major Feed Ingredients (SBM)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
Soybean Meal	0.01927		Wrong Sign
Corn	0.02882		Substitute
Corn DDGs	-0.00714		Complement
NOTES:			
Dependent Variable is the quantity of SBM included in the turkey ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

A model was run with just soybean meal, corn and distillers grains. This model still had the “wrong” sign for soybean meal, but did show corn as a substitute for soybean meal.

Component Price Elasticities for Turkey

In addition to the above elasticity estimates of SBM as an aggregate level, elasticities were estimated for the following components of SBM as an ingredient in turkey diets: metabolizable energy content in the SBM, crude protein and the derived value of lysine in the ration. These elasticities compare the relative perceived value of the characteristics of the SBM compared to other feedstuffs. It is important to know what the SBM components are worth when compared to the components of other alternative feedstuffs.

Table 19, Estimated Elasticities for Turkeys (Metabolizable Energy)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
Soybean Meal	-0.00098		Correct Sign
Meat & Bone Meal	0.02104		Substitute
Feather Meal	-0.01285		Complement
Blood Meal	0.00206		Substitute
Corn	-0.05711	**	Complement
Corn DDGs	0.01471		Substitute
Milo	0.04312		Substitute
Bakery Byproducts	-0.05148		Complement
L-Lysine	0.13814	*	Substitute
Animal-Vegetable Fat*	0.05141		Complement
NOTES:			
Dependent Variable is the quantity of Metabolizable Energy in SBM included in the turkey ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The estimated coefficients for the metabolizable energy component in SBM show mixed results with positive signs for meat and bone meal, blood meal, Corn DDGs, milo, L-Lysine and animal-

vegetable fat. This indicates that these ingredients are substitutes for soybean meal in turkey rations for metabolizable energy. Feather meal, corn and bakery byproducts show negative signs that indicate that these products are functioning as complements to soybean meal in turkey rations. Corn and milo are significant at the 5% level; L-lysine and animal-vegetable fat are significant at the 10% level.

Table 20, Estimated Elasticities for Turkeys (Crude Protein)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
Soybean Meal	-0.00266		Correct Sign
Meat & Bone Meal	0.01724		Substitute
Feather Meal	-0.00897		Complement
Blood Meal	0.00036		Substitute
Corn	-0.05520	*	Complement
Corn DDGs	0.01082		Substitute
Milo	0.03135		Substitute
L-Lysine	0.13370	*	Substitute
NOTES:			
Dependent Variable is the quantity of Crude Protein in SBM included in the turkey ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The estimated coefficients for crude protein show positive signs for meat and bone meal, blood meal corn DDGs, milo and L-lysine indicating that all of these ingredients function as substitutes to soybean meal for crude protein in turkey rations. Feather meal and corn have negative signs indicating that these ingredients do not act as substitutes for soybean meal in turkey rations. Corn and L-lysine were significant at the 10% level.

Table 21, Estimated Elasticities for Turkeys (Digestible Lysine)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
Soybean Meal	-0.00266		Correct Sign
Meat & Bone Meal	0.01724		Substitute
Feather Meal	-0.00897		Complement
Blood Meal	0.00036		Substitute
Corn	-0.05520	*	Complement
Corn DDGs	0.01082		Substitute
Milo	0.03135		Substitute
L-Lysine	0.13370	*	Substitute
NOTES:			
Dependent Variable is the quantity of Digestible Lysine in SBM included in the turkey ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The estimated coefficients for digestible lysine in turkey diets were mixed with meat and bone meal, blood meal, corn DDGs, milo and L-lysine having positive signs indicating that these feed ingredients function as substitutes to soybean meal for lysine in turkey rations. Feather meal and corn show positive signs indicating that these feed ingredients do not function as substitutes for soybean meal for lysine in turkey diets. Corn and L-lysine were significant at the 10% level.

Hogs

The hog industry is an important element of the agricultural sector of the US economy. The US hog industry is experiencing increased growth as it works to meet domestic and international consumer demand for one of the most popular protein sources worldwide. In addition to overall increasing trends of hog numbers, other measures of productivity gains are evident. Table 22 shows two key production performance indicators analyzed for conventional finishers from 2012-2017: finishing weight and finisher feed conversion. Finishing weights have increased over time for the conventional finisher and feed conversion has slightly improved for the conventional finisher as well.

Table 22: Conventional Finisher Average Productivity from 2012-2017

Productivity Measure	2012	2013	2014	2015	2016	2017
Percent Mortality	5.0 (±3.30)	5.0 (±3.07)	5.8 (±3.21)	5.5 (±3.32)	5.3 (±3.91)	5.2 (±3.51)
Finishing Weight (lbs.)	269.2 (±14.1)	272.1 (±17.2)	279.7 (±15.1)	277.4 (±14.5)	272.8 (±18.1)	272.8 (±16.1)
Days in Finisher	121.5 (±10.8)	122.8 (±13.0)	124.1 (±13.6)	121.4 (±15.0)	119.2 (±12.6)	118.5 (±11.4)
Average Daily Gain (lbs.)	1.8 (±0.15)	1.8 (±0.16)	1.9 (±0.16)	1.9 (±0.16)	1.9 (±0.17)	1.9 (±0.17)
Feed Conversion	2.7 (±0.23)	2.7 (±0.23)	2.7 (±0.26)	2.7 (±0.23)	2.7 (±0.24)	2.7 (±0.22)

Note: Standard deviations in parentheses and feed conversion is defined as feed to gain.

Source: 2018 US Pork Industry Productivity Analysis (www.pork.org)

Competing Feedstuff Analysis

Sources of protein for hog rations are many and varied with considerable opportunities for further diversification and substitution. SBM remains the most important and preferred source of high quality vegetable protein for hog feed. SBM has a high crude protein content of 44 to 48 percent and a balanced amino acids composition, which is complementary to corn for feed formulation. Following are additional details to provide context surrounding the inclusion of SBM in hog rations.

As shown in Figure 23, hog diets use fifteen percent of SBM on average. The usage of corn and DDGs is fifty-four percent and fifteen percent, respectively, in hog diets. Wheat midds and meat and bone meal was six percent and two percent respectively. This figure is based upon data contained in Table 23, which further breaks down the key ration ingredients by state.

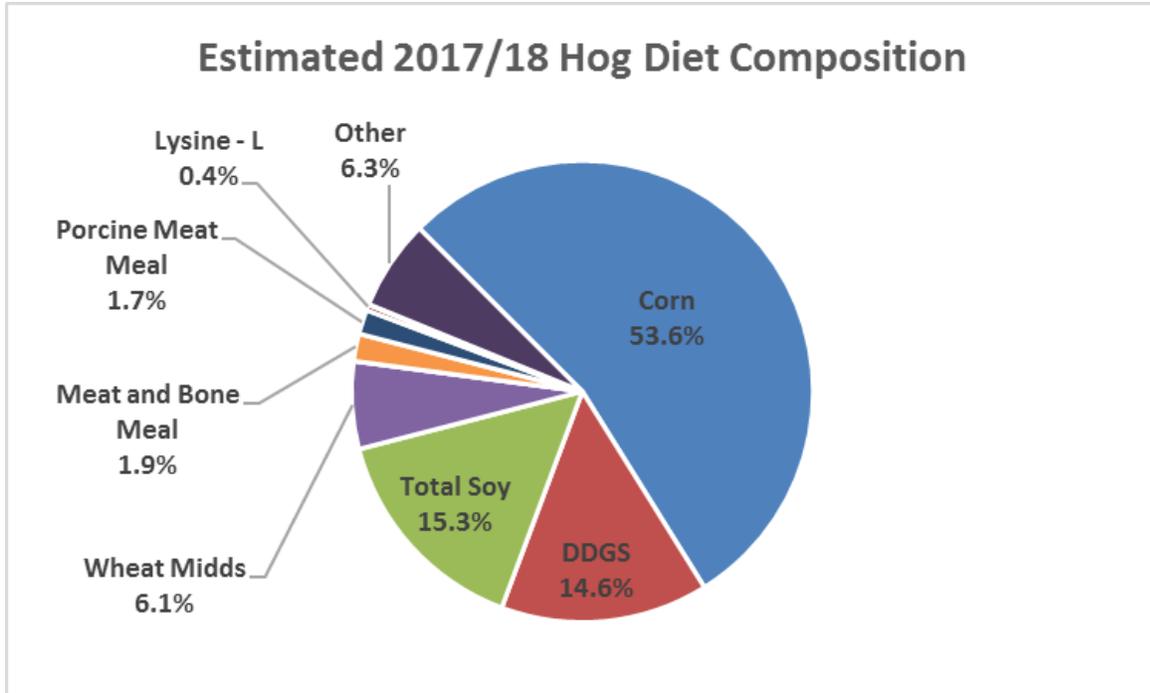


Figure 23, Estimated 2017/18 Hog Diet Composition

Table 23, 2017/18 Hog Ration Ingredient Estimates (Short Tons)

State	Corn	DDGS	Soybean Meal	Soy Hulls	Total Soy	Wheat Midds	Canola Meal	Meat and Bone Meal	Porcine Meal	Lysine - L	Methionine - DL	Other	Total
ALABAMA	38,595	8,032	10,053	-	10,053	-	-	1,072	1,066	239	19	1,003	60,080
ALASKA	630	131	170	7	177	95	0	17	0	4	0	73	1,128
ARIZONA	43,221	9,415	12,010	375	12,384	6,198	17	1,263	58	300	21	4,437	77,313
ARKANSAS	109,057	21,052	29,879	22	29,902	3,559	39	2,696	2,668	674	71	6,462	176,180
CALIFORNIA	33,319	8,037	9,568	176	9,745	4,454	10	1,113	34	240	17	2,544	59,512
COLORADO	420,654	98,588	121,943	3,492	125,435	60,104	262	12,987	3,821	3,012	231	45,913	771,008
CONNECTICUT	703	166	178	22	200	115	-	13	29	4	0	25	1,254
DELAWARE	3,746	889	1,037	88	1,125	558	-	91	153	24	2	139	6,727
FLORIDA	6,973	1,282	1,653	-	1,653	-	-	153	152	39	3	207	10,462
GEORGIA	75,167	15,712	20,299	-	20,299	-	-	2,181	2,169	475	44	2,038	118,085
HAWAII	2,541	274	559	66	625	510	0	19	1	14	0	597	4,582
IDAHO	12,194	2,430	3,358	132	3,490	1,794	8	323	29	82	6	1,470	21,827
ILLINOIS	1,957,355	527,947	520,605	7,019	527,624	210,130	548	66,193	64,431	14,538	1,084	220,213	3,590,063
INDIANA	1,524,257	430,319	423,832	3,182	427,014	156,733	351	57,574	56,024	11,844	907	178,879	2,843,903
IOWA	7,436,559	2,288,023	2,238,367	13,353	2,251,720	1,072,229	2,541	309,758	299,218	62,521	4,858	1,197,778	14,925,207
KANSAS	728,515	208,407	204,644	2,074	206,718	105,527	193	27,179	19,853	5,747	417	95,463	1,398,019
KENTUCKY	172,464	40,608	48,047	18	48,065	5,384	13	5,399	5,331	1,157	88	8,657	287,166
LOUISIANA	3,053	480	682	-	682	112	0	49	37	16	1	192	4,621
MAINE	1,781	438	469	44	513	275	-	42	72	11	1	57	3,190
MARYLAND	10,383	2,685	2,940	154	3,095	1,457	-	313	418	71	5	297	18,723
MASSACHUSETTS	3,412	830	897	88	985	531	-	78	139	21	1	112	6,110
MICHIGAN	399,108	113,782	109,139	1,497	110,636	59,307	104	13,935	14,481	3,055	222	46,363	760,992
MINNESOTA	2,825,473	850,943	837,231	7,454	844,685	415,774	1,321	111,815	108,062	23,264	1,839	446,188	5,629,364
MISSISSIPPI	201,103	42,115	52,394	-	52,394	-	-	5,622	5,591	1,249	99	5,152	313,325
MISSOURI	1,393,679	364,129	373,047	5,771	378,818	150,548	754	45,270	44,116	10,213	847	158,701	2,547,076
MONTANA	83,420	19,384	23,876	743	24,620	12,146	43	2,510	719	592	43	9,312	152,789
NEBRASKA	1,330,309	366,314	364,809	5,365	370,174	198,896	552	45,733	33,624	10,186	749	175,257	2,531,794
NEVADA	401	68	100	7	107	68	0	8	0	3	0	65	720
NEW HAMPSHIRE	1,308	331	355	26	381	194	-	35	53	9	1	39	2,350
NEW JERSEY	2,687	690	753	44	797	383	-	78	108	18	1	78	4,840
NEW MEXICO	1,241	256	335	13	348	187	0	33	1	8	1	146	2,222
NEW YORK	14,630	3,745	4,029	264	4,293	2,128	-	409	591	97	6	422	26,321
NORTH CAROLINA	3,117,806	634,908	799,083	-	799,083	-	-	83,273	82,824	19,018	1,472	83,270	4,821,654
NORTH DAKOTA	110,340	29,872	31,192	437	31,628	16,192	92	3,829	2,860	850	72	14,967	210,702
OHIO	761,677	219,870	211,866	2,402	214,268	111,171	190	27,755	28,482	5,928	438	90,092	1,459,870
OKLAHOMA	1,351,156	291,969	369,056	9,973	379,029	134,976	548	39,623	11,750	9,127	696	103,617	2,322,490
OREGON	2,811	562	747	33	780	435	1	71	2	19	1	354	5,036
PENNSYLVANIA	380,316	101,770	112,308	5,236	117,544	53,918	27	12,211	14,756	2,703	189	21,059	704,492
RHODE ISLAND	573	142	153	13	166	87	-	14	23	4	0	18	1,027
SOUTH CAROLINA	45,704	9,686	11,620	-	11,620	-	-	1,259	1,252	282	19	1,096	70,917
SOUTH DAKOTA	828,321	229,787	230,353	3,041	233,395	122,201	388	29,242	21,532	6,407	486	109,692	1,581,450
TENNESSEE	100,448	23,372	27,927	11	27,939	3,147	9	3,098	3,059	670	52	5,095	166,889
TEXAS	467,966	104,256	126,975	3,223	130,198	47,123	104	14,016	3,843	3,179	221	33,970	804,875
UTAH	204,597	44,668	57,118	1,736	58,853	29,109	89	6,025	308	1,422	100	20,753	365,924
VERMONT	1,769	436	465	44	509	274	-	41	72	11	1	56	3,170
VIRGINIA	56,292	13,688	15,840	-	15,840	1,636	-	1,904	1,939	383	30	1,209	92,921
WASHINGTON	6,849	1,450	1,880	66	1,946	1,005	2	192	9	47	3	754	12,257
WEST VIRGINIA	1,510	328	365	44	409	177	-	28	51	9	0	51	2,562
WISCONSIN	145,790	42,921	41,417	570	41,988	22,266	57	5,294	5,116	1,158	86	21,895	286,570
WYOMING	48,291	8,282	14,023	743	14,767	7,181	111	1,065	550	318	38	7,431	88,035
U.S. Total	26,470,152	7,185,471	7,469,643	79,074	7,548,717	3,020,294	8,376	942,900	841,480	201,262	15,487	3,123,655	49,357,795

Soybean Meal Price Elasticities for Hogs

The estimated coefficient of SBM price for hog rations is -0.28 and is statistically insignificant. This indicates that a 10% increase in SBM price will likely reduce SBM inclusion in hog rations by 2.8%. The estimated coefficients for meat and bone meal and blood meal are statistically significant at the 5% level and indicate that they are substitutes for SBM in hog rations. A 10% increase in meat and bone meal price results in a 5.6% increase in SBM inclusion in hog rations. A 10% increase in blood meal price results in a 1.9% increase in SBM inclusion in hog rations. Other protein sources that are statistically significant at the 10% level are fish meal and corn gluten meal feed. A 10% increase in fish meal price results in a 25% increase in SBM inclusion in hog rations. A 10% increase in corn gluten meal price results in a 5.8% increase in SBM inclusion in hog rations. Other feed ingredients that are statistically insignificant but functioning as substitutes for SBM are soybean hulls, bakery byproducts, DDGs, soft white winter wheat, and wheat bran.

The elasticity of substitution coefficients for corn, milo, corn gluten feed, canola meal and wheat midds are positive and not statistically significant. This indicates that these ingredients are not functioning as substitutes for SBM in hog rations.

Table 24, Estimated Elasticities for Hogs (SBM)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	-0.28150		Correct Sign
Hulls	0.31957		Substitute
Canola Meal	-0.02789		Complement
MBM50	0.55715	**	Substitute
Blood Meal	0.18633	**	Substitute
Fish Meal - Menhaden	2.53122	*	Substitute
CORN	-0.03738		Complement
Milo	-0.00607		Complement
Corn Gluten Feed - Dry	-0.00769		Complement
Corn Gluten Meal 60	0.58387	*	Substitute
Bakery	0.22917		Substitute
DDGS	0.12024		Substitute
Wheat - Soft White Winter	0.01124		Substitute
Wheat Bran	0.09619		Substitute
Wheat Midds	-0.27844		Complement
NOTES:			
Dependent Variable is the quantity of SBM included in the hog ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

Component Price Elasticities for Hogs

The elasticities for the following components of SBM with regard to hog diets were estimated: derived value for lysine, crude protein, and metabolizable energy content. These elasticities provide a measure of the perceived value of the characteristics of SBM (amino acids, energy, etc.) compared to other feedstuffs.

Table 25, Estimated Elasticities for Hogs (Metabolizable Energy)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	-0.43917		Correct Sign
Hulls	0.49396		Substitute
Canola Meal	-0.05734		Complement
MBM50	0.80727	**	Substitute
Blood Meal	0.30569	**	Substitute
Fish Meal - Menhaden	3.46517	*	Substitute
CORN	-0.05029		Complement
Milo	0.01171		Substitute
Corn Gluten Feed - Dry	-0.01837		Complement
Corn Gluten Meal 60	0.75888		Substitute
Bakery	0.41718		Substitute
DDGS	0.11771		Substitute
Wheat - Soft White Winter	0.04703		Substitute
Wheat Bran	0.09960		Substitute
Wheat Midds	-0.34850		Complement
Lysine HCl	-0.06336		Complement
NOTES:			
Dependent Variable is the quantity of Metabolizable Energy in SBM included in the hog ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The own-price elasticities of metabolizable energy (ME) in SBM is -.0,44. It is statistically insignificant. A 10% change in the value of ME in SBM reduces the amount of ME obtained by SBM in hog rations by 4.4%. Statistically significant substitutes for ME in SBM are meat and bone meal and blood meal, both of which are statistically significant at the 5% level and fish meal which is statistically significant at the 10% level. A 10% increase in the value of ME in meat and bone meal and blood meal increases the amount of ME supplied by SBM by 8% and 3.2% respectively. A 10% increase in the ME value of fish meal increases the amount of ME supplied by SBM by 35%. Other feed ingredients that are statistically insignificant but function as substitutes for ME in SBM are: soybean hulls, milo, corn gluten meal, bakery byproducts, DDGs, soft white winter wheat, and wheat bran. Statistically insignificant feed ingredients that are not functioning as substitutes for ME in SBM are canola meal, corn, corn gluten feed, wheat midds and L-Lysine HCL.

Table 26, Estimated Elasticities for Hogs (Crude Protein)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	-0.25374		Correct Sign
Canola Meal	-0.01312		Complement
MBM50	0.48785	*	Substitute
Blood Meal	0.17458	**	Substitute
Fish Meal - Menhaden	2.47717	*	Substitute
CORN	-0.04272		Complement
Milo	-0.00055		Complement
Corn Gluten Feed - Dry	0.00102		Substitute
Corn Gluten Meal 60	0.58063	*	Substitute
DDGS	0.13884		Substitute
Wheat - Soft White Winter	-0.04999		Complement
Wheat Bran	0.10031		Substitute
Wheat Midds	-0.27133		Complement
NOTES:			
Dependent Variable is the quantity of Crude Protein in SBM included in the hog ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

The own-price elasticity of crude protein (CP) in soybean meal is -0.25 meaning that a 10% increase in SBM price results in a 2.5% decrease in CP supplied by SBM in hog rations. Blood meal is the only feed ingredient for which the elasticity of substitution for CP is significant at the 5% level. The coefficient is 0.17 meaning that a 10% increase in the value of CP in blood meal results in a 1.7% increase in the amount of CP supplied by SBM in hog rations. The elasticity of substitution coefficients for meat and bone meal, fish meal and corn gluten meal are statistically significant at the 10% level. A 10% increase in the value of CP in meat and bone meal results in an increase in the amount of CP supplied by SBM by 4.9% in hog rations. A 10% increase in the value of CP in fish meal increases the amount of CP supplied by SBM by 25% in hog rations. A 10% increase in the value of CP in corn gluten meal increased the amount of CP supplied by SBM in hog rations by 5.8%

Other feed ingredients that are statistically insignificant but functioning as substitutes for CP in SBM in hog rations are corn gluten feed, DDGs and wheat bran. Feed ingredients that are statistically insignificant and not functioning as substitutes for CP in SBM in hog rations are canola meal, corn, milo, soft white winter wheat and wheat midds.

Table 27, Estimated Elasticities for Hogs (Digestible Lysine)

Feed Ingredient	Estimated Elasticity	Significance	Interpretation
SBM	-0.20556		Correct Sign
Canola Meal	-0.02302		Complement
MBM50	0.39471	*	Substitute
Blood Meal	0.13091	**	Substitute
Fish Meal - Menhaden	2.08395	*	Substitute
CORN	-0.02784		Complement
Milo	-0.00275		Complement
Corn Gluten Feed - Dry	-0.00669		Complement
Corn Gluten Meal 60	0.49444	*	Substitute
DDGS	0.13381		Substitute
Wheat - Soft White Winter	0.03446		Substitute
Wheat Bran	0.07723		Substitute
Wheat Midds	-0.22934		Complement
L-Lysine HCl	0.11581		Substitute
NOTES:			
Dependent Variable is the quantity of Digestible Lysine in SBM included in the hog ration			
* Denotes significance at 10% level			
** Denotes significance at 5% level			

In general, lysine from SBM competes with lysine from corn, DDGs, canola meal and synthetic lysine fed to the hogs. Lysine is the most limiting amino acid in hog diets. It can be provided in the diet from a wide range of ingredients, but the most prevalent in the U.S. is SBM. SBM has the highest concentration of lysine among alternative plant protein sources in hog diets. SBM contains approximately 3% of lysine whereas corn and DDGs consist of 0.26% and 0.78%, respectively. In addition, the significance of 'ileal digestibility' of amino acids for diet formulation, rather than total amino acid content, has to be taken into account for hogs. Lysine in SBM has a relatively high ileal digestibility compared to corn and canola meal, further separating its attractiveness from corn, DDGs, and canola meal from a lysine perspective. Synthetic forms of specific amino acids are also available (i.e., L-Lysine HCl (78%)) but these synthetic forms only supply the specific amino acid, not a blend of amino acids.

There is value to including SBM in swine diets as opposed to only including L-Lysine HCl because SBM also contributes other amino acids, protein, vitamins as well as other nutrients. However, if the primary reason for including SBM is to contribute L-Lysine, then some L-Lysine HCl can be included so that SBM will be included only at a level to satisfy the second limiting amino acid.

The own-price elasticity of the value of lysine in SBM is -0.21 meaning that a 10% increase in the value of lysine in SBM results in a 2.1% reduction in the amount of lysine supplied by

inclusion of SBM in hog rations. Blood meal is a statistically significant substitute for lysine in SBM in hog rations. A 10% increase in the value of lysine in blood meal results in a 1.3% increase in the amount of lysine supplied by SBM in hog rations. Meat and bone meal, fish meal and corn gluten meal are statistically significant substitutes for lysine in SBM at the 10% level. A 10% increase in the value of lysine in meat and bone meal results in a 3.9% increase the amount of lysine supplied by inclusion of SBM in hog rations. A 10% increase in the value of lysine in fish meal results in a 21% increase in the amount of lysine supplied by SBM in hog rations. A 10% increase in the value of lysine in corn gluten meal results in a 4.9% increase in the amount of lysine supplied by SBM inclusion in hog rations.

Other feed ingredients that are substitutes for lysine in SBM in hog rations but having statistically insignificant coefficients of substitution are DDGs, soft white winter wheat, wheat bran and L-Lysine HCL. A 10% increase in the value of lysine in these ingredients results in an increase in lysine supplied by SBM in hog rations by 1.3%, 0.3%, 0.8% and 1.1%, respectively.

Feed ingredients with negative and statistically insignificant coefficients of substitution for lysine are corn, milo, canola meal, corn gluten feed, and wheat midds.

Dairy Cows

The U.S. dairy herd has experienced change during the last fifteen years. Movement of dairy cows into states such as Idaho, Arizona, and Texas and in Midwestern states such as South Dakota, Michigan and Indiana continues to take place. Access to high quality feed ingredients, proximity to milk and cheese processors, weather patterns (toward more rainfall) and a more stable regulatory environment continue to be key reasons for shifts in dairy production regions.

Due to continued demand for milk and its components, expectations for milk production is expected to continue to increase year-over-year in the near term. Below is a map depicting where high producing herds were located in 2018. States with dark shading denote above average herds in terms of annual milk production per cow. States with high columns denote either large dairy cow populations and/or high annual milk production per cow.

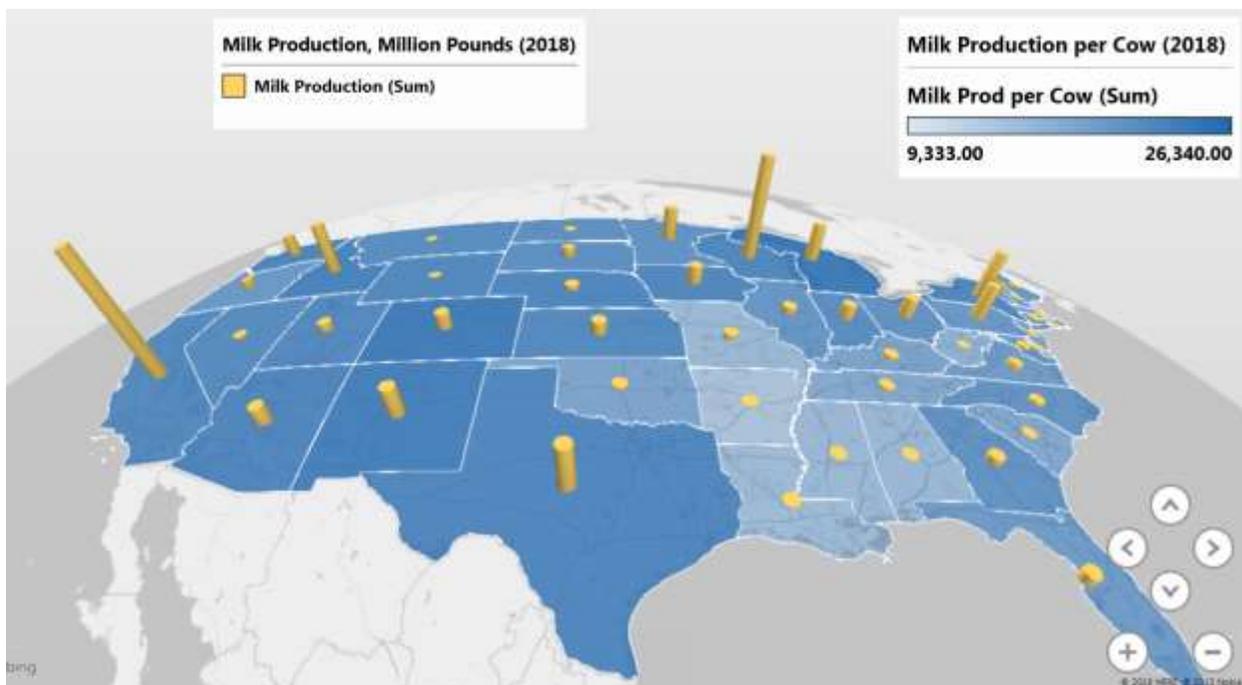


Figure 24, Milk Production Map

The following two charts illustrates the top and bottom states in terms of milk production per cow.

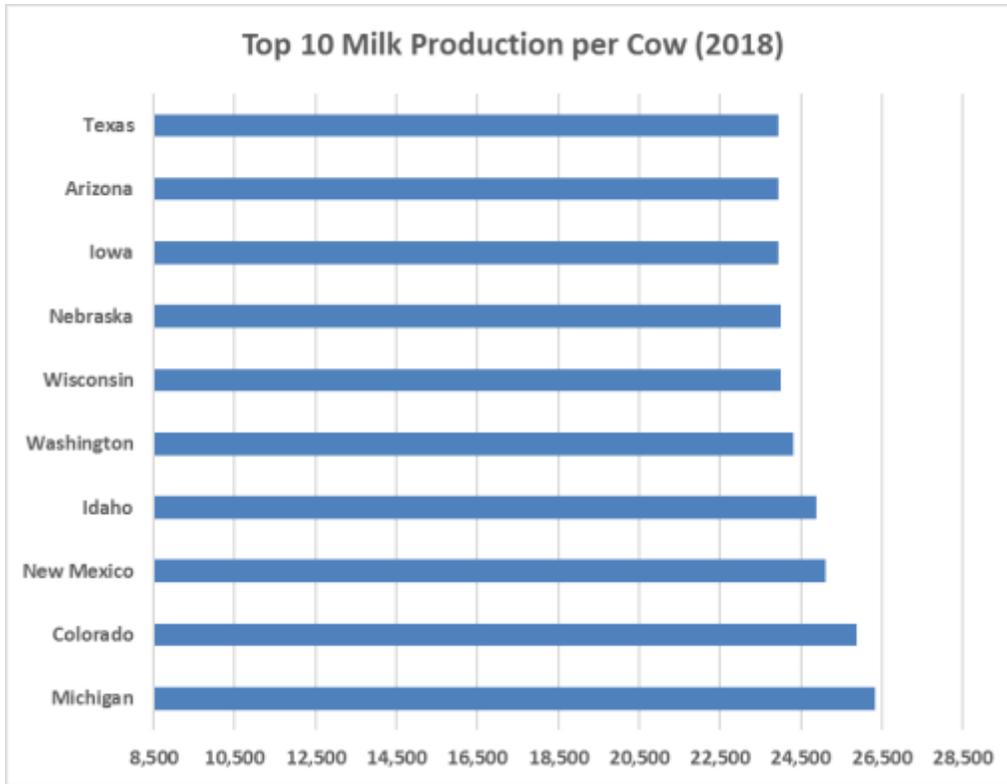


Figure 25, Top 10 Milk Production per Cow (2018)

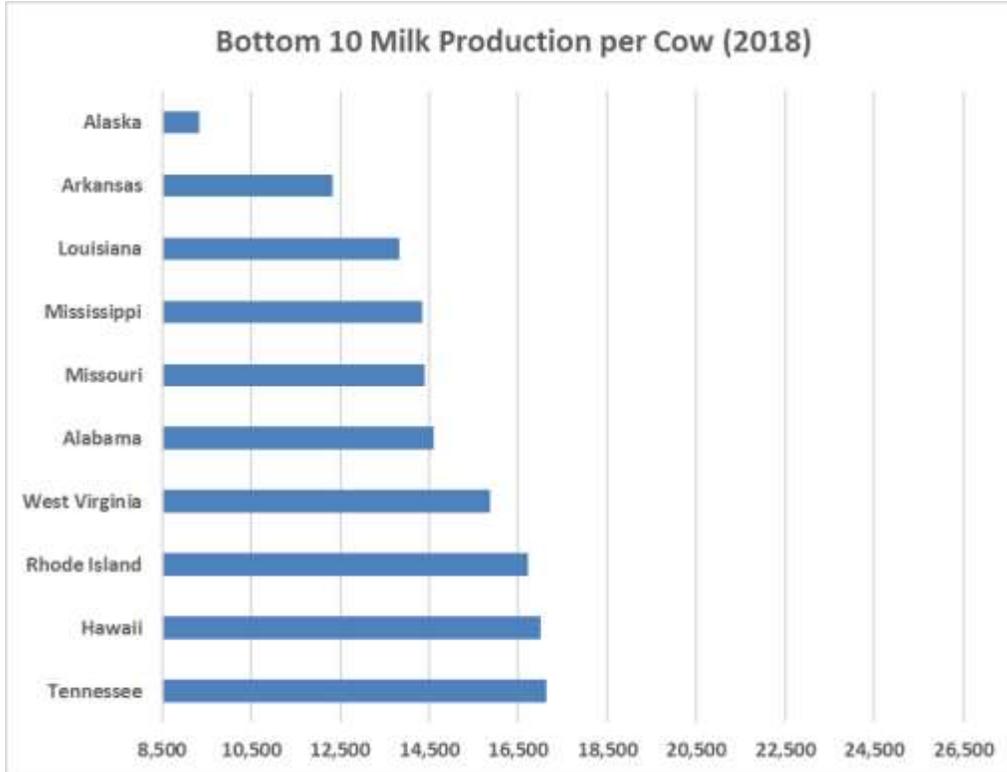


Figure 26, Bottom 10 Milk Production per Cow (2018)

Competing Feedstuff Analysis

Because the quality of milk (which is priced by its components) is heavily influenced by the quality of feed, dairy cattle have requirements for high quality feed ingredients. To be of value to dairy cattle, a protein source needs to allow amino acids to bypass the rumen, which allows them to be more effectively utilized.

Due to dairy cattle being ruminants, they require forage inclusion in rations, allowing them to have more options to satisfy protein requirements than monogastric animals such as hogs and poultry. When high quality alfalfa is available and included in dairy rations, needs for SBM from a crude protein perspective are diminished. While prices did increase relative to SBM, DDGs were still competitively priced against SBM in the 2017/18 marketing year (39% of SBM price compared to 31% in 2016/17), placing modest pressure on dairy producers to reduce inclusion of SBM and soy hulls in rations.

Both SBM and soy hulls are used in dairy diets as shown in Figure 27. On an “as-fed” basis, total soy accounts for four percent in dairy diets. Corn silage and legume silage are significant and major ingredients composing eighty-two percent in dairy diets on an as-fed basis, primarily due to their high moisture level. DDGs accounts for three percent during the 2017-18 marketing year. Table 28 breaks down key ration ingredients by state.

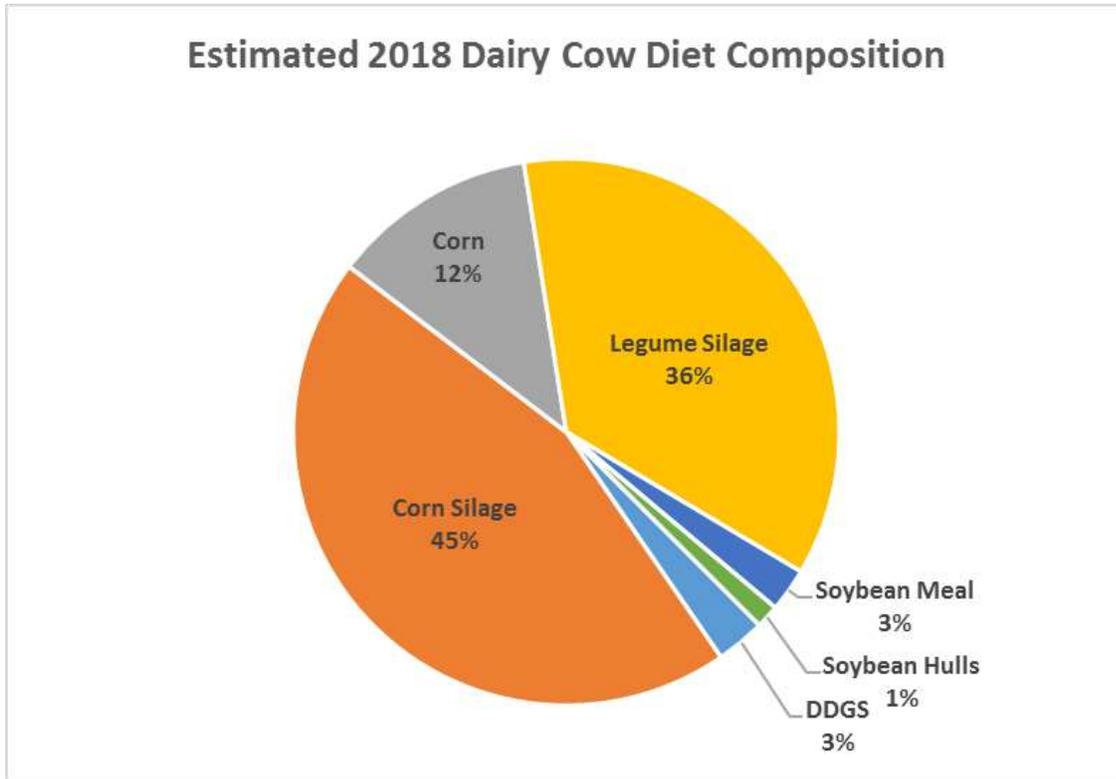


Figure 27, Estimated 2017/18 Dairy Cow Diet Composition

Table 28, 2017/18 Dairy Cow Ration Ingredient Estimates (Short Tons)

State	Soybean Meal	Soybean Hulls	Total Soy	DDGS	Corn Silage	Corn	Legume Silage	Other	Total
ALABAMA	2,176	986	3,162	2,654	40,573	11,028	29,883	9,396	96,695
ALASKA	112	-	112	108	1,444	365	608	382	3,019
ARIZONA	74,071	8,818	82,889	71,185	680,184	354,882	1,469,631	252,033	2,910,803
ARKANSAS	2,000	907	2,907	2,440	37,302	10,139	27,474	8,639	88,901
CALIFORNIA	574,517	43,968	618,486	591,572	9,044,118	3,108,416	5,108,035	2,830,617	21,301,243
COLORADO	60,732	7,230	67,962	58,366	557,697	290,975	1,204,980	206,647	2,386,627
CONNECTICUT	7,189	-	7,189	6,909	92,422	23,395	38,901	24,461	193,278
DELAWARE	1,850	-	1,850	1,778	23,784	6,021	10,011	6,295	49,739
FLORIDA	34,132	15,472	49,604	41,633	636,501	173,003	468,796	147,404	1,516,940
GEORGIA	7,673	3,478	11,151	9,359	143,083	38,890	105,383	33,136	341,001
HAWAII	824	-	824	791	10,588	2,680	4,457	2,802	22,142
IDAHO	214,421	25,526	239,948	206,067	1,969,011	1,027,320	4,254,317	729,590	8,426,253
ILLINOIS	23,930	39,171	63,101	31,622	664,631	84,895	296,776	123,710	1,264,736
INDIANA	47,817	78,272	126,090	63,187	1,328,070	169,638	593,020	247,199	2,527,203
IOWA	56,595	92,641	149,236	74,787	1,571,867	200,779	701,883	292,577	2,991,129
KANSAS	40,220	39,502	79,721	53,148	914,043	210,675	698,220	194,755	2,150,562
KENTUCKY	16,525	16,230	32,755	21,836	375,547	86,559	286,873	80,018	883,588
LOUISIANA	3,885	1,761	5,646	4,738	72,443	19,690	53,356	16,777	172,649
MAINE	11,230	-	11,230	10,792	144,374	36,546	60,768	38,211	301,922
MARYLAND	18,107	-	18,107	17,402	232,789	58,927	97,983	61,612	486,820
MASSACHUSETTS	4,452	-	4,452	4,279	57,236	14,488	24,091	15,149	119,695
MICHIGAN	109,606	179,415	289,022	144,837	3,044,188	388,842	1,359,316	566,626	5,792,831
MINNESOTA	117,054	114,964	232,017	154,678	2,660,186	613,139	2,032,067	566,805	6,258,892
MISSISSIPPI	3,115	1,412	4,527	3,799	58,084	15,787	42,780	13,451	138,428
MISSOURI	23,725	38,835	62,560	31,351	658,932	84,167	294,232	122,650	1,253,892
MONTANA	5,164	615	5,779	4,963	47,421	24,741	102,459	17,571	202,933
NEBRASKA	15,537	25,433	40,970	20,531	431,524	55,120	192,688	80,321	821,154
NEVADA	11,014	1,311	12,325	10,585	101,138	52,768	218,523	37,475	432,815
NEW HAMPSHIRE	5,051	-	5,051	4,854	64,939	16,438	27,333	17,187	135,803
NEW JERSEY	2,467	-	2,467	2,371	31,713	8,028	13,348	8,394	66,321
NEW MEXICO	117,392	13,975	131,367	112,818	1,077,997	562,439	2,329,160	399,437	4,613,217
NEW YORK	220,973	-	220,973	212,363	2,840,839	719,118	1,195,740	751,881	5,940,915
NORTH CAROLINA	12,467	12,245	24,712	16,475	283,334	65,305	216,433	60,370	666,628
NORTH DAKOTA	4,408	4,330	8,738	5,825	100,183	23,091	76,528	21,346	235,711
OHIO	67,434	110,382	177,816	89,109	1,872,888	239,229	836,297	348,608	3,563,946
OKLAHOMA	10,932	10,736	21,668	14,445	248,435	57,261	189,775	52,934	584,518
OREGON	43,321	5,157	48,478	41,633	397,813	207,557	859,529	147,404	1,702,414
PENNSYLVANIA	134,803	132,396	267,198	178,132	3,063,555	706,110	2,340,193	652,751	7,207,939
RHODE ISLAND	322	-	322	309	4,134	1,046	1,740	1,094	8,645
SOUTH CAROLINA	4,481	2,031	6,512	5,465	83,558	22,711	61,542	19,351	199,139
SOUTH DAKOTA	30,755	50,343	81,098	40,641	854,185	109,107	381,417	158,993	1,625,441
TENNESSEE	11,853	11,642	23,495	15,663	269,384	62,089	205,777	57,397	633,806
TEXAS	147,989	67,083	215,073	180,515	2,759,759	750,111	2,032,619	639,119	6,577,195
UTAH	34,999	4,167	39,166	33,636	321,394	167,685	694,415	119,088	1,375,384
VERMONT	45,180	-	45,180	43,420	580,839	147,031	244,482	153,730	1,214,682
VIRGINIA	22,041	21,648	43,689	29,126	500,919	115,455	382,643	106,731	1,178,563
WASHINGTON	97,590	11,618	109,208	93,788	896,163	467,568	1,936,282	332,061	3,835,070
WEST VIRGINIA	2,283	2,242	4,525	3,017	51,879	11,957	39,629	11,054	122,060
WISCONSIN	328,390	322,526	650,916	433,944	7,463,055	1,720,138	5,700,891	1,590,151	17,559,095
WYOMING	2,246	267	2,513	2,158	20,625	10,761	44,563	7,642	88,262
US Total	2,835,050	1,518,735	4,353,786	3,205,105	49,386,765	13,354,113	39,587,845	12,383,030	122,270,644

Competition for inclusion of other protein sources in dairy rations are dictated primarily by pricing and geography. Summaries of the most likely competing substitutes of soybean meal in dairy cattle rations are included below.

Canola Meal

The inclusion of canola meal in dairy cattle rations is primarily a function of relative price per unit of protein between SBM and canola meal. The fact that canola meal has lower overall protein than SBM (36% vs. 48%) means that does not have near the negative impact on inclusion of SBM in dairy cattle rations as it would on other species of animal agriculture that have higher protein requirements (i.e., hogs and poultry) because dairy cattle source much of their protein from forage ingredients. Also, where canola meal is available it is typically chosen over SBM because it does a better job of passing through the rumen. As with 2016/17, none of the regional rations used for this analysis utilized canola meal.

- As the price of SBM per unit of protein increases relative to that for canola meal, inclusion rates of SBM goes down. Demand is quite elastic for SBM from a protein perspective because of protein requirements are largely met by other feedstuffs (alfalfa).

Cottonseed Meal

Similar to canola meal, the inclusion of cottonseed meal in dairy cattle rations is primarily a function of relative price per unit of protein between SBM and cottonseed meal. Consideration of the price per unit of protein for canola meal is also made when determining whether to include cottonseed meal in dairy rations. The fact that cottonseed meal has lower overall protein than SBM (40% vs. 48%) does not have near the negative impact on inclusion in dairy cattle rations as it would on other species of animal agriculture that have higher protein requirements (i.e., hogs and poultry) because dairy cattle source much of their protein from forage ingredients.

- As the price of SBM per unit of protein increases relative to that for cottonseed meal, inclusion rates of SBM goes down. Demand is quite elastic for SBM from a protein perspective because of protein requirements are largely met by other feedstuffs (alfalfa).

DDGs

DDGs were competitively priced relative to many feed ingredients during the 2017/18 marketing year, particularly for dairy cattle. The fact that protein levels in DDGs are greater than 27% (more than 3X that of corn) and is a good source of energy (nearly equal to corn) makes it a very attractive feed ingredient for dairy rations. Its attractiveness is further enhanced by dairy cattle's lower requirements for protein from sources other than forage. However, high phosphorus content in DDGs often limits its use in dairy rations.

Within the last several years most, if not all, dry mill ethanol plants have begun separating the corn oil from whole corn prior to processing and have thereby begun providing a much more consistent feed product (with less oil) than they were ten years ago. More attention to DDGs quality and consistency has been caused by reduced margins on ethanol. Lower oil content in DDGs and a more consistent product increases the attractiveness of DDGs from a dairy perspective.

- Notwithstanding the phosphorus issue, as long as the price relationship between DDGs and SBM that existed in 2017/18 persists, DDGs will continue to be a competitive feed ingredient in dairy rations. Despite higher SBM prices in 2017/18 relative to 2016/17, inclusion in dairy rations will continue. The relative price of DDGs to SBM was 39% in 2017/18, compared to 31% in 2016/17 and total DDGs fed to dairy cows was essentially the same as in 2016/17.

Meat & Bone Meal

Due to the ban on ruminant meat and bone meal in place since the Bovine Spongiform Encephalopathy (mad cow disease) outbreak in late 2003, only poultry and porcine meat and bone meals are available for use in dairy rations. Poultry meat and bone meal continues to be used almost exclusively in poultry rations and therefore does not find its way into dairy rations. This is because of nutritional variability, price per unit of protein is generally higher than that for SBM and odor issues that may lead to reduced feed intake. Because of these reasons, many dairy nutritionists will not formulate rations containing porcine meat and bone meal. In fact, some milk processors label their products as coming from cows not fed animal proteins. The fact that higher protein sources is not needed in a dairy ration further raises the hurdle for its inclusion.

- Nutritional variability, higher price per unit of protein relative to SBM, odor issues, and unacceptability by consumers will continue to limit the use of porcine meat and bone meal in dairy rations.

Synthetic Essential Amino Acids

The two most important essential amino acids for dairy are lysine and methionine. Research from the “Nutrient Requirements of Dairy Cattle”, published by the National Research Council states that lysine requirements are 7.2% of metabolizable protein and methionine requirements are 2.4% of metabolizable protein. In all diets used for this analysis, no supplemental inclusion of these essential amino acids was required. In our discussions with nutritionists, while there may not be nutritional reasons for including synthetic amino acids, there may be regulatory (environmental) reasons for doing so. The Chesapeake Bay area

continues to have restrictions on manure handling and use to guard against too much protein (nitrogen) finding its way into manure. It is conceivable in some instances in areas with these types of restrictions that protein sources for dairy rations could be sought that provide lower levels of protein than what is needed. Supplemental synthetic essential amino acids would then be added incrementally to bring levels equal what is required for the health of the animal. However, due to protein requirements sourced from non-forage feed ingredients being unnecessary, the odds of including synthetic amino acids in dairy rations for reasons other than the manure issue is very low.

The use of SBM and soy hull usage in dairy rations continues to be a comparatively expensive proposition since dairy cattle have lower needs for protein in general than monogastric animals and what protein they do need is sourced in large part from forage. The fact that dairy cows have lower requirements for protein from feedstuffs other than forage allows their rations to be much more flexible in how nutritionists formulate their diets.

The year 2017/18 was a year marked by increased use of still competitively priced DDGs (quantity did not change compared to 2016/17) and other lower cost per unit of protein feed ingredients. Our research suggests that the dynamic of using or not using SBM and soy hulls in dairy cattle rations is heavily influenced by access to feed ingredients which provide protein more economically than SBM.

Beef Cows

Up until about 2014, the U.S. beef cattle herd had dropped in size and shifted locations. National beef cattle inventory numbers are now the highest (31.47 million head) they've been since 2009, when inventory was 31.79 million head. In 2015 the herd size began to recover from a downward trend. Below is a chart from the USDA and a map that shows current and historical beef cattle inventory by state.

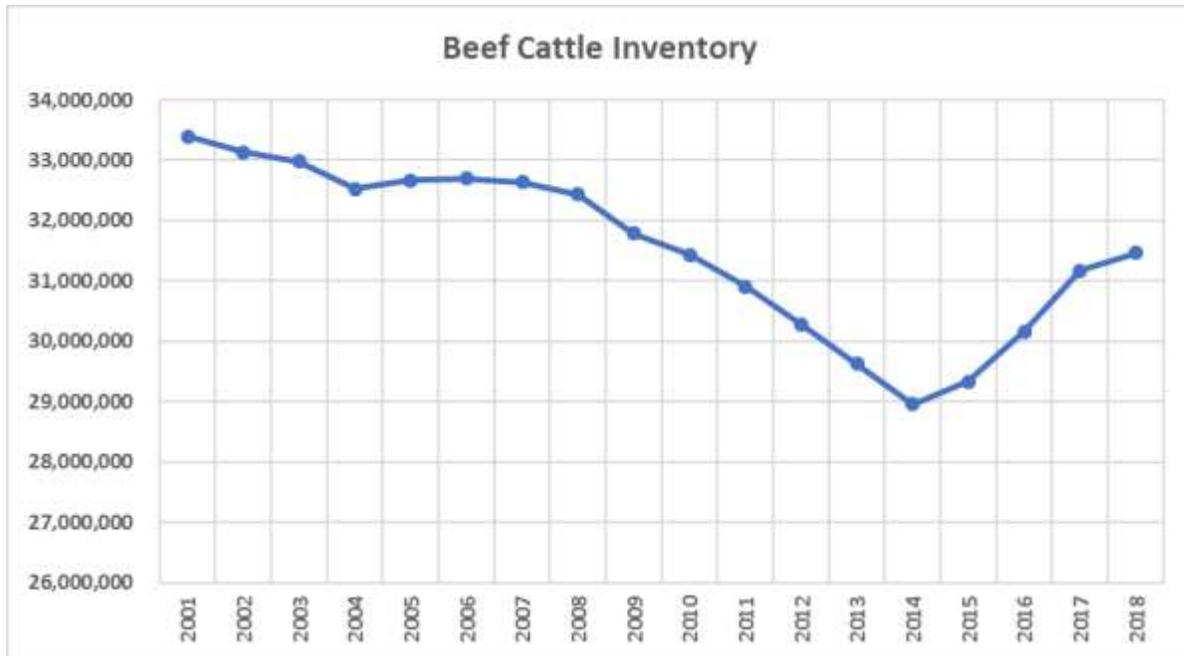


Figure 28, Beef Cattle Inventory (2001-2018)

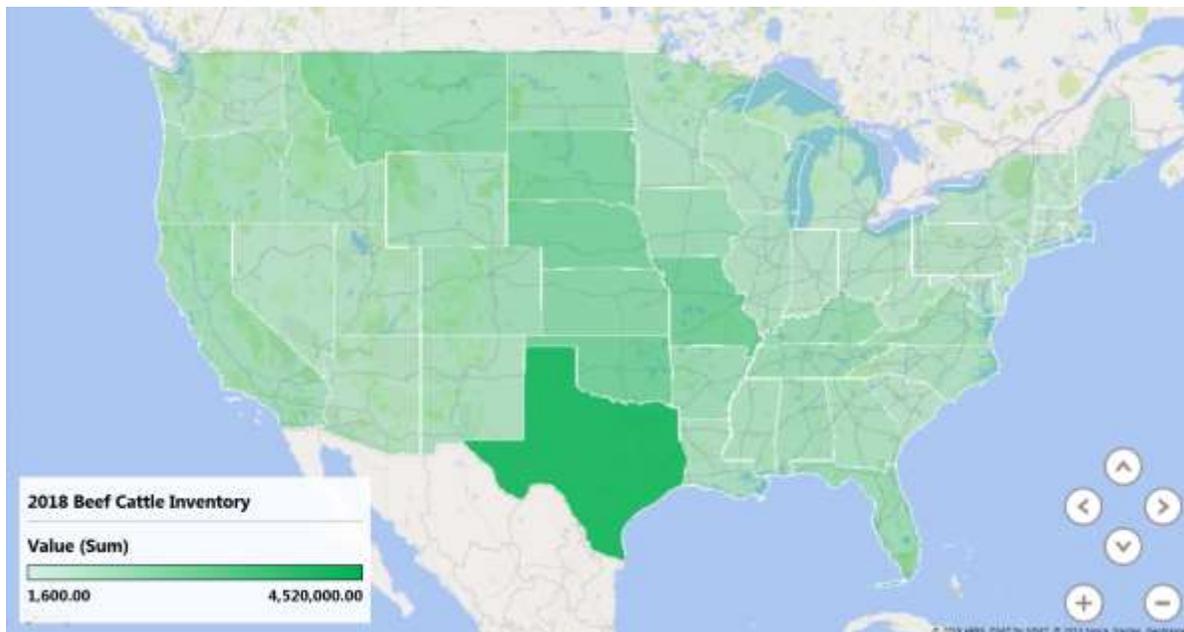


Figure 29, 2018 Beef Cattle Inventory Map

Competing Feedstuff Analysis

In contrast to other livestock (hogs) and poultry (broilers, turkeys and layer), beef cattle are less reliant upon SBM. This is due to two reasons: 1) ruminant requirements for forage, which provides much of the protein needs for beef cattle, and 2) widespread access to DDGs.

In our discussions with nutritionists from University of Missouri, University of Nebraska, Lincoln, Iowa State University and others, the vast majority of SBM is either fed as a creep feed to calves approaching and slightly beyond weaning age and calves that are part of the backgrounding process (up to about 700 lbs). We also determined in our research that soy hulls are also fed during these two stages of life and are included in our estimates. Of note, when pasture conditions are sufficient to provide good forage opportunities for mother cows, the requirements for supplemental creep feed is diminished, thereby reducing requirements for both SBM and soy hulls for this stage of life.

In our work we have developed regional rations for a northern and southern states. A change to northern diets has been reduced inclusion of DDGs. This is for a different reason than down south. Many ethanol plants in northern states remove significant portions of oil from DDGs, which is reducing their “feeding value”. The University of Nebraska continues to research de-oiled DDGs and are recommending inclusion levels much lower than they have in the past.

In mid-2019, a fire at a Tyson plant in Holcomb, Kansas has undoubtedly caused disruptions in the market. The inclusion of SBM in cattle finishing diets is not expected to be affected as there is almost no reason to use relatively higher-priced SBM compared to using relatively cheaper DDGs.

The map below depicts our estimate of the amount of SBM fed in U.S. beef production during 2018. The estimated total of about 318,000 short tons represents approximately 0.9% of total estimated SBM consumed by animal agriculture in 2018. During 2018, the use of SBM and hulls was concentrated in the weaning and backgrounding phases of cattle production.

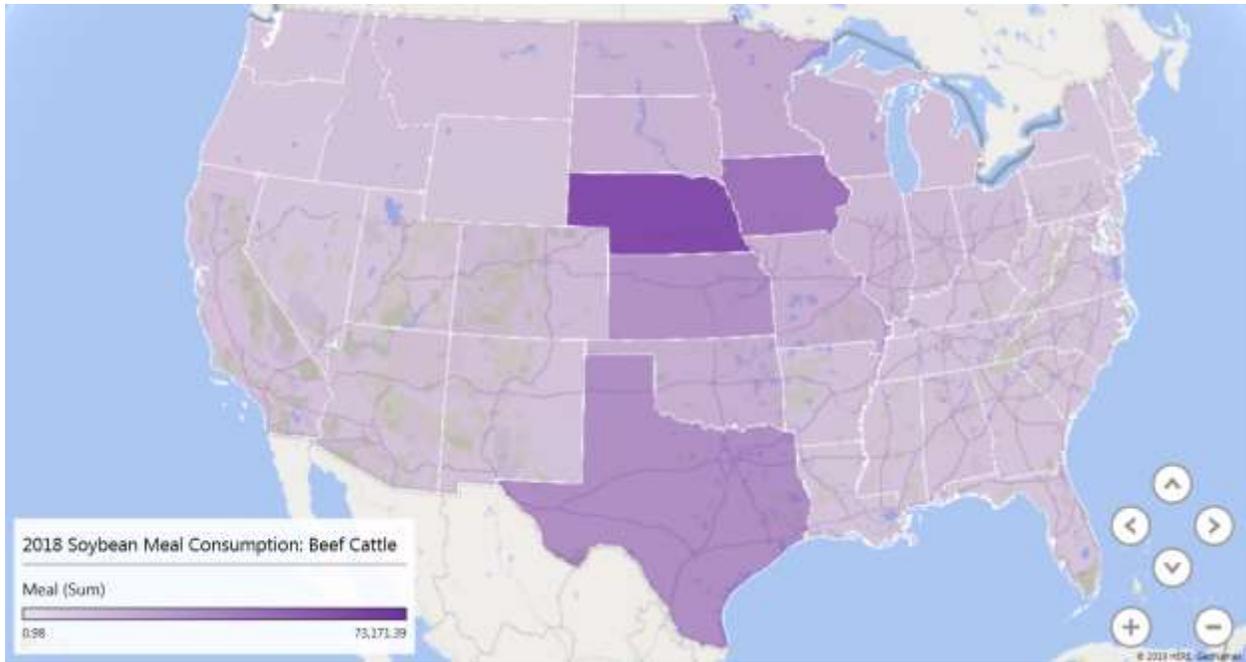


Figure 30, 2018 Soybean Meal Consumption: Beef Cattle

Conclusion

The year 2017/18 was a year again marked by low reliance upon SBM for beef production. This was primarily due to the continuation of competitively-priced DDGs and access to good forage, both in pastures and in feedlots. Our research suggests that the dynamic of using or not using SBM in beef cattle rations is heavily influenced by access to adequate forage. In years where poor pasture and range conditions persist, we would expect higher needs for SBM and soy hulls. SBM and soy hulls are unlikely to become a competitive substitute for on-farm or locally-grown forage and pasture when it is available.

Companion Animals

For purposes of this analysis, we have defined companion animals as a combination of cats, dogs, and horses (equine). According to our subject matter experts, differences in the use of SBM for companion animals is primarily due to the perception of the use of vegetable proteins. This is particularly true for cats and dogs, which many people consider part of their family.

The use of SBM within the companion animal sector is very limited when compared with other users of SBM. Estimated 2018 total SBM consumption for companion animals is about 434,000 tons, which represents about 1 percent of total SBM consumption in 2018. Due to lack of data on ration specifications and the low representation of SBM consumption relative to totals, our analysis for companion animals has been confined to total estimates of SBM usage. The map below illustrates that, while SBM is fed to companion animals in all states, the use of SBM for companion animals is concentrated in states such as California, Texas, and Florida. Following the map are details for each of cats, dogs and horses.

Cats

The use of SBM in cat food is very limited. Estimated SBM consumption by cats during 2018 is just 32,500 tons, or one tenth percent of the estimated total for 2018. Not only is the daily food consumption of cats low, the perception by the industry of SBM as a cat food ingredient is generally negative. In many regards, the pet food market follows similar marketing techniques as human food. For instance, fad diets come and go within human diets (i.e., Atkins, Paleo, etc.), which has implications for the use of certain types of food (carbohydrates, fats, animal proteins, etc.).

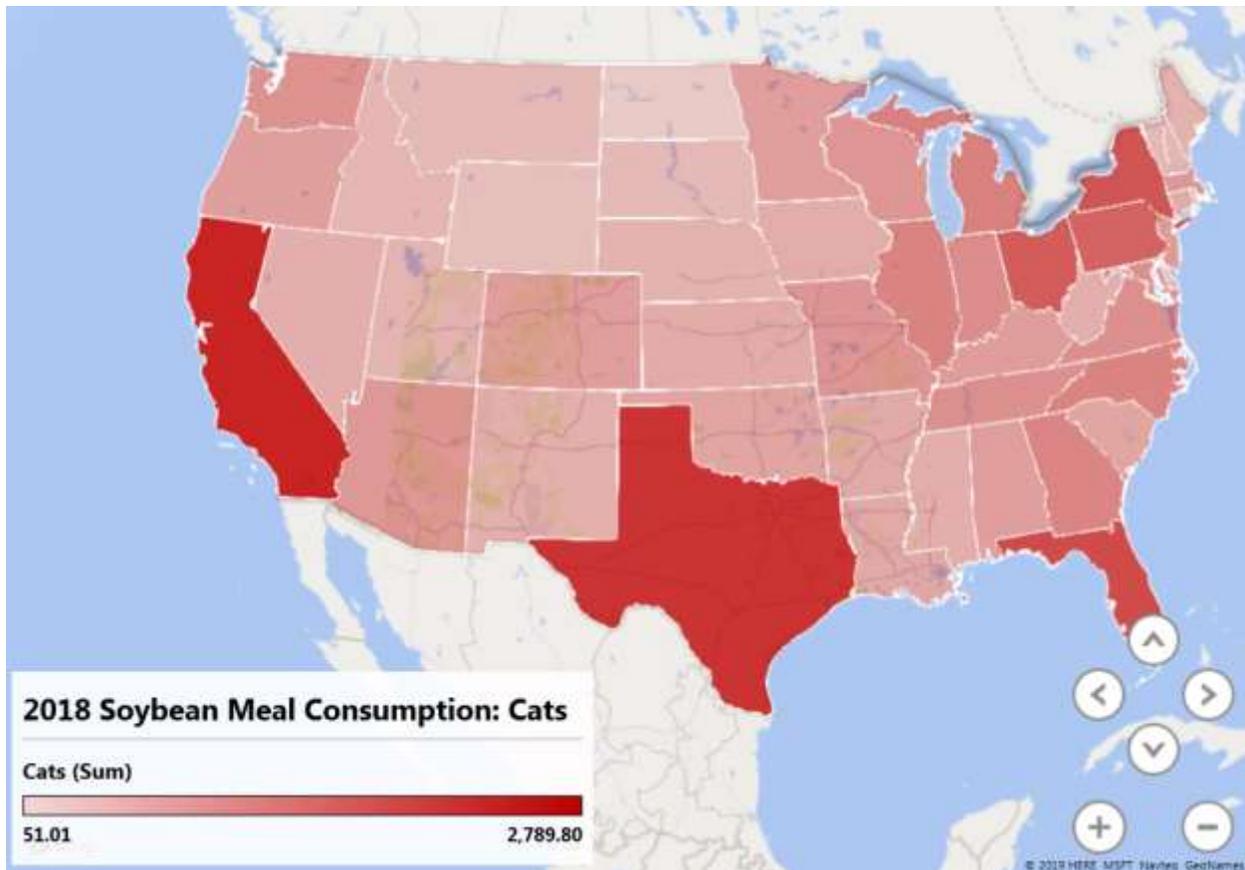


Figure 31, 2018 Soybean Meal Consumption: Cats

Dogs

The use of SBM in dog food is very limited. Estimated SBM consumption by dogs during 2018 is about 207,000 tons, or 6 tenths of a percent of the estimated total for 2018. The perception of SBM as a dog food ingredient by the industry is somewhat negative. In many regards, the pet food market follows similar marketing techniques as human food. For instance, fad diets come and go within human diets (i.e., Atkins, Paleo, etc.), which has implications for the use of certain types of food (carbohydrates, fats, animal proteins, etc.).

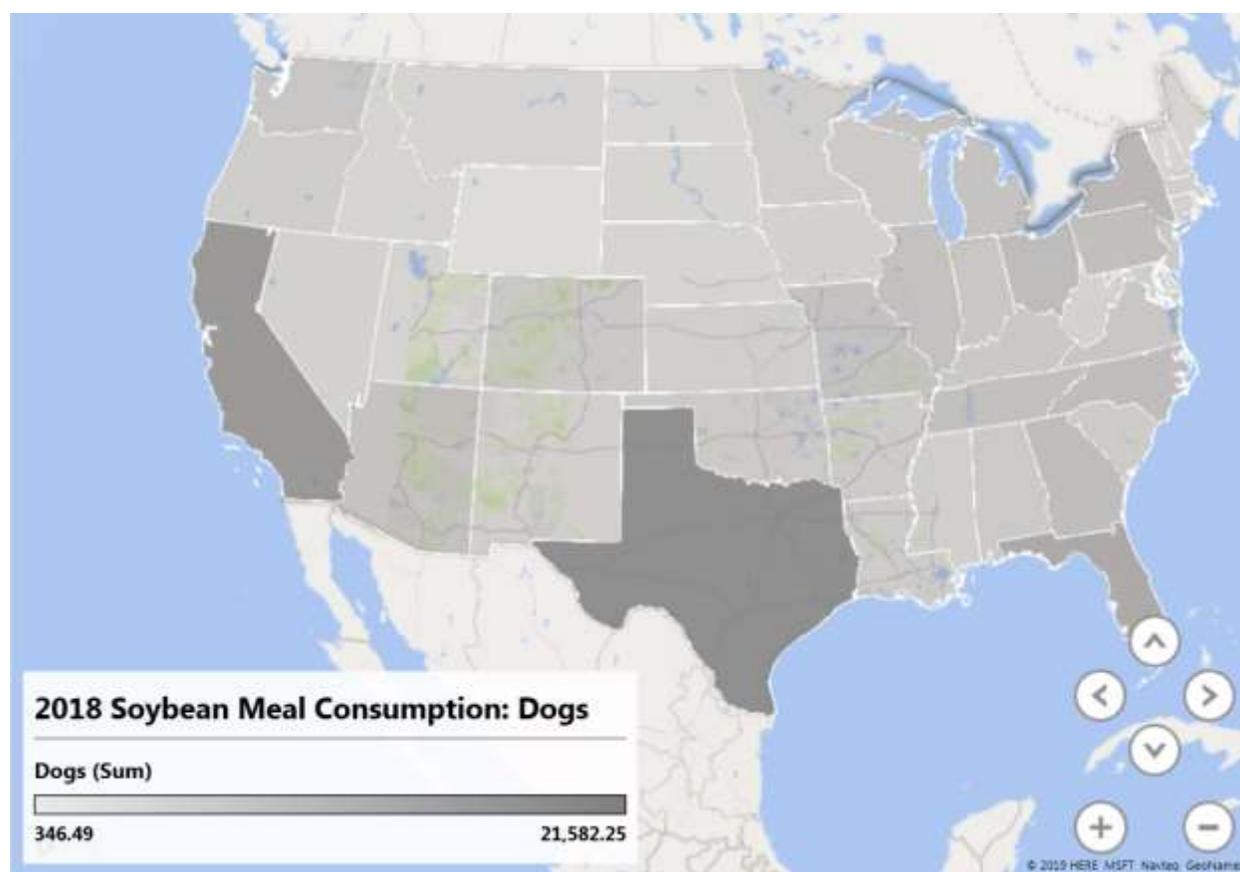


Figure 32, 2018 Soybean Meal Consumption: Dogs

For many years within the cat and dog food market, the use of SBM has been relegated to use in “value” cat and dog foods, which is primarily private label and other lower cost cat and dog food. For the most part, premium (although it may contain some SBM), super-premium, and holistic cat and dog foods have been specifically marketed as not containing SBM (or other “meals”) because of the general consumer perception that SBM is not good for cat and dogs.

However, in visiting with nutritionists, avoidance of SBM in pet foods is beginning to change. This is a reversing trend is worth continuing to monitor over the next several years. What appears to be happening is that SBM is again beginning to be viewed as a good source of protein for cat and dogs.

Horses

Estimated 2018 SBM consumption by horses was about 195,000 tons, or about six tenths percent of estimated 2018 national SBM consumption. In our research, the vast majority of SBM fed to horses is for growing (weaning to 2 years) and performance horses (age 3 to about age 15). The growing phase represents just eight percent of the life expectancy (25 years) of a typical horse. Maintenance diets for non-performing adult horses do not typically include SBM, and it is assumed that maintenance diets are fed to non-performance horses from age 3-25.

Performance horses consume a diet containing SBM for the duration of its prime period of life, but the share of performance horses to total horse population is small, thereby placing an effective upper limit on use of SBM in horse diets. Maintenance diets for horses can contain SBM, but more often than not a feed source with lower protein such as DDGs or alfalfa meal is used to supplement forage so as to not overfeed protein. If needed, horses fed a maintenance diet will add supplemental synthetic lysine.

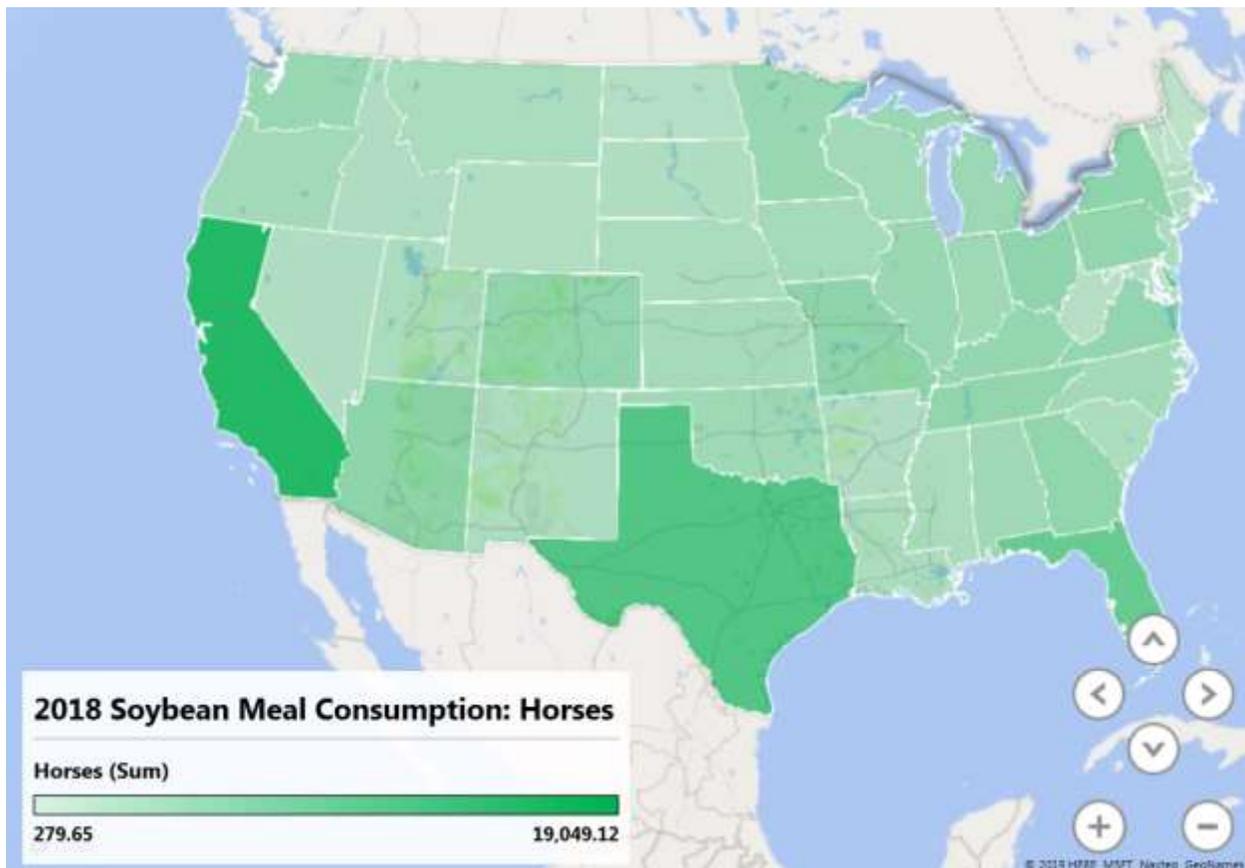


Figure 33, 2018 Soybean Meal Consumption: Horses

Conclusion

Companion animals are not large consumers of SBM and the opportunity for increased usage is constrained by companion animal owner perceptions (although they may be changing) about the suitability of feeding SBM to their pets. Due to horse nutritional needs during various growth and life stages, opportunities for SBM consumption is essentially limited by the number of young and performance horses.

Aquaculture

Due to increasing global demand for seafood and the declining supply of commercially harvested seafood species, global aquaculture is a growing industry. In the US, Catfish and Trout production are the two largest segments. Annual reports published by USDA/NASS show catfish sales were down five percent from the previous year² and trout sales were down ten percent from the previous year³. Within the trout segment, sales of food size fish were down in numbers by 13 percent and the average 2018 price was the same as 2017.

Input from several industry sources indicate there was not much change in production in other species. Some tilapia operations have expanded, and others have either ceased operations or switched to other species. Pacific White Shrimp production in Texas is well established, and one South Dakota operation is in the planning stage. These new operations are using recirculating aquaculture systems (RAS).

Over a decade of research, much of it funded by the soybean checkoff, has supported an increase in the amount of SBM used in feed produced for most species of fish raised for food. SBM has gained widespread acceptance because of its price and stability in both quality and supply compared to fish meal.

Trends in Aquaculture

Feeding

Advances in pre-treatment, feed pellet production, supplements, and feeding methods continue the trend toward higher inclusion rates for soybean meal and soy protein concentrate. Depending on the species there is an upper limit on inclusion rate where FCR and meat quality suffer. Other protein sources such as animal and plant source meals are replacing fish meal in some catfish rations. However, the inclusion rate for SBM remains stable.

Production

Finfish and shrimp production facilities based on recirculating aquaculture systems (RAS) are being built closer to animal and plant-based protein sources. New production facilities are operating in Ellsworth, IA (tilapia) and Rockport, TX (pacific white shrimp). Another RAS facility is in planning stages for Madison, SD (pacific white shrimp).

Competing Feedstuff Analysis

USSEC worked with partners to develop the Asian Aquaculture Feed Formulation Database. It is now called the International Aquaculture Feed Formulation Database (IAFFD)⁴. The nutrients included in this database are being used to develop rations that replace or remove fish meal

² USDA/NASS Catfish Production ISSN:1948-271X, April 2,2019

³ USDA/NASS Trout Production ISSN:1948-271X, February 2,2018

⁴ <http://www.iaffd.com>

and fish oil from rations due to cost and sustainability issues. Many of the “farmed” fish species are carnivores, many others are omnivores. For the most part, using fish meal and fish oil in rations implies harvesting fish to feed fish. Fish meal and fish oil are also used in pet food and other production animal rations.

New developing sources of protein include algae and insect meals. Many of the insect and algae meals provide crude protein or energy levels above the average for similar ingredients (green highlight).

Ingredient Description	Dry Matter (%)	Moisture (%)	Crude Protein (%)	Crude Lipids (%)	Gross Energy - MJ (MJ/kg)	DE Fish/Shrimp (Kcal/kg)	ME Fish (MJ/kg)	ME Guelph Fish Carni (MJ/kg)	ME Guelph Fish Omni (MJ/kg)	ME Guelph Carp (MJ/kg)	ME Guelph Shrimp (MJ/kg)
Fish meal, menhaden, Special Select	91.7	7.3	63.26	8.61	18.35	15.87	14.83	14.77	14.77	14.77	14.77
Feather meal, 81% CP	95.3	4.7	80.9	9.7	23.35	17.42	16.25	15.95	15.95	15.95	15.95
Porcine meal, 65% CP	97.8	2.2	65.5	13.5	21.71	18.10	17.03	16.28	16.28	16.28	16.28
Silkworm pupae meal, defatted, dried	88.8	6.2	75.6	6.6	21.23	16.57	15.41	14.79	14.79	14.79	14.79
Maggot meal, MagMeal, AgriProtein	90	10	50	10	18.54	15.68	14.86	12.72	12.72	12.72	12.72
Black soldier fly larvae meal, defat., Enterra	99	7	83	10	20.27	17.21	15.23	14.57	14.57	14.57	14.57
Yellow mealworm meal, defatted, TMP-465, Ynsect	91	8	65	13	22.82	19.27	18.21	16.54	16.54	16.54	16.54
Brewer's dried grains	91.75	8.25	26.14	6.87	18.13	11.31	10.88	7.48	7.89	7.62	7.48
Corn, grain	87.29	12.71	8.59	3.52	15.96	12.56	12.43	6.84	9.89	8.51	3.23
Cottonseed meal, 41% CP, expeller	91.7	8.3	41.05	4.75	18.29	12.16	11.49	9.37	9.65	9.57	9.41
Distillers dried grains with solubles, DDGS, corn, low oil	88	12	29	7	17.48	11.09	10.64	7.70	8.05	7.79	7.48
Rapeseed meal, expeller, 35% CP	88.85	10.15	35.2	7.45	18.06	12.51	11.95	9.30	9.62	9.58	9.44
Soy protein concentrate, 70% CP	95.18	4.81	68.73	0.5	19.81	18.38	17.09	15.60	16.32	16.21	15.99
Soybean meal, 40% CP, expeller	88.64	10.36	41.33	6.23	18.38	13.67	12.96	10.83	11.34	11.27	11.03
Soybean meal, 48% CP, solvent extracted	88.81	10.19	48.86	1.39	17.74	13.84	13.00	10.74	11.48	11.33	10.85
Soybean meal, USA	90.1	9.9	47.3	1.63	17.7	12.70	11.89	10.39	10.81	10.80	10.94
Soybean meal, low heat	91.7	8.3	47.7	1.6	17.82	12.80	11.78	10.44	10.96	10.94	10.99
Soybean meal, high heat	93.3	6.7	48.8	1.9	18.29	12.94	12.10	10.76	11.27	11.17	10.99
Wheat middlings	90	10	15.81	3	16.39	11.26	10.99	6.31	7.94	6.84	4.63
Algae, Spirulina, 55% CP	93.81	7.19	56.29	3.98	19.02	15.51	14.64	12.70	13.70	13.96	12.18
Algae, Spirulina, 69% CP	95.05	4.95	69.05	4.8	20.58	16.49	15.47	14.87	14.88	14.71	14.23
Algal single cell protein	94.53	5.47	42.03	7.79	18.47	7.61	7.45	5.31	5.81	5.21	4.78
Algae, Schizochytrium sp	96	4	16.3	51.4	28.07	23.85	23.60	21.85	22.54	22.40	21.11
Algal meal, Alitech SP1	96.3	3.7	12	65.3	30.92	26.59	26.40	25.35	25.61	25.57	25.22
Values Above Average											
Values Below Average											

Source: International Aquaculture Feed Formulation Database

Many of the algae and insect meals supply crude protein and/or energy levels above (amber highlight) the typical soybean meal derived from a solvent extraction process (green highlight).

Ingredient Description	Dry Matter (%)	Moisture (%)	Crude Protein (%)	Crude Lipids (%)	Gross Energy - MJ (MJ/kg)	DE Fish/Shrimp (Kcal/kg)	ME Fish (MJ/kg)	ME Guelph Fish Carni (MJ/kg)	ME Guelph Fish Omni (MJ/kg)	ME Guelph Carp (MJ/kg)	ME Guelph Shrimp (MJ/kg)
Fish meal, menhaden, Special Select	91.70	7.30	63.26	8.61	18.35	15.87	14.83	14.77	14.77	14.77	14.77
Feather meal, 81% CP	95.30	4.70	80.90	9.70	23.35	17.42	16.25	15.95	15.95	15.95	15.95
Porcine meal, 65% CP	97.80	2.20	65.50	13.50	21.71	18.10	17.03	16.28	16.28	16.28	16.28
Silkworm pupae meal, defatted, dried	88.80	6.20	75.60	6.60	21.23	16.57	15.41	14.79	14.79	14.79	14.79
Maggot meal, MagMeal, AgriProtein	90.00	10.00	50.00	10.00	18.54	15.68	14.86	12.72	12.72	12.72	12.72
Black soldier fly larvae meal, defat., Enterra	99.00	7.00	83.00	10.00	20.27	17.21	15.23	14.57	14.57	14.57	14.57
Yellow mealworm meal, defatted, TMP-465, Ynsect	91.00	8.00	65.00	13.00	22.82	19.27	18.21	16.54	16.54	16.54	16.54
Brewer's dried grains	91.75	8.25	26.14	6.87	18.13	11.31	10.88	7.48	7.89	7.62	7.48
Corn, grain	87.29	12.71	8.59	3.52	15.96	12.56	12.43	6.84	9.89	8.51	3.23
Cottonseed meal, 41% CP, expeller	91.70	8.30	41.05	4.75	18.29	12.16	11.49	9.37	9.65	9.57	9.41
Distillers dried grains with solubles, DDGS, corn, low oil	88.00	12.00	29.00	7.00	17.48	11.09	10.64	7.70	8.05	7.79	7.48
Rapeseed meal, expeller, 35% CP	88.85	10.15	35.20	7.45	18.06	12.51	11.95	9.30	9.62	9.58	9.44
Soy protein concentrate, 70% CP	95.18	4.81	68.73	0.50	19.81	18.38	17.09	15.60	16.32	16.21	15.99
Soybean meal, 40% CP, expeller	88.64	10.36	41.33	6.23	18.38	13.67	12.96	10.83	11.34	11.27	11.03
Soybean meal, 48% CP, solvent extracted	88.81	10.19	48.86	1.39	17.74	13.84	13.00	10.74	11.48	11.33	10.85
Soybean meal, USA	90.10	9.90	47.30	1.63	17.70	12.70	11.89	10.39	10.81	10.80	10.94
Soybean meal, low heat	91.70	8.30	47.70	1.60	17.82	12.80	11.78	10.44	10.96	10.94	10.99
Soybean meal, high heat	93.30	6.70	48.80	1.90	18.29	12.94	12.10	10.76	11.27	11.17	10.99
Wheat middlings	90.00	10.00	15.81	3.00	16.39	11.26	10.99	6.31	7.94	6.84	4.63
Algae, Spirulina, 55% CP	93.81	7.19	56.29	3.98	19.02	15.51	14.64	12.70	13.70	13.96	12.18
Algae, Spirulina, 69% CP	95.05	4.95	69.05	4.80	20.58	16.49	15.47	14.87	14.88	14.71	14.23
Algal single cell protein	94.53	5.47	42.03	7.79	18.47	7.61	7.45	5.31	5.81	5.21	4.78
Algae, Schizochytrium sp	96.00	4.00	16.30	51.40	28.07	23.85	23.60	21.85	22.54	22.40	21.11
Algal meal, Alitech SP1	96.30	3.70	12.00	65.30	30.92	26.59	26.40	25.35	25.61	25.57	25.22
Values Above SBM, 48% CP, solvent extracted											
Values Below SBM, 48% CP, solvent extracted											

Source: International Aquaculture Feed Formulation Database

While these new alternative ingredients are competitive with soybean meal on a nutrition level it is not likely they will be replacing soybean meal. It is more likely that these ingredients along

with soybean meal will help nutritionists move closer to the goal of replacing or significantly reducing the more expensive fish meal in farmed fish rations.

Conclusion

Overall, sources of information on aquaculture production are less complete and accurate compared to other animals produced for food. Estimates for inclusion rates for SBM and its competing replacements for fish meal range from fifteen to fifty percent. Given the estimated consumption of SBM represents less than seven hundredths percent of total US consumption, some of the tools available in other areas of animal agriculture are not available for aquaculture. An encouraging development is the recent update (stage III) of the IAFFD. As this tool is developed and expanded it will facilitate future detailed analysis of market elasticities in aquaculture. Stage III includes 28 species and well over 400 ingredients.

Sheep

In terms of SBM consumption, sheep represent a small percentage of overall consumption in the U.S. Our estimates suggest that only 23,200 tons of SBM were consumed by meat goats in 2017/18, which is less than one tenth percent of total U.S. estimated SBM consumption in 2017/18. This is due to a few reasons:

1. Overall sheep slaughter is very minimal compared to other livestock and poultry. About 2.0 million sheep and lambs were commercially slaughtered in 2017/18.
2. Ninety four percent of sheep and lambs slaughtered were considered “lambs”, or something less than a mature slaughtered sheep.
3. Most sheep are pasture raised and therefore do not normally consume diets containing SBM.
4. Ewes, which are a larger source of demand for SBM, typically have diets that require high quality feed ingredients (protein) during the last trimester of pregnancy and lactation. The rest of the time, ewes consume diets that do not typically contain SBM.

Demand for SBM in sheep is confined to ewes in their third trimester of pregnancy, lactating ewes and some lambs on a creep feed. The balance of time for a ewe is considered a maintenance period and is the longest period in the production cycle for ewes. The maintenance period is when the ewe flock is not lactating and lasts up to about 30 days before breeding. Once the ewe flock has been bred, the first two-thirds of gestation is also considered a maintenance phase of nutrition. The term maintenance is used because the ewes only needs are to maintain themselves or if growth is expected, it is slow growth rate. These requirements are fairly easily met with a wide range of feedstuffs. If hay is being fed it would take three to four pounds of medium to low quality hay to meet these requirements. Maintenance is often the phase where ewes are on pasture or some type of crop residue, such as corn stalks.

If sheep are raised intensively (confined), sheep are likely to be fed SBM as part of a concentrated ration, but instances of intensively-raised sheep are not common. More often than not, sheep are pasture or range raised, which means needs for SBM or competing substitutes are low. This stands to reason given the majority of sheep are raised in states with large amounts of pasture and range (Western and Plains states). Given consumer preference trends demanding grass-fed animal protein, the likelihood of more sheep production moving to an intensive environment is low.

Meat Goats

In terms of SBM consumption, meat goats represent a very small percentage of overall consumption in the U.S. Our estimates suggest that only 182 tons of SBM were consumed by meat goats in 2017/18. This is due to a few reasons:

1. Overall goat slaughter is very minimal compared to other livestock and poultry. About 622,000 meat goats were commercially slaughtered in 2018.
2. Meat from kids (cabritos, or goats up to 3 months of age, which do not consume SBM because these are baby goats raised on milk only) are destined for the Hispanic market, which is the largest segment of the demand group. The Hispanic market represents more than half of the market for meat goats.
3. Feed consumption is low for meat goats compared to other livestock. Inclusion rates of SBM, if it's included at all, is also low. Estimated SBM consumption for goats that are not destined for Hispanic markets is approximately 1.3 lbs per head.
4. Because of their unique physiology, meat goats do not fatten like cattle or sheep, and rates of weight gain are lower, ranging from 0.1 to 0.8 lbs/day.

The majority of all U.S. goats and kids are raised for meat. Meat from goats 6-9 months of age are destined mainly for the Middle Eastern consumers who prefer does or bucks of all sizes and ages and Caribbean consumers who demand older bucks. The Hispanic population in the U.S. is larger than the Middle Eastern population, although the Caribbean population (which is part of the Hispanic ethnic group) prefer older goats. Based on this, we assume fifty five percent slaughtered goats are young goats (up to 3 months of age), therefore, no SBM is used for this group, leaving forty five percent of goats slaughtered between 6 and 9 months.

In summary, demand is driven by ethnic group preferences. Hispanics prefer cabritos with light colored fat that have never consumed SBM. In Texas, this is usually a 50-pound live goat, carcass weight of about 25 lbs. Middle Eastern consumers prefer does or bucks of all sizes and ages. Caribbean consumers demand older bucks. While the meat goat industry is one of the fastest growing segments of livestock production in the United States (on a percentage basis), the overall opportunities for increasing SBM consumption in this sector would fall behind priorities for increasing consumption in other sectors of animal agriculture with more promise.

Competitiveness of Soybean Meal Remarks

The analysis conducted in this study provides estimates of livestock and poultry demand for SBM in response to other competing feed ingredients. We employed a combination of feed ration simulations and sector-level econometric modeling in this analysis. The own-price and cross-price elasticities were estimated for broilers, layers, turkeys, and hogs. To understand what key SBM components are worth compared to other competing feed ingredients, this

study extends the analysis by estimating the demand elasticities of SBM components. By doing so, we analyze how the perceived value of characteristics of SBM impact the relative value of SBM and other competing ingredients. The components analyzed in this study are focused on digestible lysine, digestible crude protein, and metabolizable energy as appropriate for each species studied for the elasticity analysis.

Own-price elasticity of SBM demand results differ across the four-species indicating that basic inclusion rates, limits on inclusion rates of alternative feedstuffs (such as DDGs) and price distortions in commodity markets due to trade disruptions may all be factors affecting the results of elasticity calculations. Own-price elasticity of SBM demand was negative for SBM use in hog rations and of reasonable magnitude but statistically insignificant at the 10% level. Own-price elasticities for SBM in broilers and layers were statistically insignificant and positive (wrong sign). This result was present in the analysis for both overall feed ingredient analysis and for the analysis of ingredient components of ME, CP and DL. Own-price elasticity for SBM in turkey rations produced mixed results with a positive elasticity (wrong sign) for overall feed ingredient substitution and negative (correct sign) but relatively inelastic results for ME, CP and DL in turkey rations.

With respect to Broilers:

- Cross-price elasticities of SBM demand indicate that corn, DDGs, meat and bone meal, L-Lysine HCL and Threonine compete with SBM in aggregate.
- Corn, DDGs and meat and bone meal compete with SBM for the crude protein component of broiler rations. Wheat and canola meal do not.
- The SBM components elasticity analysis indicates that corn and DDGs are moderate competitors with SBM for the the lysine component in SBM while meat and bone meal is a slight competitor. Canola meal and wheat were not found to be competitors for the lysine component in broiler rations.
- Synthetic lysine poses a threat for the lysine component in SBM with the largest coefficient for elasticity of substitution.
- Corn and DDGs and meat and bone meal compete with the metabolizable energy in the SBM, but canola meal and wheat do not.

With respect to Layers:

- DDGs exhibited the strongest competitive threat to SBM for the lysine component of SBM. Corn and canola meal also compete with SBM with respect to the lysine component, but not wheat, meat and bone meal nor synthetic lysine.

- DDGs compete with SBM's metabolizable energy component, as do corn and canola meal, but not wheat, meat and bone meal.
- DDGs were the strongest competitor to SBM with respect to crude protein content. Corn and canola meal were weak competitors.

With respect to Turkeys:

- Meat and bone meal, blood meal, bakery byproducts, animal-vegetable fats and choice white grease are all relatively weak substitutes for SBM in turkey rations. Corn was found to be a weak substitute for SBM in turkey rations. DDGs, milo and feather meal were not found to be substitutes.
- Synthetic lysine poses a bigger threat for the lysine component in SBM than the other ingredients although meat and bone meal, blood meal, DDGs and milo are weak competitors for the lysine component in SBM.
- DDGs, milo and meat and bone meal are competing for the metabolizable energy component in SBM, but corn, feather meal, bakery byproducts and animal-vegetable fat are not.

With respect to Hogs:

- The own-price elasticity of SBM indicates that SBM prices do have impacts on the inclusion rate of SBM in hog rations with a 10% increase in SBM price resulting in a 2.8% reduction in SBM inclusion in hog rations.
- The cross-price elasticities of SBM demand indicate that meat and bone meal, blood meal, fish meal, corn gluten meal, bakery byproducts, DDGs, wheat and wheat bran are all competitive substitutes for SBM in hog rations.
- The strongest competitors with SBM for the crude protein component of hog rations are blood meal, meat and bone meal, fish meal and corn gluten meal. DDGs and wheat bran are also competitors with SBM for the crude protein component. Corn and milo were not competitive.
- There are many ingredients that are competing with SBM for the lysine component of hog rations. The strongest competitors are blood meal, meat and bone meal, fish meal and corn gluten meal. Synthetic lysine also provides competition for the lysine component.
- Lysine in corn, milo, canola meal, corn gluten feed and wheat midds do not compete with SBM on a lysine component basis.
- There are many ingredients that compete with SBM for metabolizable energy. The strongest competitors are meat and bone meal, blood meal and fish meal with soybean

hulls, milo, corn gluten meal, bakery byproducts, DDGs, wheat and wheat bran exhibiting competitiveness.

This study brings out very important findings related to the competitive position of SBM in livestock and poultry diets in the United States with the results helping to examine the potential for SBM to compete on component levels. With respect to the lysine component in SBM, animal protein sources have become more competitive, in general, compared to prior years. Synthetic lysine is still competitive as a provider of the lysine component in livestock and poultry rations. The competitive position of DDGs has become mixed with it being significantly competitive as a substitute for SBM in broiler and layer rations and somewhat competitive in hog rations, but not a competitor in turkey rations.

Surprisingly, corn was not found to be a significant competitor to SBM in any of the rations but may have become complementary to SBM. This may be a short-term effect due to trade disruptions in commodity market pricing but could be something to keep an eye on to see if it persists in future years.

National Results

The Animal Agriculture National Results section details the results of all three components of this analysis. These components are: 1) Economic Impacts of Animal Agriculture, 2) Animal Agriculture Soybean Meal Consumption and 3) Animal Unit Trends.

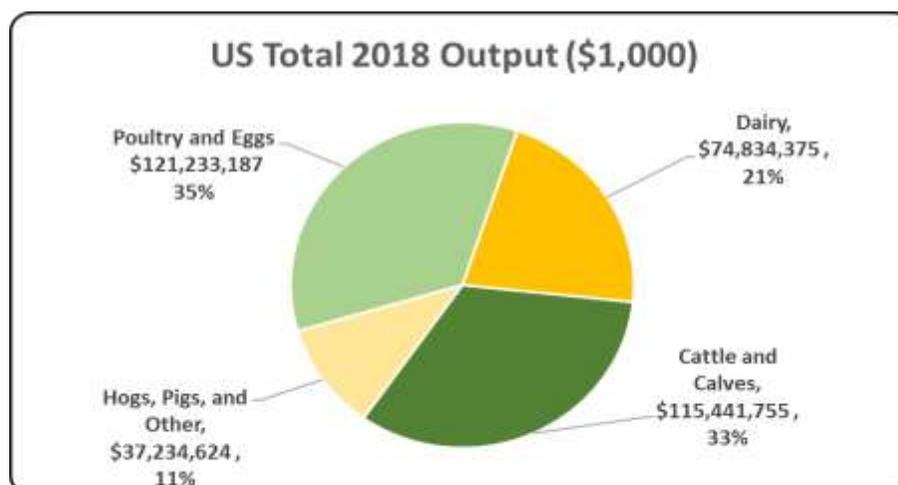
U.S. Economic Impact of Animal Agriculture

This section details the impact of animal agriculture for the U.S. during 2008-2018. As demonstrated, animal agriculture is an integral part of the U.S. economy. The results of the analysis indicate that diminishment or removal of any one of the animal agriculture industries will cause negative impacts to the remaining industries within the impacted region and beyond. Table 29 (at the end of this section) shows state-by-state estimated 2018 economic impacts of animal agriculture. During the last decade in the U.S., animal agriculture has contributed to the following measures of economic activity:

- \$16.6 billion increase in economic output
- \$3.2 billion expansion in household earnings
- 73,366 more jobs
- \$734.5 million more income taxes paid

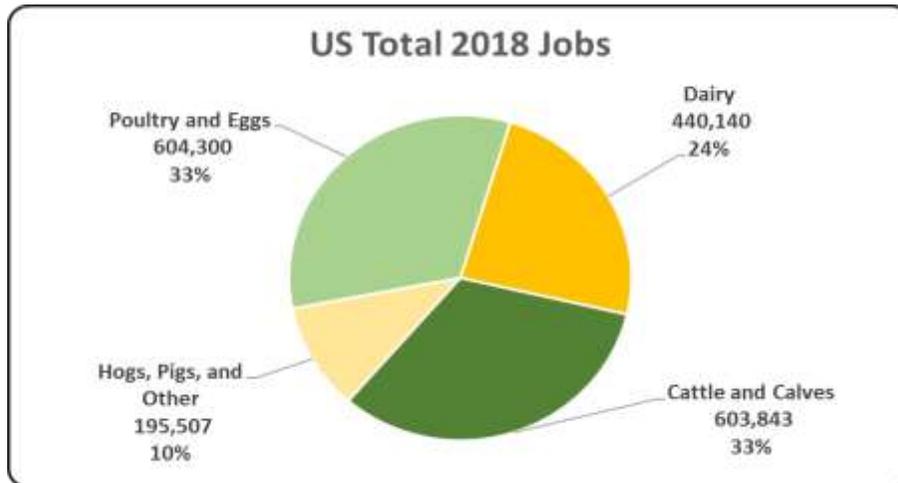
U.S. Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers from the U.S. Bureau of Economic Analysis. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. As shown, animal agriculture provides a significant impact to the U.S. economy, with about \$348.7 billion in output within and related to animal agriculture.



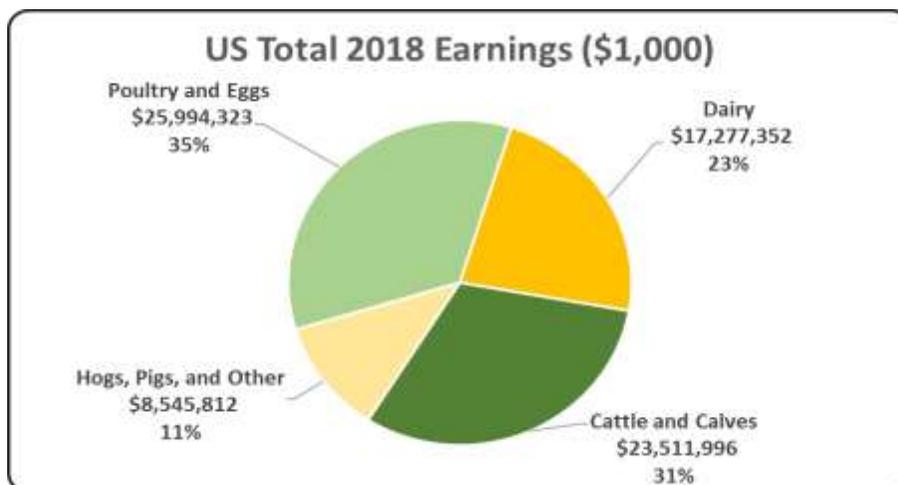
U.S. Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The chart below illustrates the impact to the U.S. in terms of animal agriculture jobs. Animal agriculture contributes significantly to U.S. total jobs, contributing 1,843,789 jobs within and related to animal agriculture.



U.S. Earnings

Earnings includes wages and salaries and proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The chart below illustrates the impact of animal agriculture to the U.S. economy in terms of earnings. About \$75.3 billion in earnings can be attributed to animal agriculture in U.S.



U.S. by State Economic Impact Results

Animal agriculture is an important piece to the U.S. economy, and helped generate \$348.7 billion of output in 2018. The top 5 leading states for animal agriculture in terms of output include Texas (\$33.1 billion), Iowa (\$24.6 billion), California (\$19.5 billion), North Carolina (\$18.2 billion), and Wisconsin (\$16.6 billion). Table 29 on page 18 lists the total output, earnings, employment, and income taxes paid in 2018 for each state.

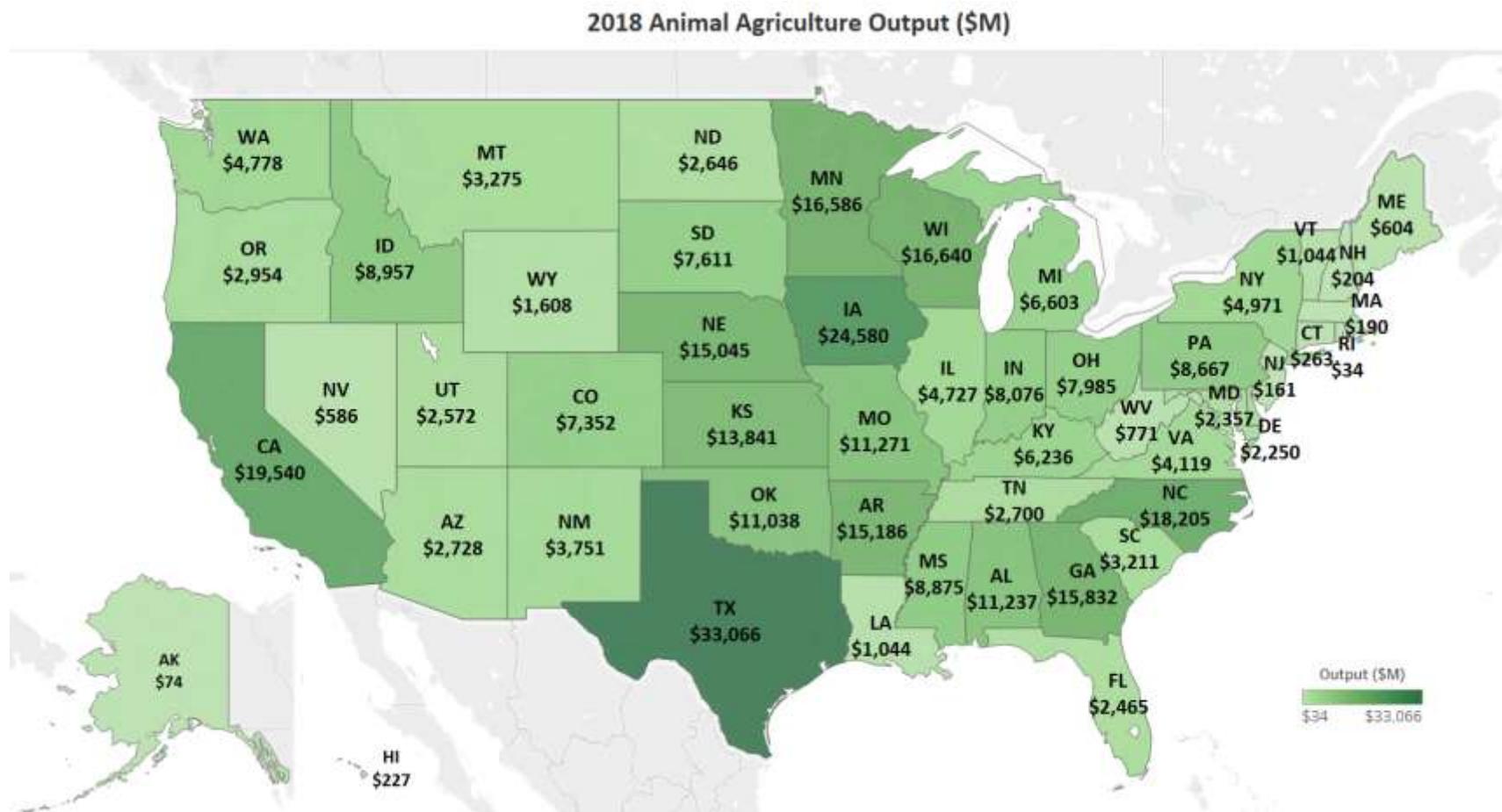


Figure 34, U.S. Animal Agriculture Output (\$M)

The majority of states across the U.S. saw an increase from 2008 to 2018 in the amount of output supported by animal agriculture. Iowa, South Dakota, Missouri, Texas, and Oklahoma were the leading states for total dollar increases in animal agriculture output. Although not as large of an increase in total output, Utah, Wyoming, and North Dakota also saw sizeable growth on a percent basis within their state. Alaska and Hawaii also saw large growth percentages over this timeframe, however the total animal agriculture output in these states is relatively small.

Table 30 on page 19 lists the changes in output, earnings, employment, and income taxes paid from 2008 to 2018 for each state.

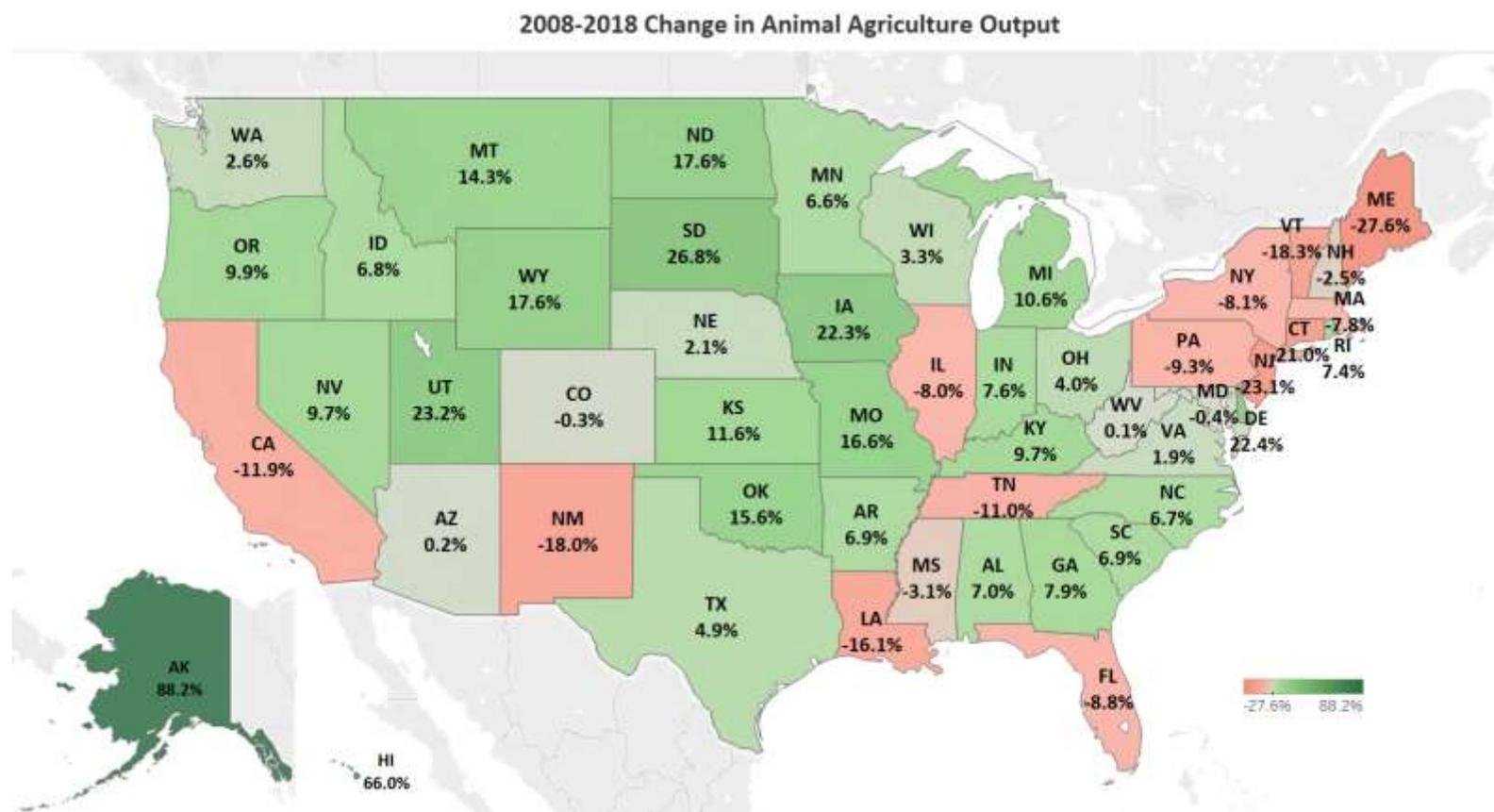


Figure 35, 2008-2018 % Change in Animal Agriculture Output

In 2018, animal agriculture supported 1,843,789 jobs in the United States. There are six states where this sector is especially robust and supports over 75,000 jobs: Texas (215,825), Iowa (111,092), Wisconsin (99,917), California (89,348), North Carolina (88,621), and Minnesota (76,329).

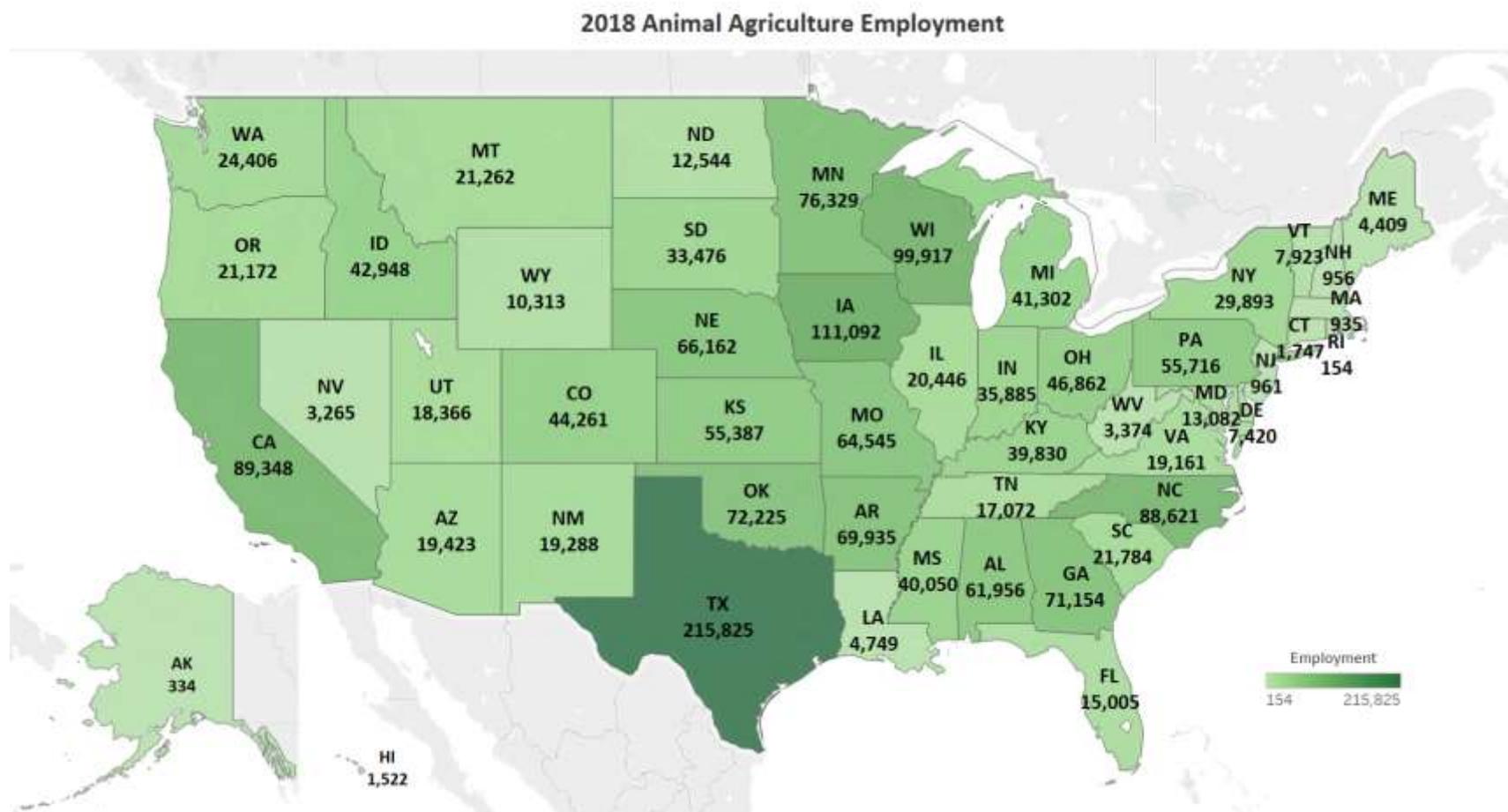


Figure 36, U.S. Animal Agriculture - Employment (Jobs)

Animal agriculture supported increases in jobs in many states over the past decade. More specifically, 9 of the states saw animal agriculture generate jobs gains greater than 15% from 2008 to 2018, and half of the states saw at least a 5% increase.

2008-2018 Change in Animal Agriculture Employment

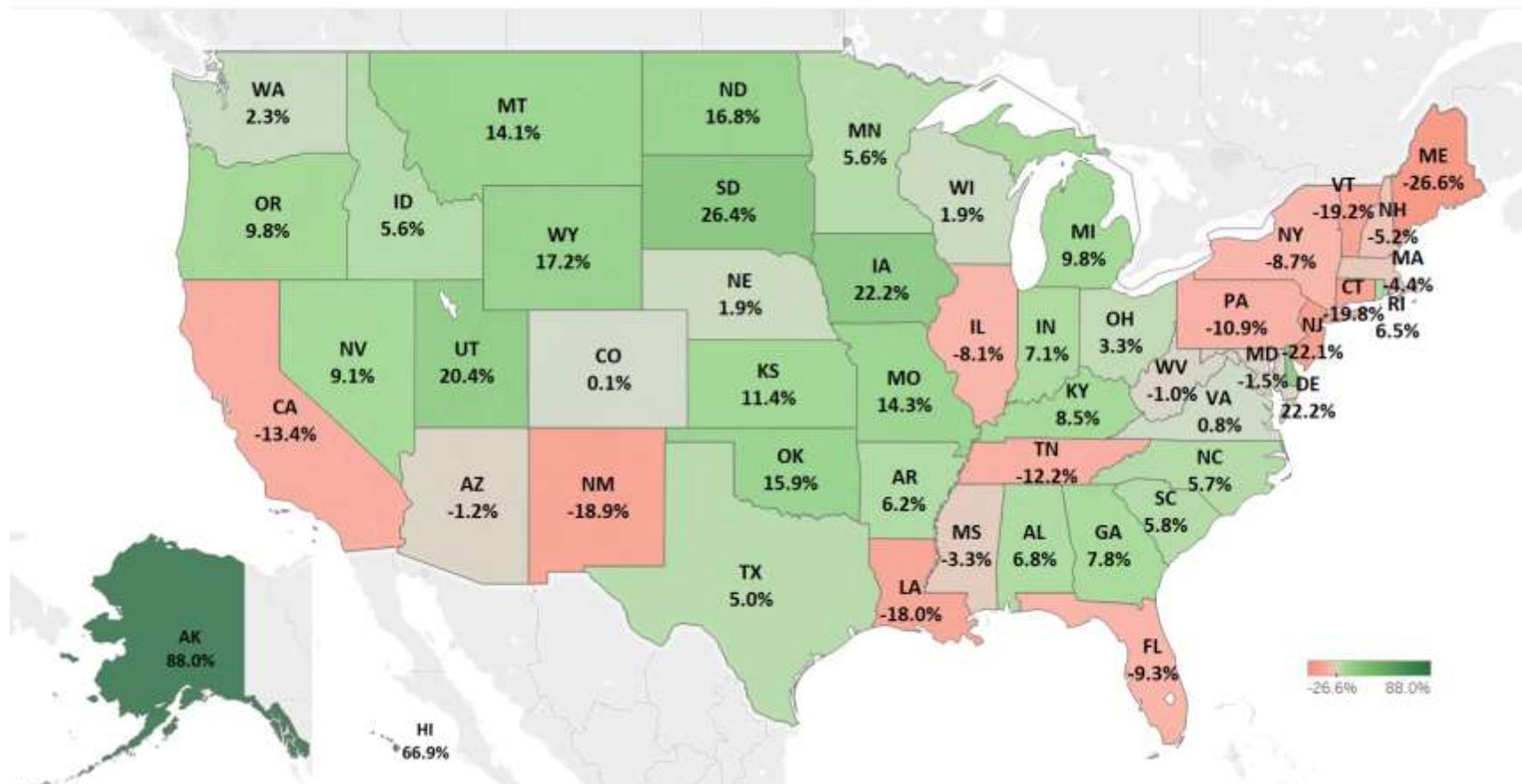


Figure 37, 2008-2018 % Change in Animal Agriculture Employment

Earnings are an important component of a local economy since they allow households to invest capital and spend currency that trades hands many times, generating additional economic activity. Animal agriculture helped generate nearly \$75.3 billion in household earnings in the U.S. in 2018 and contributes heavily to earnings in many states such as Texas (\$7.2 billion), Iowa (\$5.4 billion), California (\$4.5 billion), North Carolina (\$4.1 billion), Wisconsin (\$3.7 billion), and many more.

2018 Animal Agriculture Earnings (\$M)

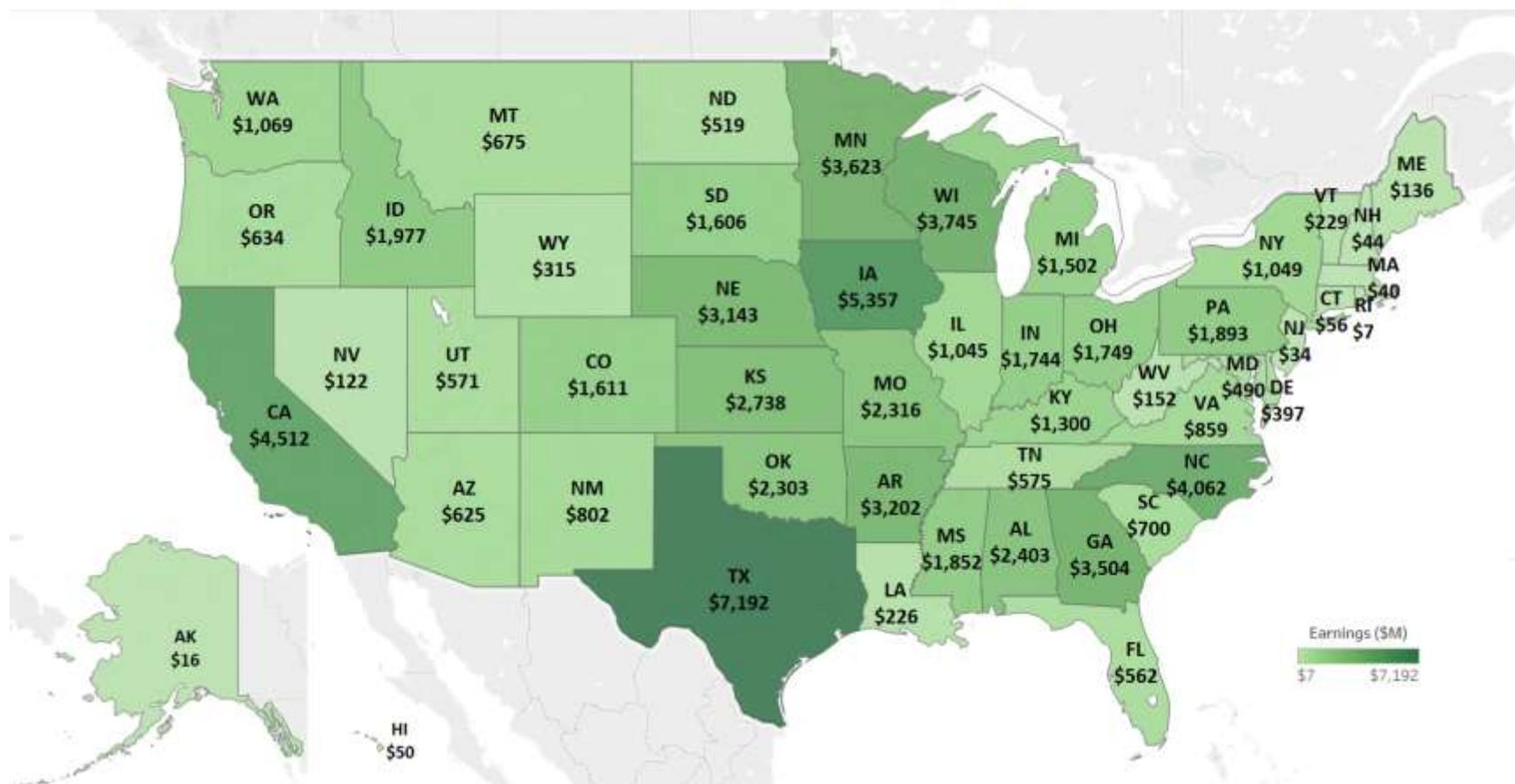


Figure 38, U.S. Animal Agriculture - Earnings (\$M)

Many states across the U.S. have seen increased earnings generated from the animal agriculture sector from 2008 to 2018. The animal agriculture sector increased earnings by greater than 15% in 10 states over the past decade. However, California saw a 13% decline in earnings from animal agriculture due to decreasing animal unit numbers. Dairy was the main contributor to the large decline in California with a 10% lower average milk price received compared to 2008, in addition to a reduction of dairy animal units over the last decade.

2008-2018 Change in Animal Agriculture Earnings

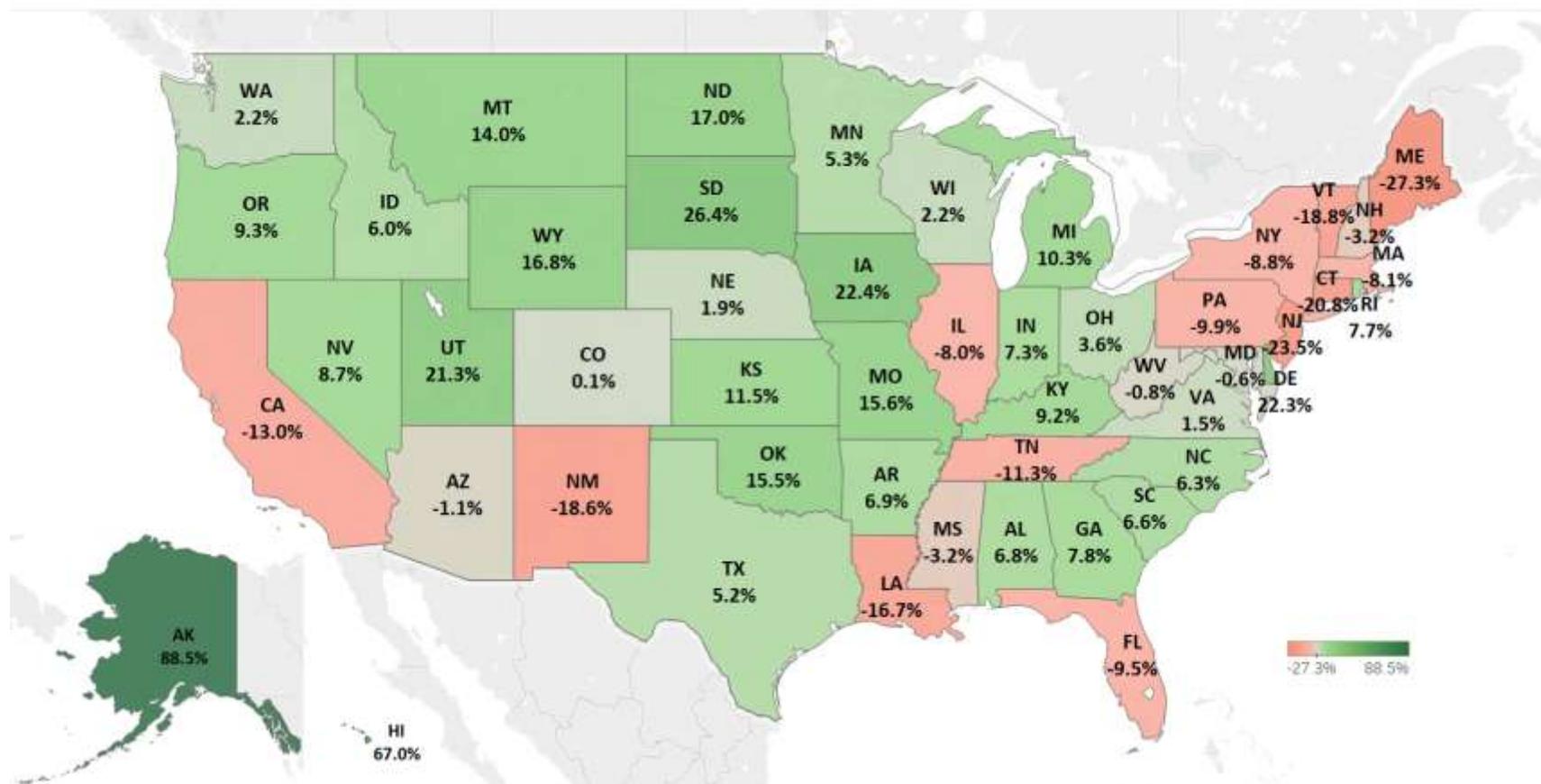


Figure 39, 2008-2018 % Change in Animal Agriculture Earnings

In addition to the large amounts of economic activity derived from animal agriculture across the country, animal agriculture plays an important part in supporting local, state and federal taxing jurisdictions. A direct relationship to the size and scope of animal agriculture yields significant income tax payments in states such as Texas, Iowa, California, North Carolina, Minnesota, and Wisconsin. In nineteen states, animal agriculture paid taxes estimated at \$400 million or more in 2018.

2018 Animal Agriculture Income Taxes Paid (\$M)

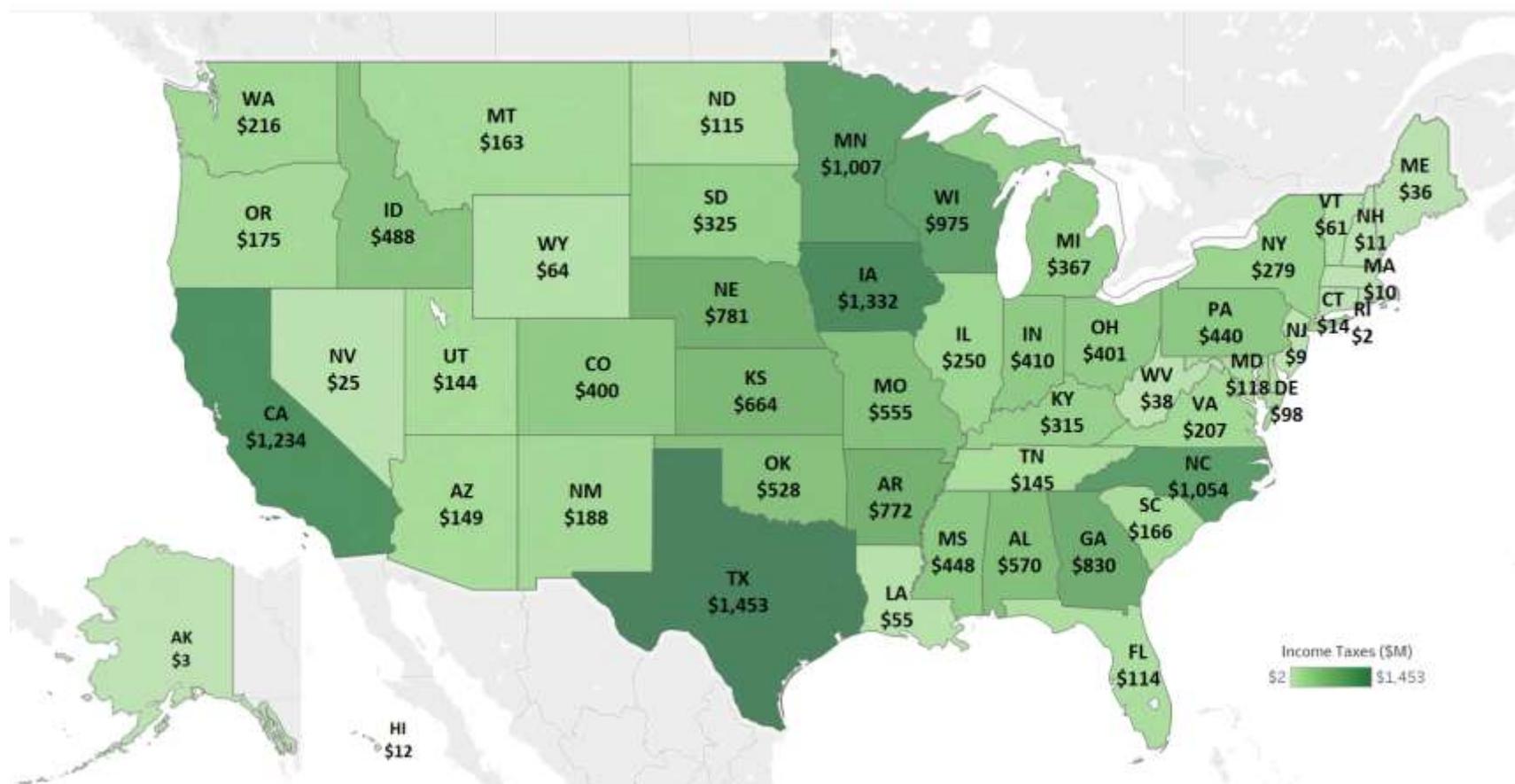


Figure 40, 2018 Animal Agriculture – Income Taxes Paid (\$M)

Income taxes paid at the local, state, and federal jurisdictions increased steadily over the last decade. States such as Iowa, Missouri, Texas, Oklahoma, and Kansas were among top states for total dollar growth in estimated income tax payments. Ten states saw growth over 15% in income taxes paid by animal agriculture from 2008 to 2018, and over half of the states saw at least a 5% increase.

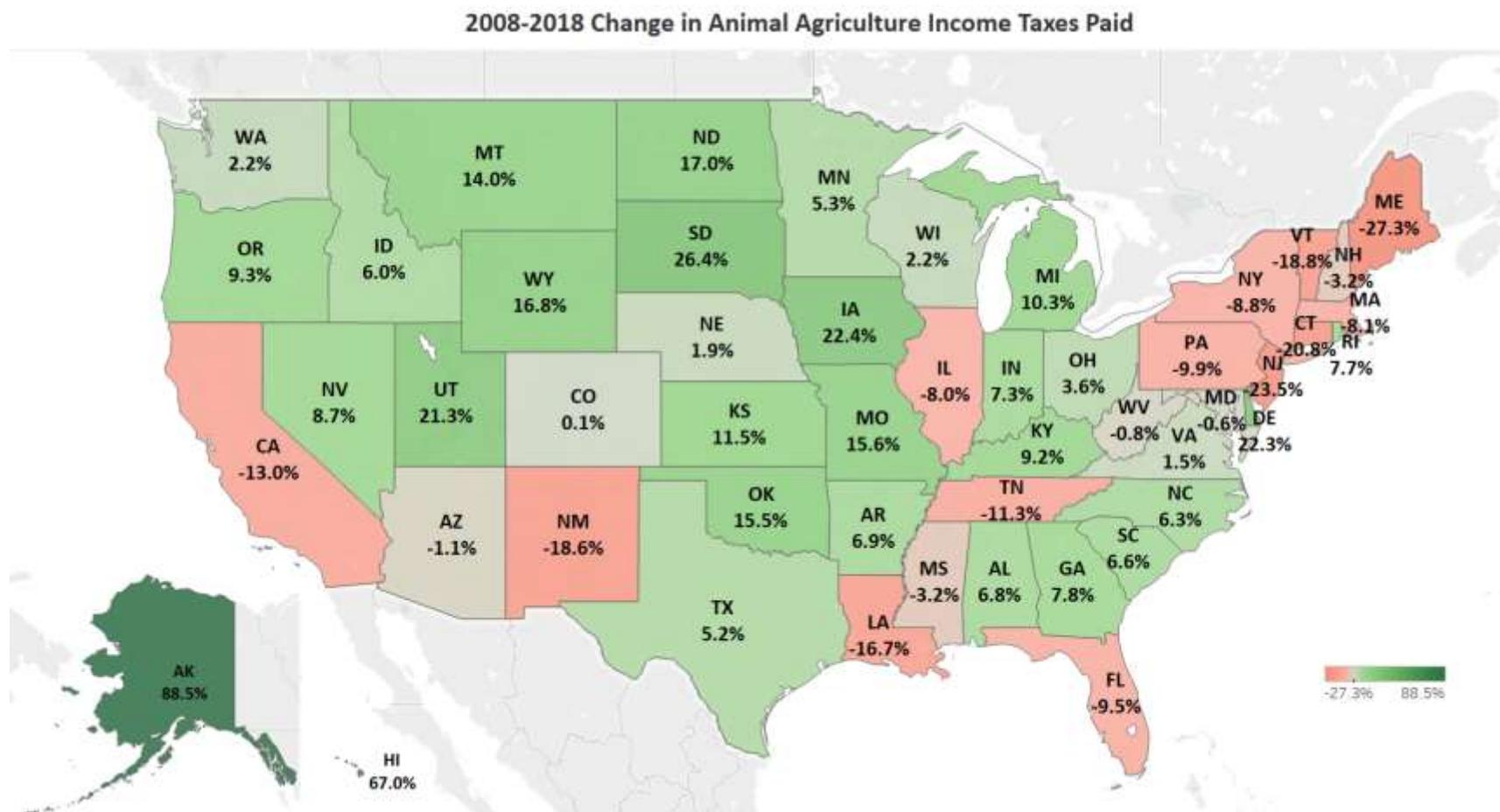


Figure 41, 2007-2017 % Change in Animal Agriculture Income Taxes Paid

Table 29, Estimated 2018 Economic Impact of Animal Agriculture

State	Output (\$M)	Earnings (\$M)	Employment	Income Taxes (\$M)	Property Taxes (\$M)
ALABAMA	\$ 11,236.9	\$ 2,403.4	61,956	\$ 569.6	\$ 56.7
ALASKA	\$ 74.0	\$ 15.5	334	\$ 3.1	\$ 2.0
ARIZONA	\$ 2,728.0	\$ 625.2	19,423	\$ 148.6	\$ 42.5
ARKANSAS	\$ 15,185.6	\$ 3,202.1	69,935	\$ 771.7	\$ 100.3
CALIFORNIA	\$ 19,540.0	\$ 4,511.8	89,348	\$ 1,234.0	\$ 1,126.7
COLORADO	\$ 7,351.8	\$ 1,611.0	44,261	\$ 400.0	\$ 128.9
CONNECTICUT	\$ 262.9	\$ 55.9	1,747	\$ 14.1	\$ 34.5
DELAWARE	\$ 2,250.1	\$ 397.4	7,420	\$ 97.8	\$ 7.1
FLORIDA	\$ 2,464.7	\$ 561.9	15,005	\$ 113.5	\$ 211.5
GEORGIA	\$ 15,832.0	\$ 3,503.9	71,154	\$ 830.4	\$ 162.6
HAWAII	\$ 227.2	\$ 49.8	1,522	\$ 12.5	\$ 16.3
IDAHO	\$ 8,957.0	\$ 1,977.3	42,948	\$ 488.4	\$ 103.0
ILLINOIS	\$ 4,727.4	\$ 1,045.1	20,446	\$ 250.3	\$ 431.6
INDIANA	\$ 8,075.7	\$ 1,743.9	35,885	\$ 409.8	\$ 332.9
IOWA	\$ 24,580.2	\$ 5,356.5	111,092	\$ 1,332.2	\$ 538.3
KANSAS	\$ 13,841.0	\$ 2,738.0	55,387	\$ 664.0	\$ 323.8
KENTUCKY	\$ 6,235.7	\$ 1,299.7	39,830	\$ 314.5	\$ 148.1
LOUISIANA	\$ 1,044.3	\$ 226.0	4,749	\$ 54.7	\$ 41.8
MAINE	\$ 604.3	\$ 135.7	4,409	\$ 36.2	\$ 33.9
MARYLAND	\$ 2,357.4	\$ 490.3	13,082	\$ 118.0	\$ 54.4
MASSACHUSETTS	\$ 189.8	\$ 39.6	935	\$ 10.0	\$ 40.1
MICHIGAN	\$ 6,603.0	\$ 1,502.2	41,302	\$ 367.3	\$ 250.6
MINNESOTA	\$ 16,586.1	\$ 3,622.8	76,329	\$ 1,007.1	\$ 403.3
MISSISSIPPI	\$ 8,875.1	\$ 1,851.8	40,050	\$ 448.1	\$ 97.6
MISSOURI	\$ 11,271.1	\$ 2,315.8	64,545	\$ 554.6	\$ 234.5
MONTANA	\$ 3,274.6	\$ 675.4	21,262	\$ 163.1	\$ 147.9
NEBRASKA	\$ 15,044.5	\$ 3,143.1	66,162	\$ 781.1	\$ 686.5
NEVADA	\$ 585.6	\$ 121.6	3,265	\$ 24.6	\$ 19.0
NEW HAMPSHIRE	\$ 204.1	\$ 43.8	956	\$ 11.0	\$ 25.6
NEW JERSEY	\$ 161.3	\$ 34.5	961	\$ 8.7	\$ 69.1
NEW MEXICO	\$ 3,751.4	\$ 801.9	19,288	\$ 188.5	\$ 46.0
NEW YORK	\$ 4,971.4	\$ 1,048.5	29,893	\$ 279.0	\$ 236.4
NORTH CAROLINA	\$ 18,205.5	\$ 4,061.6	88,621	\$ 1,054.0	\$ 157.4
NORTH DAKOTA	\$ 2,645.6	\$ 518.6	12,544	\$ 115.1	\$ 142.3
OHIO	\$ 7,984.7	\$ 1,748.7	46,862	\$ 401.3	\$ 411.7
OKLAHOMA	\$ 11,038.1	\$ 2,302.5	72,225	\$ 528.4	\$ 151.2
OREGON	\$ 2,954.3	\$ 634.3	21,172	\$ 175.4	\$ 151.4
PENNSYLVANIA	\$ 8,667.1	\$ 1,892.8	55,716	\$ 440.5	\$ 252.7
RHODE ISLAND	\$ 34.4	\$ 7.1	154	\$ 1.8	\$ 7.0
SOUTH CAROLINA	\$ 3,211.1	\$ 700.1	21,784	\$ 165.9	\$ 58.5
SOUTH DAKOTA	\$ 7,610.5	\$ 1,606.5	33,476	\$ 324.5	\$ 261.3
TENNESSEE	\$ 2,699.9	\$ 574.5	17,072	\$ 144.8	\$ 131.3
TEXAS	\$ 33,066.1	\$ 7,191.8	215,825	\$ 1,452.7	\$ 698.2
UTAH	\$ 2,571.7	\$ 571.2	18,366	\$ 143.9	\$ 43.8
VERMONT	\$ 1,044.0	\$ 228.9	7,923	\$ 60.5	\$ 34.9
VIRGINIA	\$ 4,118.8	\$ 859.0	19,161	\$ 206.8	\$ 126.4
WASHINGTON	\$ 4,777.8	\$ 1,068.9	24,406	\$ 215.9	\$ 217.8
WEST VIRGINIA	\$ 771.0	\$ 151.9	3,374	\$ 37.9	\$ 30.9
WISCONSIN	\$ 16,640.5	\$ 3,744.8	99,917	\$ 974.6	\$ 329.3
WYOMING	\$ 1,608.4	\$ 315.2	10,313	\$ 63.7	\$ 55.2
US Total	\$ 348,743.9	\$ 75,329.5	1,843,789	\$ 18,214.3	\$ 9,415.1

Table 30, Economic Impact of Animal Agriculture: Change from 2008-2018

State	Output (\$1,000)	Earnings (\$1,000)	Employment	Income Taxes (\$1,000)
ALABAMA	\$ 733,576	\$ 153,670	3,928	\$ 36,420
ALASKA	\$ 34,693	\$ 7,294	156	\$ 1,473
ARIZONA	\$ 6,368	\$ (7,054)	(243)	\$ (1,676)
ARKANSAS	\$ 979,762	\$ 205,531	4,064	\$ 49,533
CALIFORNIA	\$ (2,648,100)	\$ (676,854)	(13,871)	\$ (185,120)
COLORADO	\$ (24,570)	\$ 856	33	\$ 213
CONNECTICUT	\$ (69,919)	\$ (14,694)	(432)	\$ (3,702)
DELAWARE	\$ 411,773	\$ 72,487	1,348	\$ 17,832
FLORIDA	\$ (236,413)	\$ (59,065)	(1,547)	\$ (11,931)
GEORGIA	\$ 1,159,708	\$ 253,967	5,122	\$ 60,190
HAWAII	\$ 90,343	\$ 19,975	610	\$ 4,999
IDAHO	\$ 569,414	\$ 111,874	2,294	\$ 27,633
ILLINOIS	\$ (410,692)	\$ (90,305)	(1,801)	\$ (21,628)
INDIANA	\$ 572,281	\$ 118,036	2,373	\$ 27,738
IOWA	\$ 4,482,379	\$ 981,309	20,178	\$ 244,052
KANSAS	\$ 1,434,567	\$ 281,454	5,666	\$ 68,253
KENTUCKY	\$ 551,805	\$ 109,727	3,132	\$ 26,554
LOUISIANA	\$ (201,038)	\$ (45,237)	(1,040)	\$ (10,947)
MAINE	\$ (230,712)	\$ (51,018)	(1,595)	\$ (13,609)
MARYLAND	\$ (8,787)	\$ (3,065)	(199)	\$ (738)
MASSACHUSETTS	\$ (16,001)	\$ (3,474)	(43)	\$ (879)
MICHIGAN	\$ 633,576	\$ 139,690	3,694	\$ 34,154
MINNESOTA	\$ 1,024,011	\$ 183,625	4,032	\$ 51,048
MISSISSIPPI	\$ (280,260)	\$ (62,186)	(1,377)	\$ (15,049)
MISSOURI	\$ 1,604,602	\$ 311,826	8,094	\$ 74,682
MONTANA	\$ 410,065	\$ 83,164	2,630	\$ 20,084
NEBRASKA	\$ 309,227	\$ 57,798	1,258	\$ 14,363
NEVADA	\$ 51,562	\$ 9,755	273	\$ 1,971
NEW HAMPSHIRE	\$ (5,171)	\$ (1,463)	(52)	\$ (369)
NEW JERSEY	\$ (48,368)	\$ (10,611)	(273)	\$ (2,694)
NEW MEXICO	\$ (822,402)	\$ (183,101)	(4,506)	\$ (43,029)
NEW YORK	\$ (439,550)	\$ (100,668)	(2,835)	\$ (26,788)
NORTH CAROLINA	\$ 1,150,473	\$ 239,285	4,804	\$ 62,094
NORTH DAKOTA	\$ 396,113	\$ 75,520	1,805	\$ 16,766
OHIO	\$ 310,727	\$ 60,142	1,494	\$ 13,803
OKLAHOMA	\$ 1,488,626	\$ 308,413	9,885	\$ 70,781
OREGON	\$ 267,052	\$ 53,789	1,882	\$ 14,873
PENNSYLVANIA	\$ (885,730)	\$ (207,102)	(6,824)	\$ (48,193)
RHODE ISLAND	\$ 2,381	\$ 512	9	\$ 128
SOUTH CAROLINA	\$ 207,421	\$ 43,604	1,203	\$ 10,334
SOUTH DAKOTA	\$ 1,609,238	\$ 335,827	6,990	\$ 67,837
TENNESSEE	\$ (332,000)	\$ (73,457)	(2,378)	\$ (18,511)
TEXAS	\$ 1,544,206	\$ 358,488	10,183	\$ 72,415
UTAH	\$ 484,387	\$ 100,358	3,108	\$ 25,290
VERMONT	\$ (234,027)	\$ (52,862)	(1,889)	\$ (13,982)
VIRGINIA	\$ 76,681	\$ 13,029	149	\$ 3,137
WASHINGTON	\$ 119,353	\$ 23,453	537	\$ 4,738
WEST VIRGINIA	\$ 891	\$ (1,223)	(34)	\$ (305)
WISCONSIN	\$ 525,557	\$ 81,096	1,858	\$ 21,105
WYOMING	\$ 240,702	\$ 45,412	1,512	\$ 9,173
US Total	\$ 16,589,780	\$ 3,197,525	73,366	\$ 734,514

U.S. Total Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

U.S.'s animal agriculture consumed nearly 32.3 million tons of soybean meal in 2018. Additionally, animal agriculture in U.S. consumed 2.96 million tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (15.8 million tons)
2. Hogs (7.5 million tons)
3. Egg-Laying Hens (3.0 million tons)

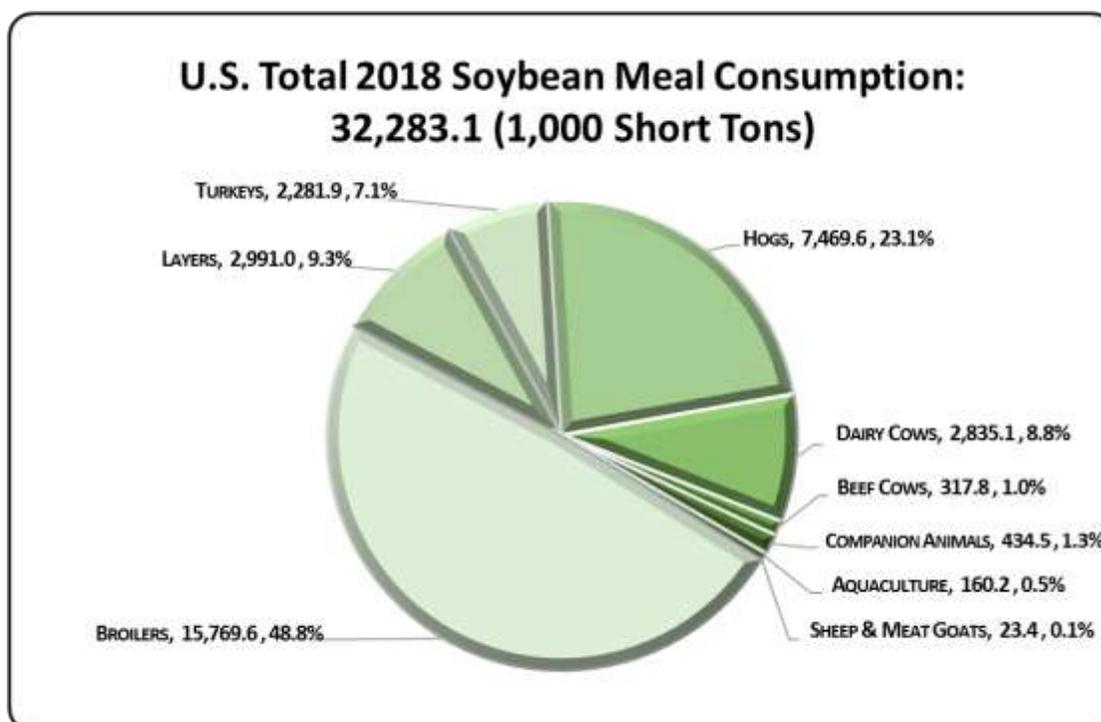


Figure 42, U.S. Total 2018 Soybean Meal Consumption

Due to the large number of hogs, layers, cattle and turkeys, Iowa was the leader in soybean meal usage for 2018. Other states that used large amounts of soybean meal include North Carolina, Georgia, Arkansas, Alabama, Texas and Minnesota due to large numbers of animals in those states. Detailed results for all species including the breakdown of companion animals and aquaculture can be found in Appendix A.

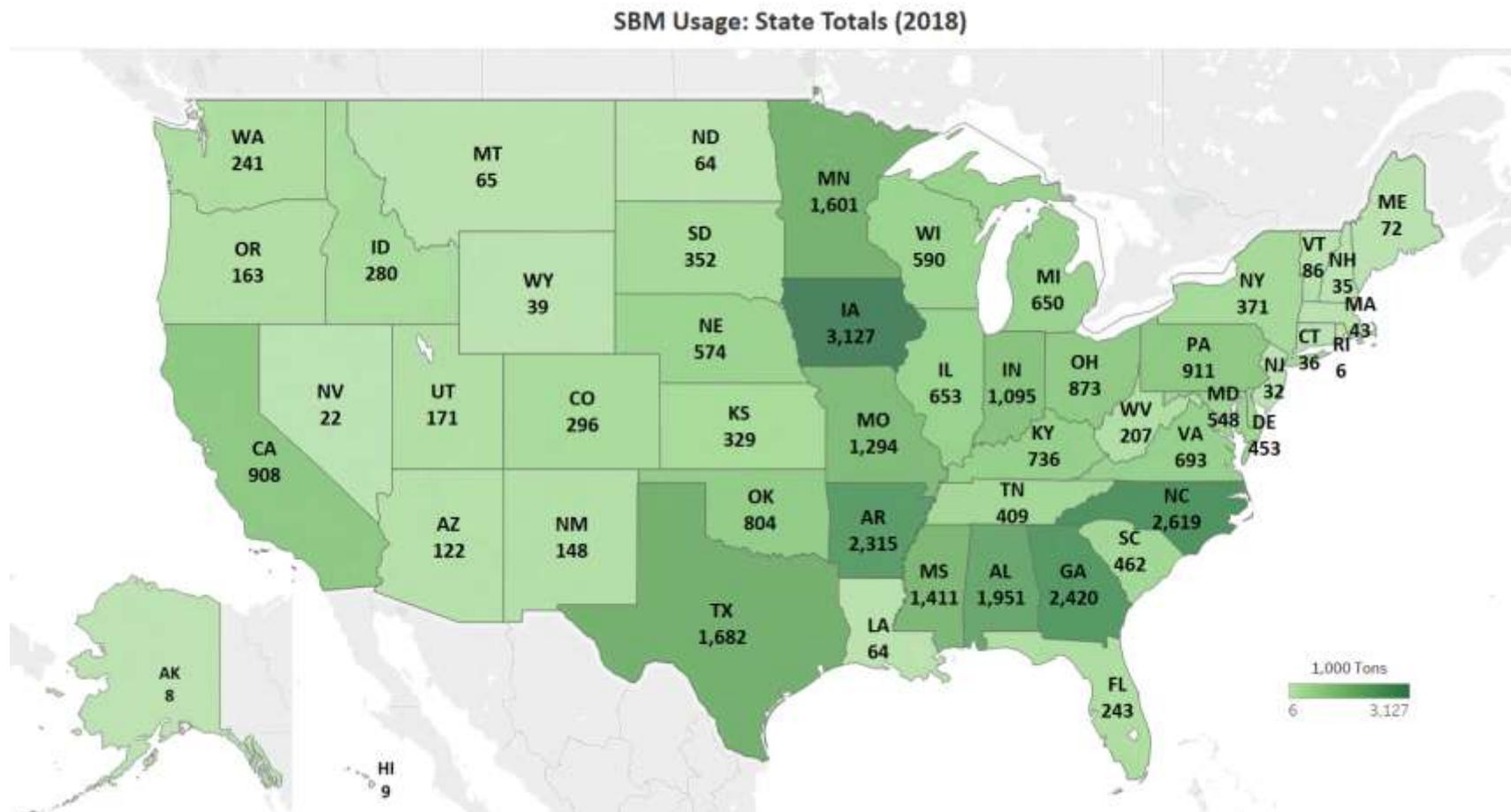


Figure 43, SBM Usage: State Totals (2018)

Wisconsin was the leading state for soy hulls usage since it is often used in dairy cow rations with nearly 381,600 tons consumed in 2018. Animal agriculture in Nebraska and Iowa also consumed large amounts of soy hulls as the second and third largest state user respectively since it is also used in hog and beef cow rations.

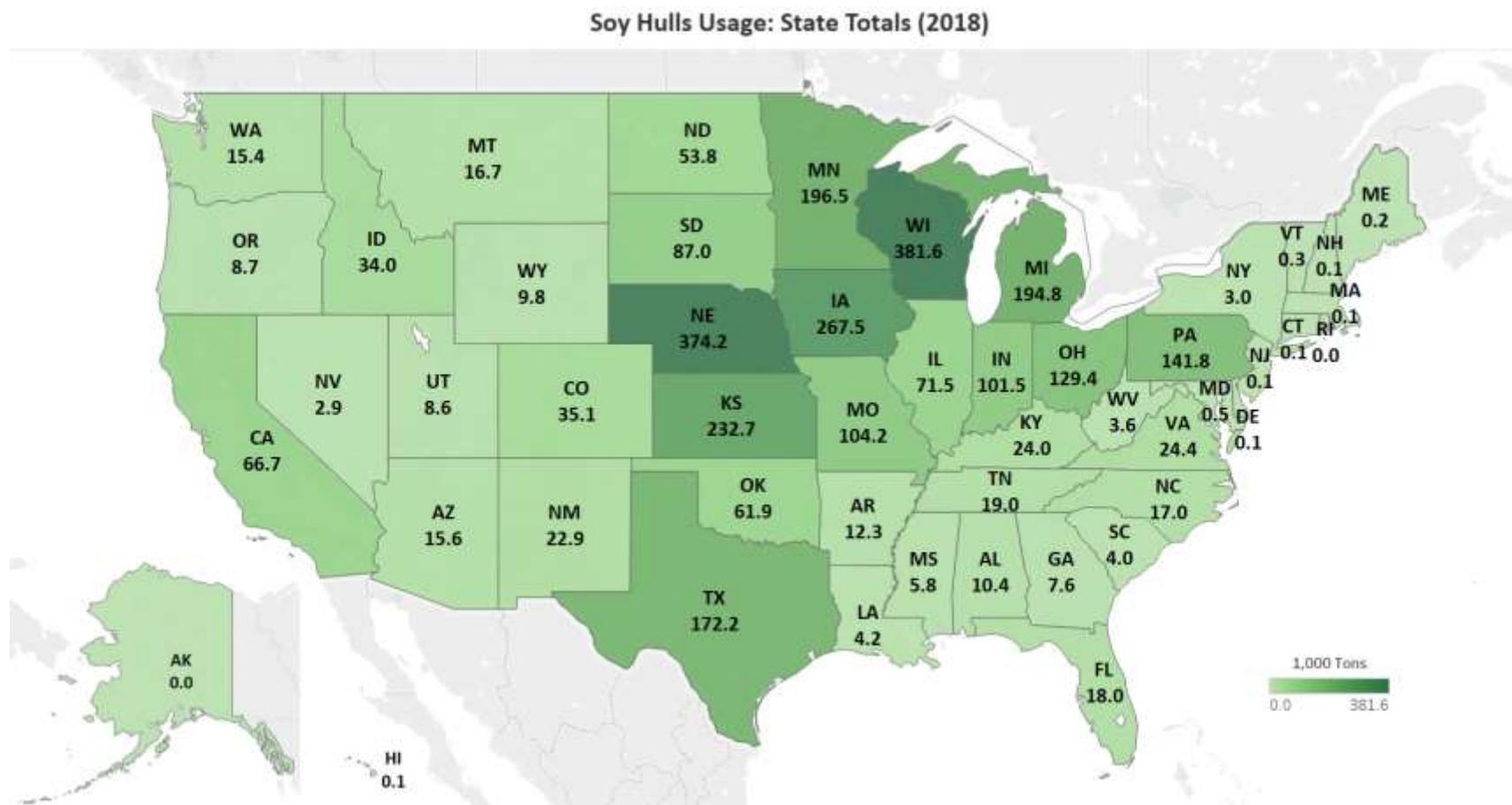


Figure 44, Soy Hulls Usage: State Totals (2018)

Georgia’s broiler chickens consumed about 2.3 million tons of soybean meal in 2018. Other states that use significant amounts of soybean meal in their broiler diets are concentrated in the southeastern states including Alabama, Arkansas, North Carolina, Mississippi, and Texas.

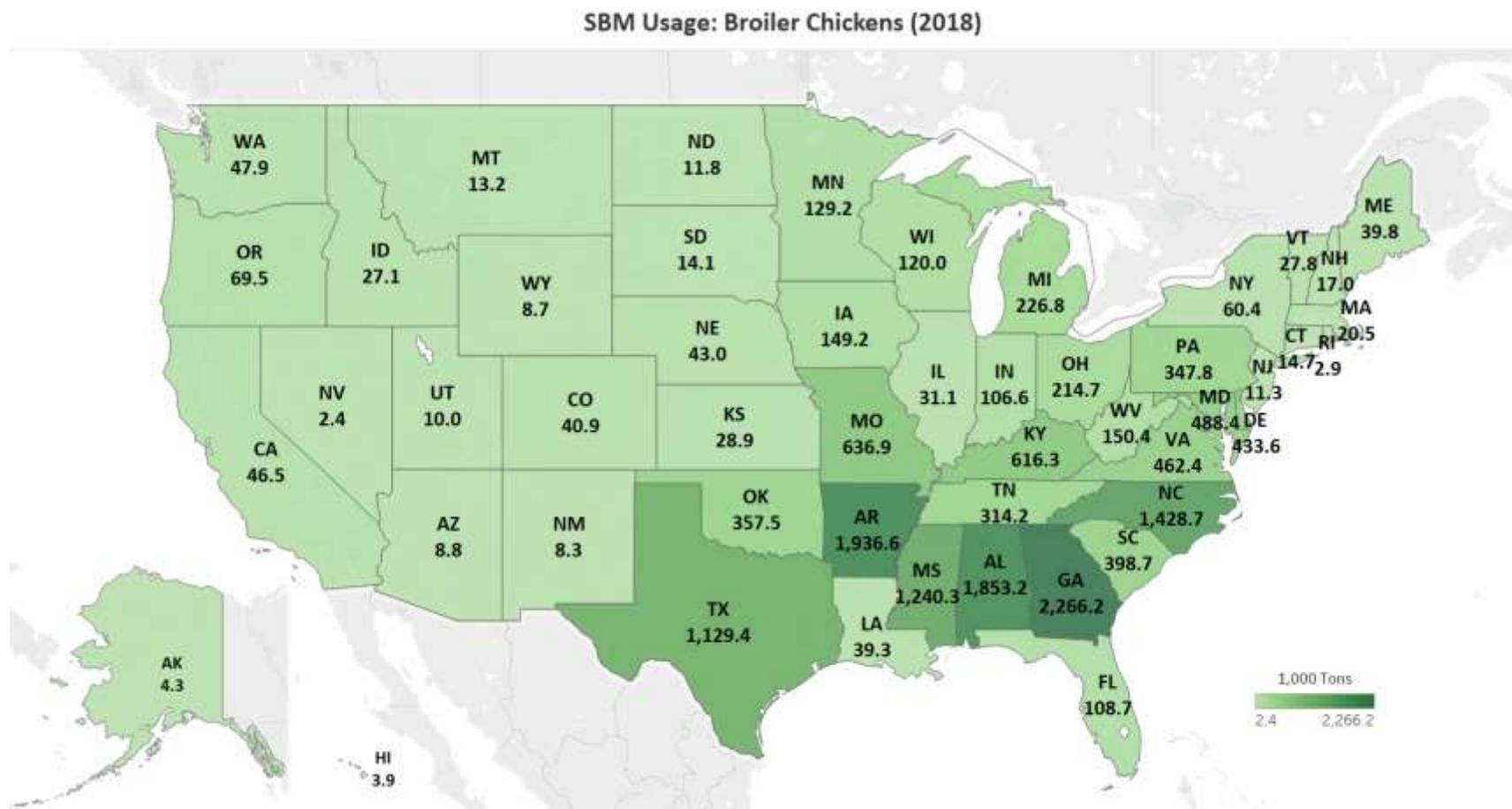


Figure 45, SBM Usage: Broiler Chickens (2018)

In 2018, Iowa’s laying hens consumed about 512,700 tons of soybean meal which has increased from about 322,800 tons in 2015 when Iowa was suffering from the Avian Influenza outbreak. Other top states for soybean meal consumption by laying hens in 2018 include Ohio, Pennsylvania, and Indiana.

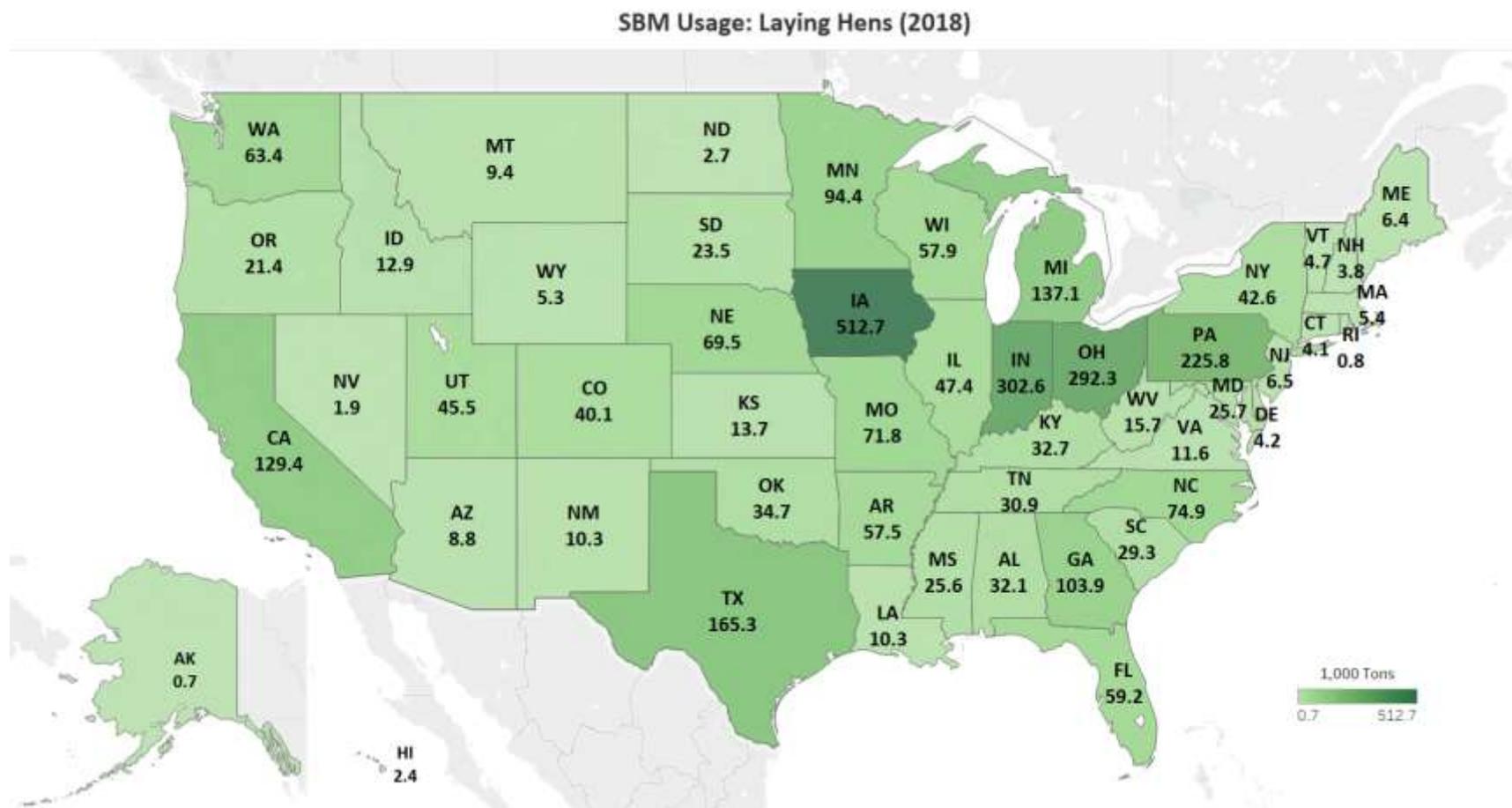


Figure 46, SBM Usage: Laying Hens (2018)

Minnesota was the leading state for turkey production and consumed about 398,700 tons of soybean meal by the state’s turkeys in 2018. North Carolina, Arkansas, Indiana and Virginia turkeys also consumed large amounts of soybean meal.

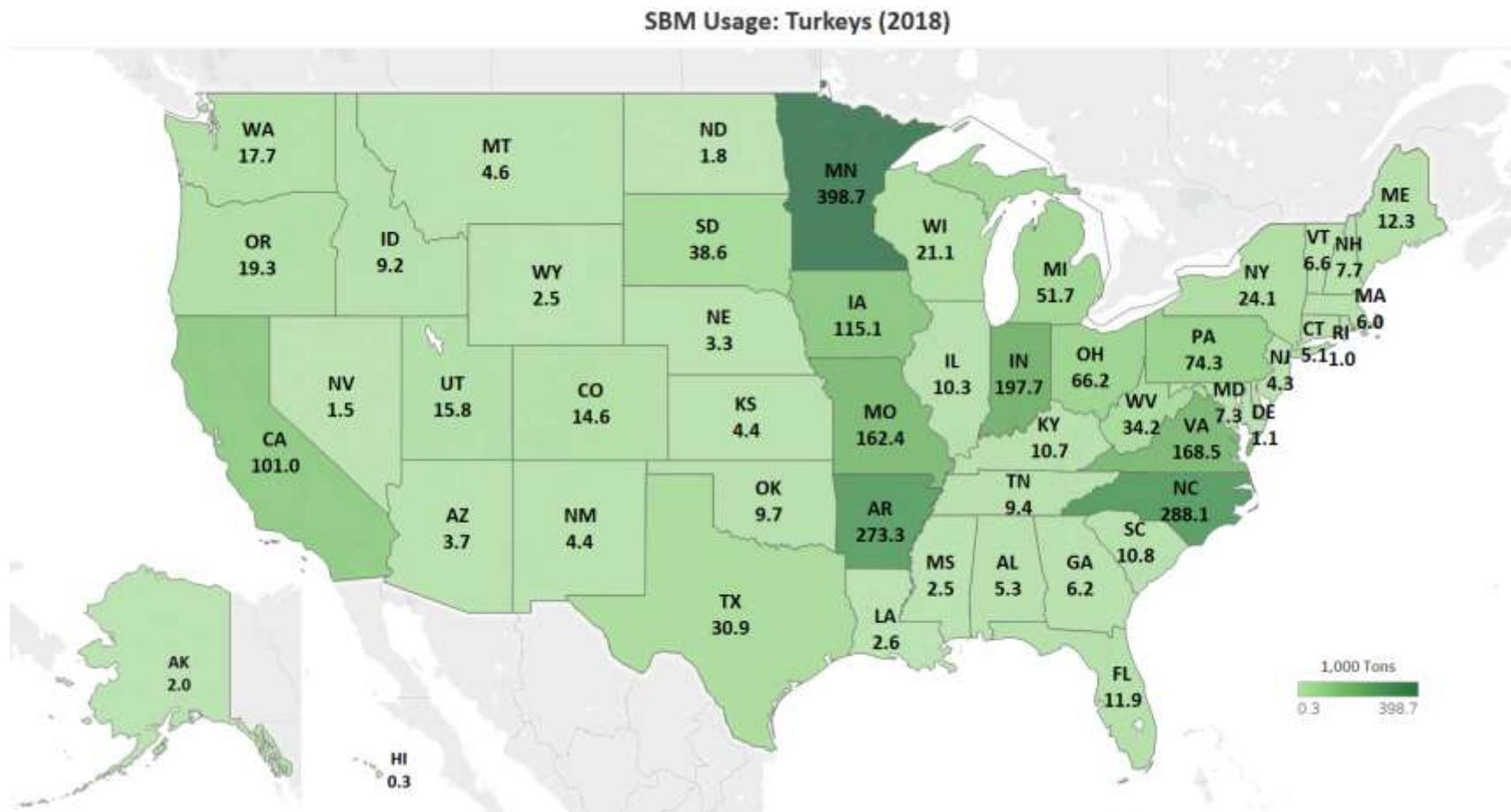


Figure 47, SBM Usage: Turkeys (2018)

Iowa leads the nation in hog production and the state’s hogs consumed over 2.2 million tons of soybean meal in 2018. Hogs in North Carolina, Minnesota and Illinois also consumed large amounts of soybean meal in 2018.

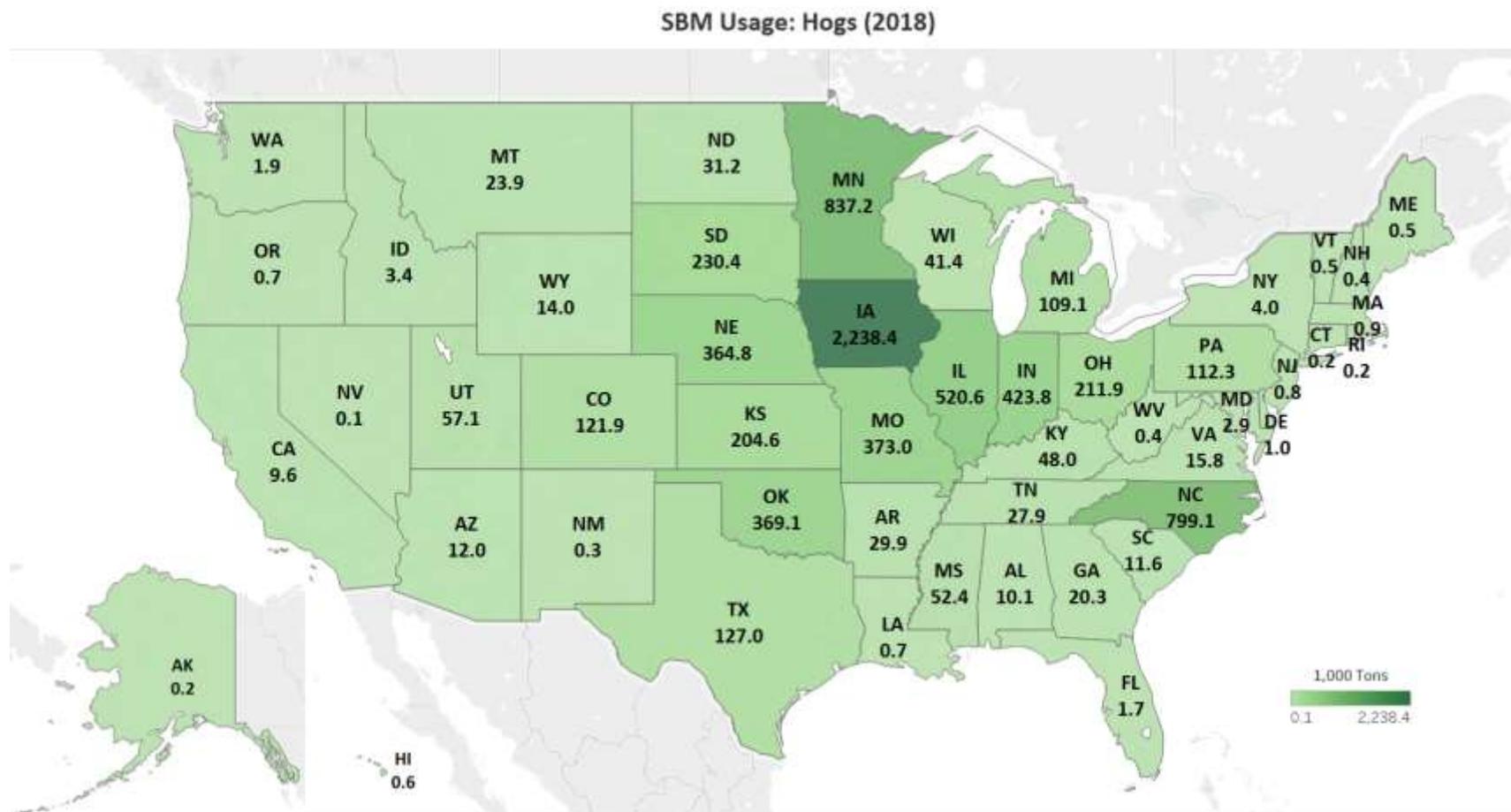


Figure 48, SBM Usage: Hogs (2018)

In 2018, hogs in Iowa and Oklahoma consumed about 13,400 and 10,000 tons of soy hulls, respectively, as the leading states in hog consumption of soy hulls.

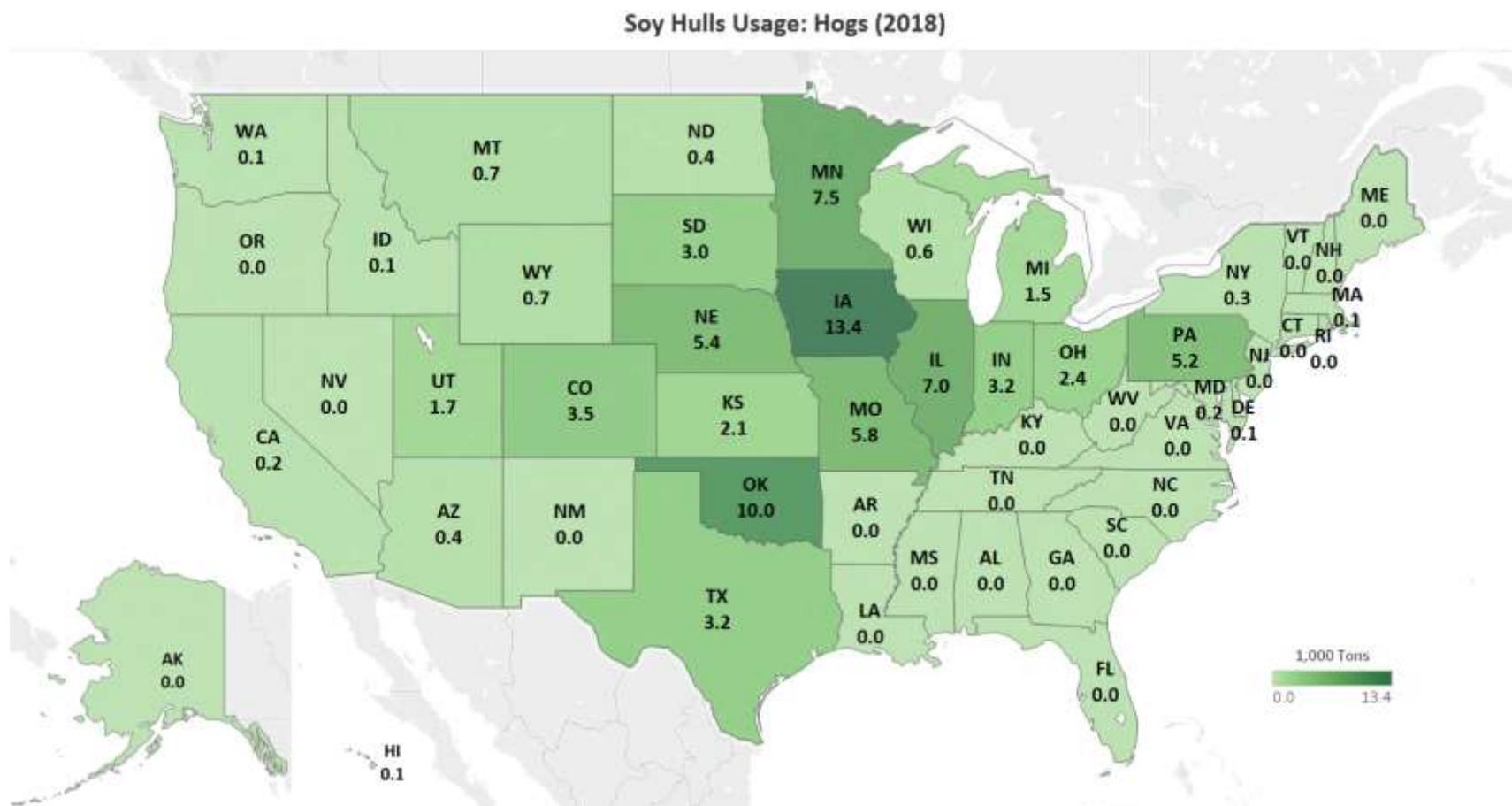


Figure 49, Soy Hulls Usage: Hogs (2018)

In 2018, California and Wisconsin's dairy cows consumed about 574,500 and 328,400 tons of soybean meal, respectively. Dairy cows in New York and Idaho each consumed over 200,000 tons of soybean meal in 2018.

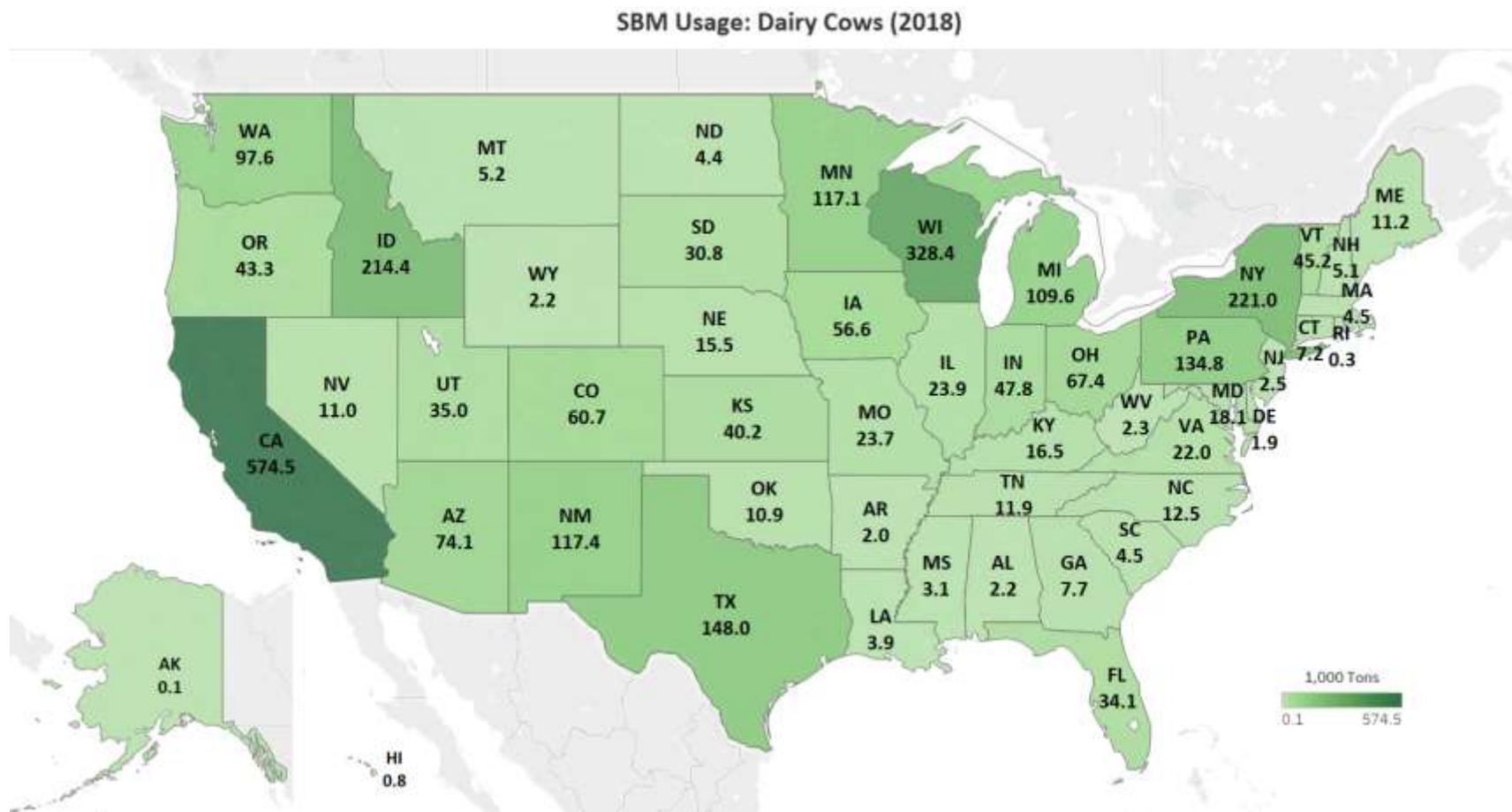


Figure 50, SBM Usage: Dairy Cows (2018)

Dairy cows in Wisconsin consumed about 322,500 tons of soy hulls in 2018. Other states that used over 100,000 tons of soy hulls for dairy cows include Michigan, Pennsylvania, Minnesota, and Ohio in 2018.

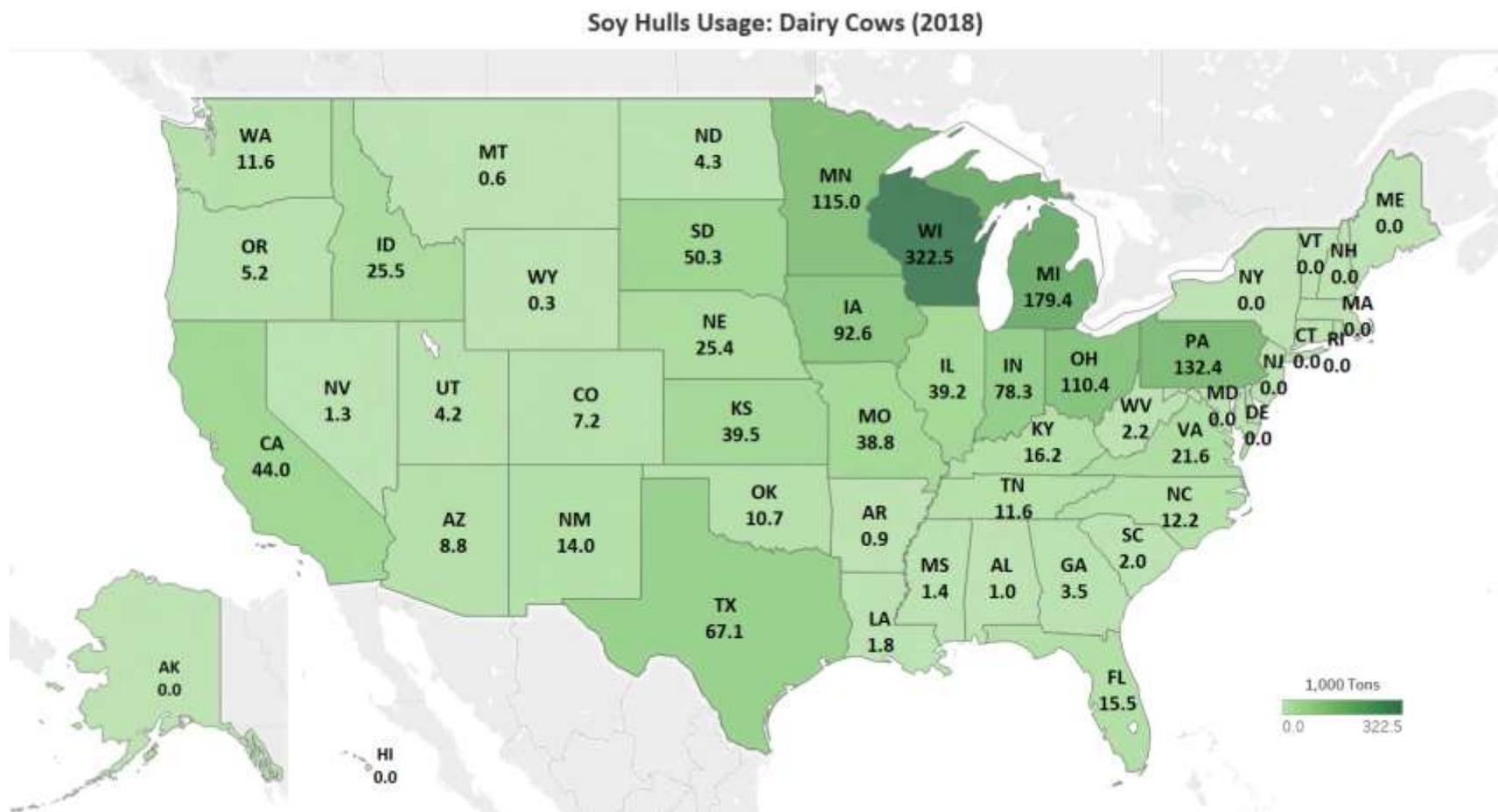


Figure 51, Soy Hulls Usage: Dairy Cows (2018)

Nebraska’s beef cows consumed about 73,200 tons of soybean meal in 2018. Beef cows in Iowa, Texas and Kansas also consumed over 25,000 tons of soybean meal each in 2018.

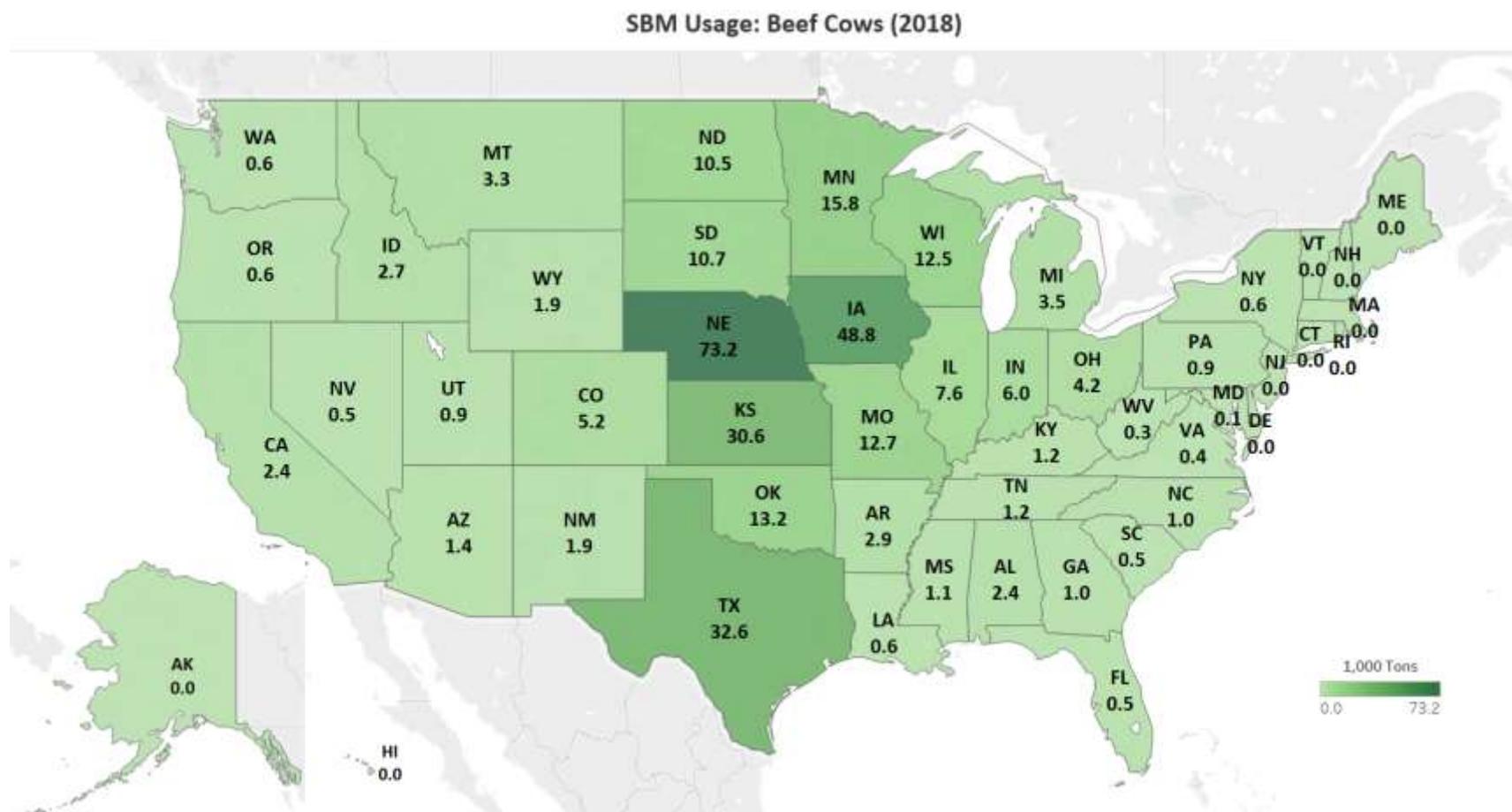


Figure 52, SBM Usage: Beef Cows (2018)

Nebraska beef cows consumed about 343,400 tons of soy hulls in 2018. Beef cows in Kansas, Texas and Iowa also consumed greater than 125,000 tons of soy hulls in 2018.

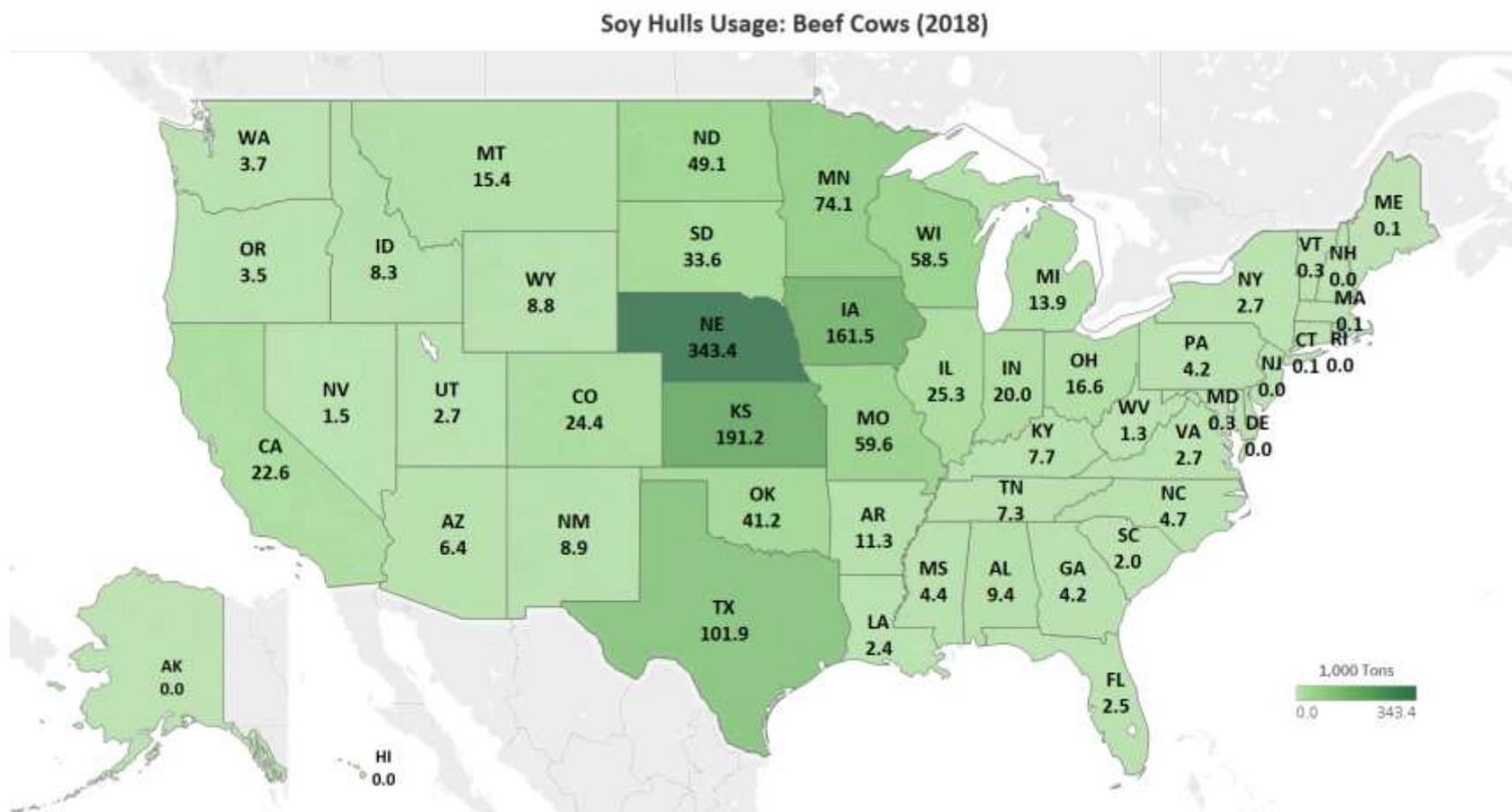


Figure 53, Soy Hulls Usage: Beef Cows (2018)

The companion animals considered in this report include dogs, cats and horses. The leading state in soybean meal usage for companion animals was California with about 40,300 tons in 2018. Texas and Florida also had significant amounts of soybean meal usage by companion animals with about 37,300 and 26,100 tons, respectively in 2018.

SBM Usage: Companion Animals (2018)

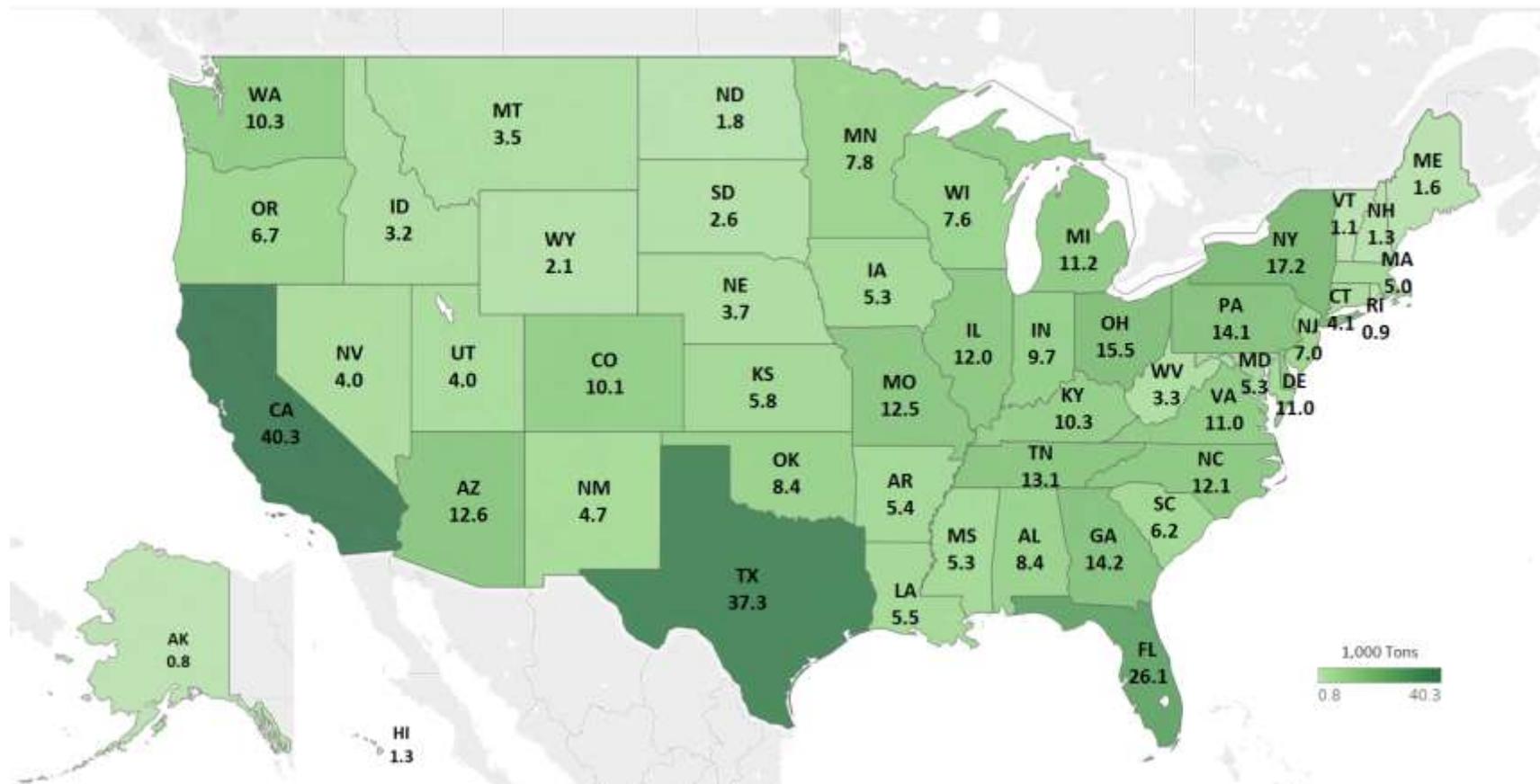


Figure 54, SBM Usage: Companion Animals (2018)

This 2018 study includes catfish, trout, tilapia, hybrid striped bass, yellow perch, shrimp, and baitfish in estimates for aquaculture consumption of soybean meal. Most soybean meal consumed in the aquaculture category is in Mississippi and Alabama, with about 80,700 and 37,600 tons, respectively in 2018.

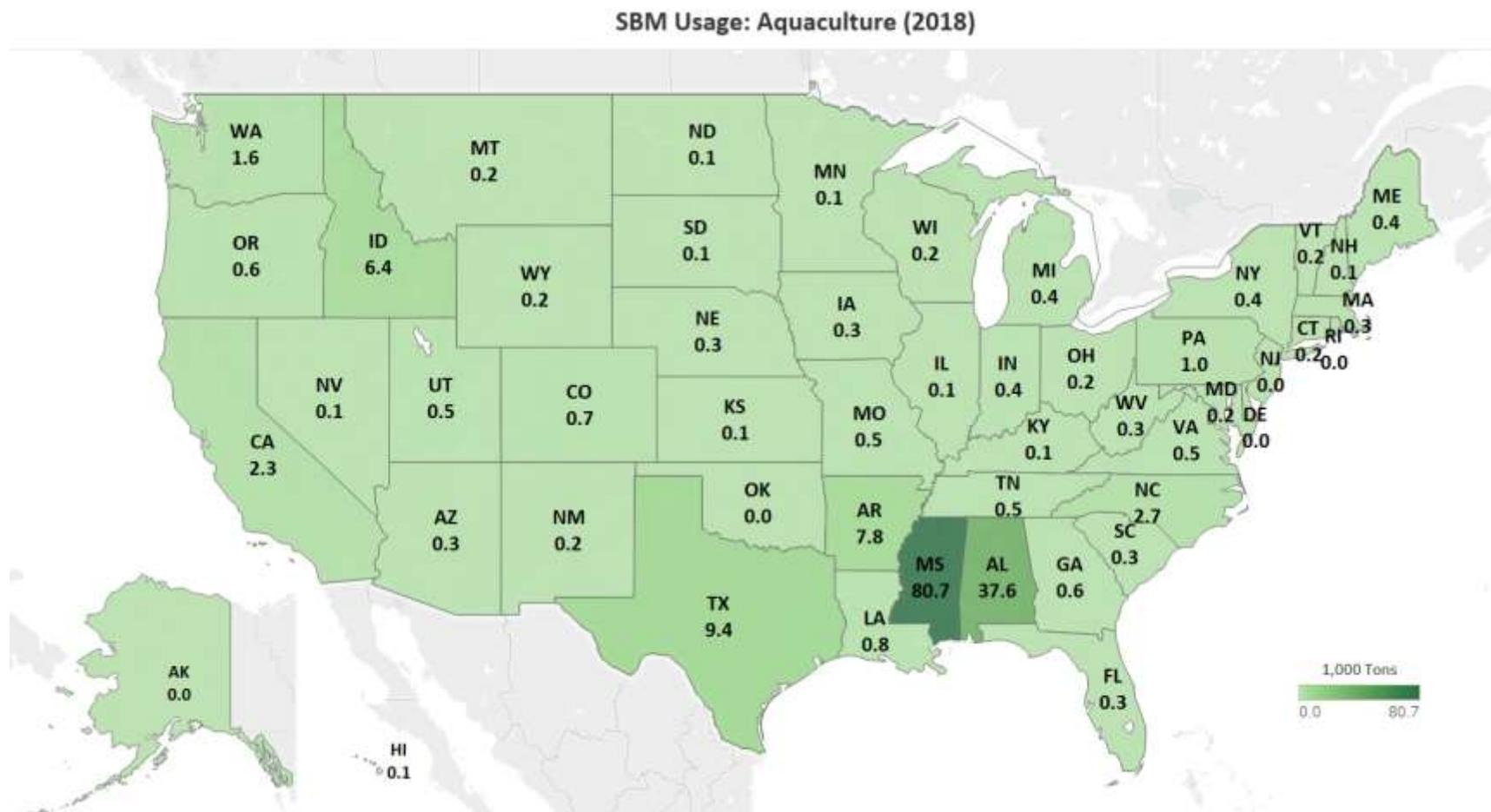


Figure 55, SBM Usage: Aquaculture (2018)

Texas was the leading state for soybean meal usage in sheep production in 2018 with about 2,100 tons. Many other states across the West also used between 1,000 and 2,000 tons of soybean meal for sheep production.

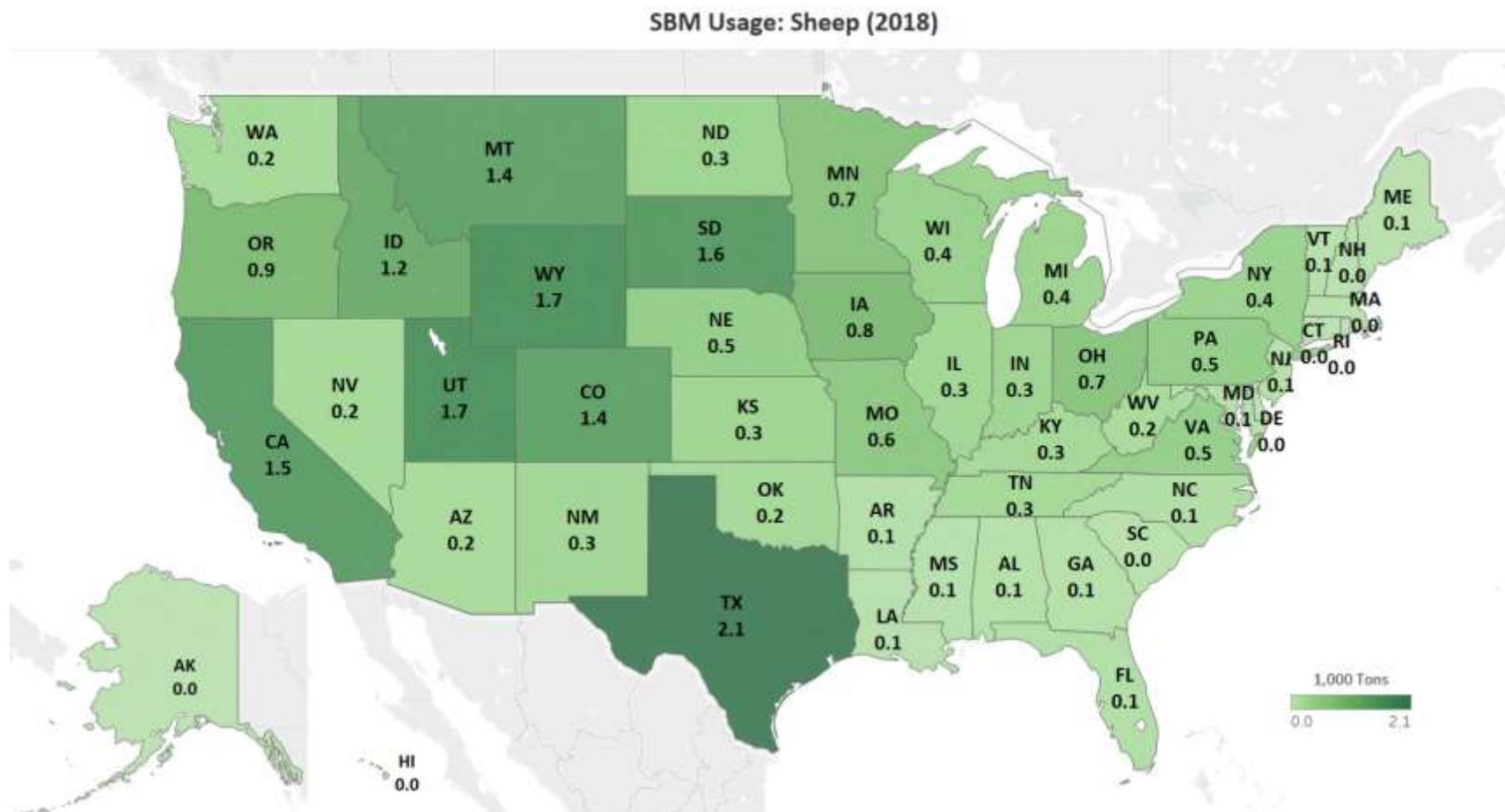


Figure 56, SBM Usage: Sheep (2018)

Texas had the most soybean meal usage in meat goats with about 67 tons in 2018. Overall, soybean meal usage for meat goats is minimal in most states across the U.S.

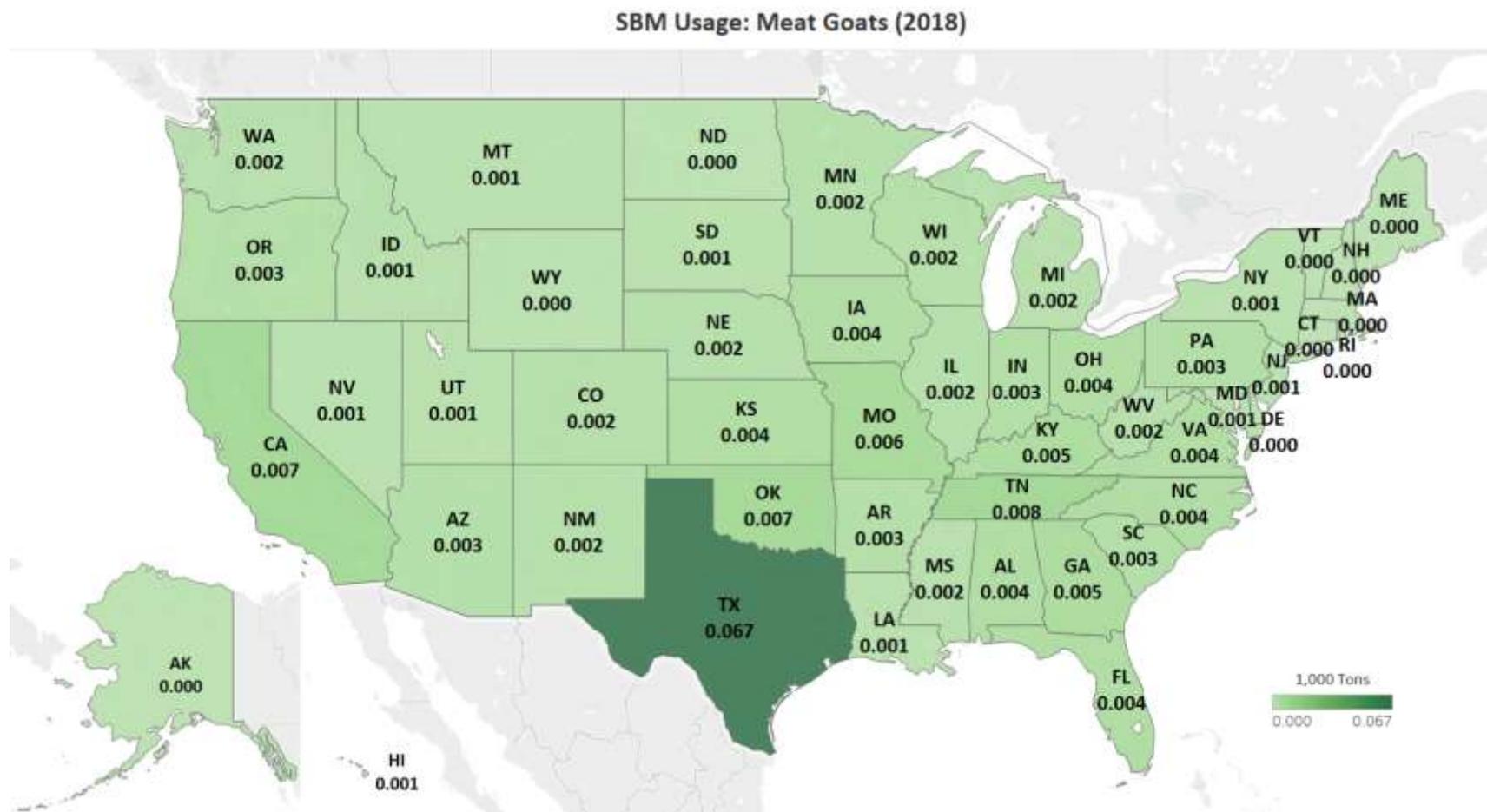


Figure 57, SBM Usage: Meat Goats (2018)

U.S. Total Animal Unit (AU) Trends

Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the U.S. Due to this reality, using a single year as a measure of the presence and strength of an industry can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to the United States.

As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In U.S., the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (57.6 million AUs), Broilers (27.1 million AUs), and Hogs (27.1 million AUs). Total animal units in U.S. during 2018 were 130.2 million AUs.

The map below represents the combined total number of animal units for all species by state. As shown, Iowa was home to more than 12.1 million animal units in 2018. Texas and Nebraska follow with about 10.0 and 9.2 million AUs, respectively.

Total AUs by State (2018)

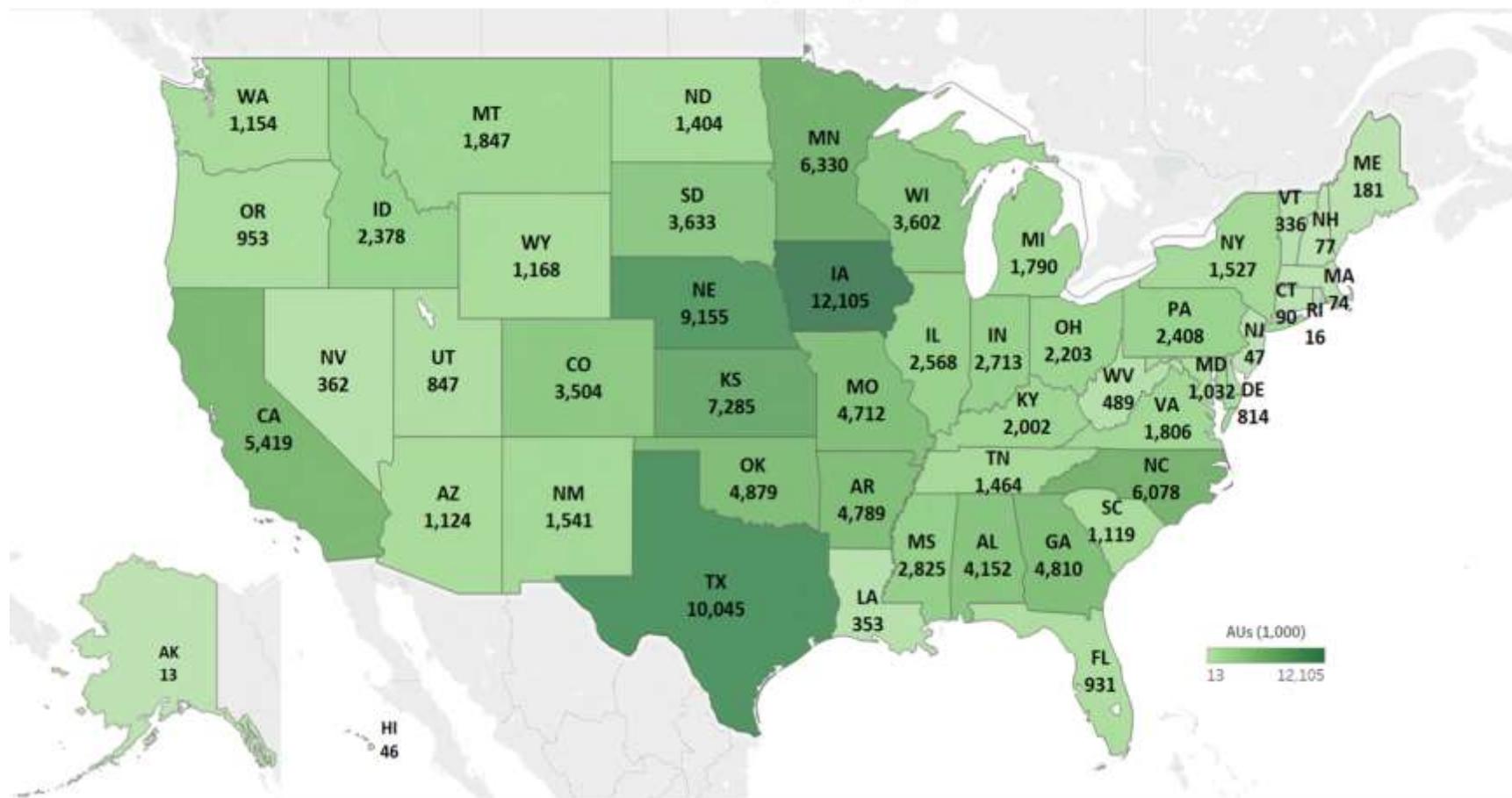


Figure 58, Total AUs by State (2018)

States across much of the southern part of the U.S. saw declines in total animal units from 2008 to 2018, while many Midwestern states saw increases in animal units. Cattle and hog production declining in many southern states and increases in Midwestern states contributed to changes in animal units. Iowa, the leading state in total animal units in 2018, increased by 25% from 2008 to 2018.

Change from 2008 to 2018 in Total AUs

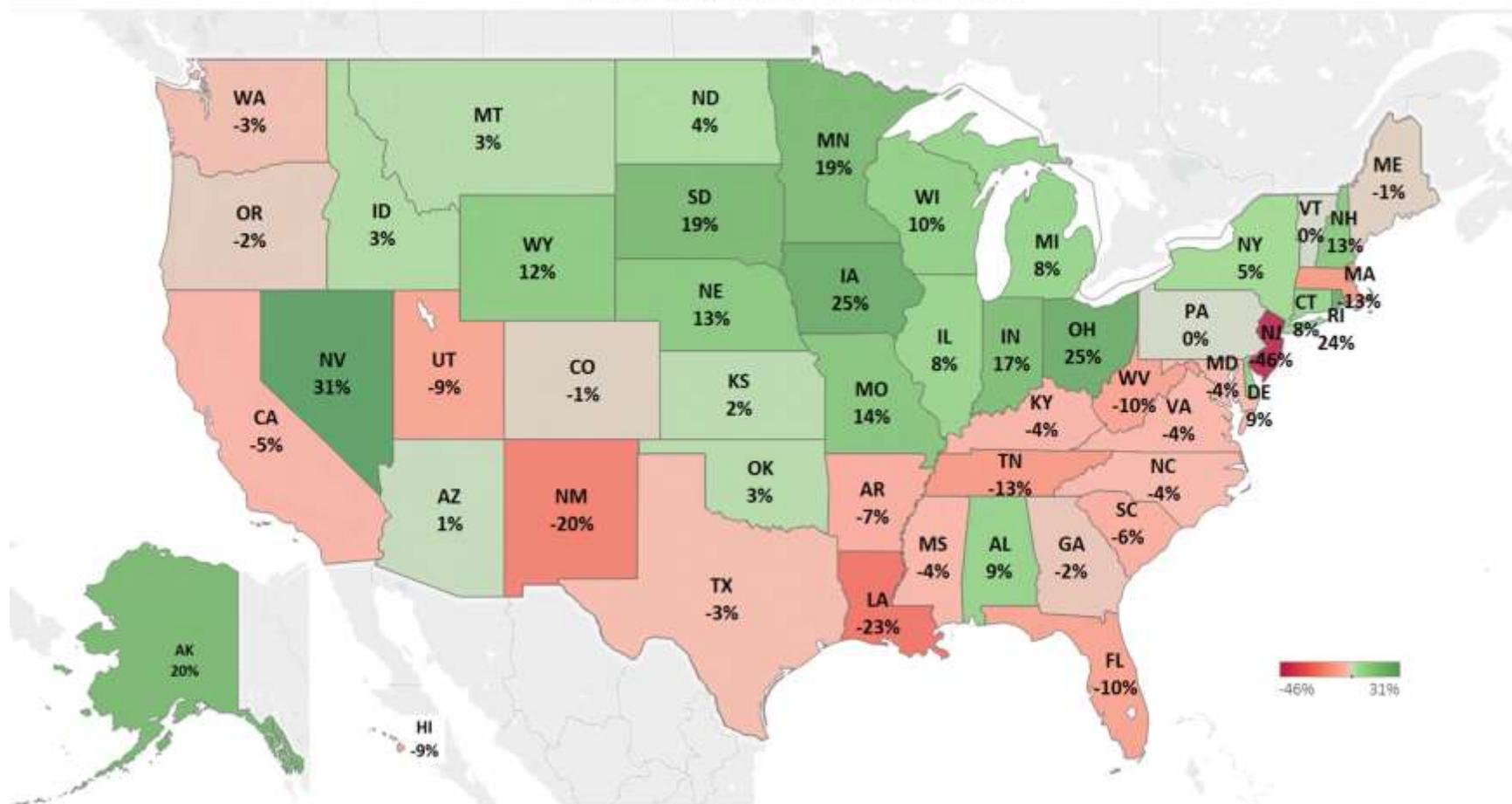


Figure 59, Change from 2008 to 2018 in Total AUs

U.S. broiler chickens are heavily concentrated in the southeastern states of Georgia, Alabama, Arkansas, North Carolina and Mississippi. About 15% of the nation’s broiler chickens were located in Georgia, while Alabama and Arkansas each house an additional 12% of the broiler chickens in the U.S.

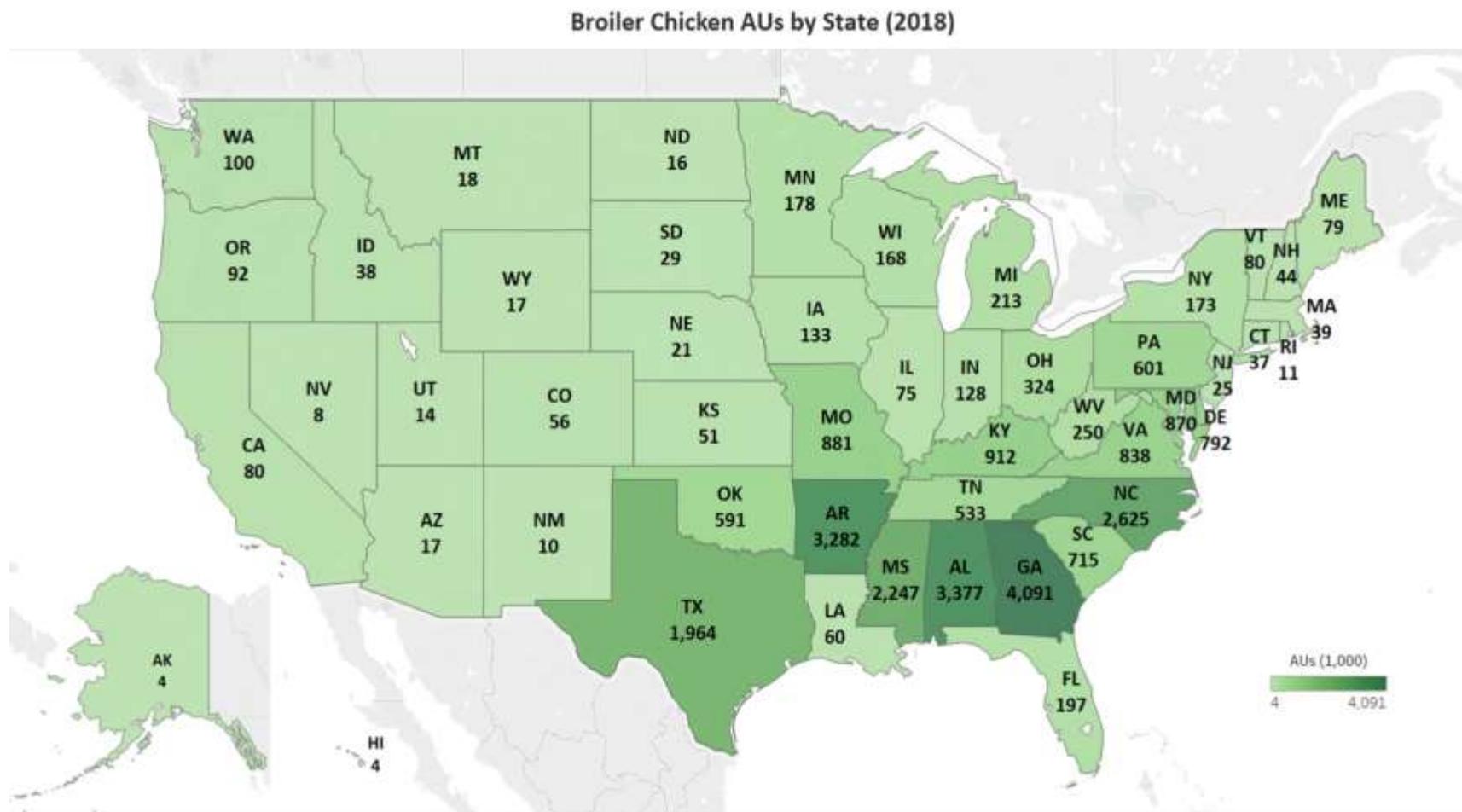


Figure 60, Broiler Chicken AUs by State (2018)

This map shows that many states across the West and Midwest saw a large percent changes in broiler chicken animal units from 2008 to 2018, but it is important to remember that these states do not have many broilers. States that have high broiler numbers like Alabama and North Carolina each saw increases of 8% and 12%, respectively, in animal units during the last decade. Alabama and North Carolina accounted for a large increase in total broiler AUs. However, Arkansas and Mississippi saw 4% and 9% reductions in broiler chickens, respectively, while Georgia remained constant.

Change from 2008 to 2018 in Broiler Chicken AUs

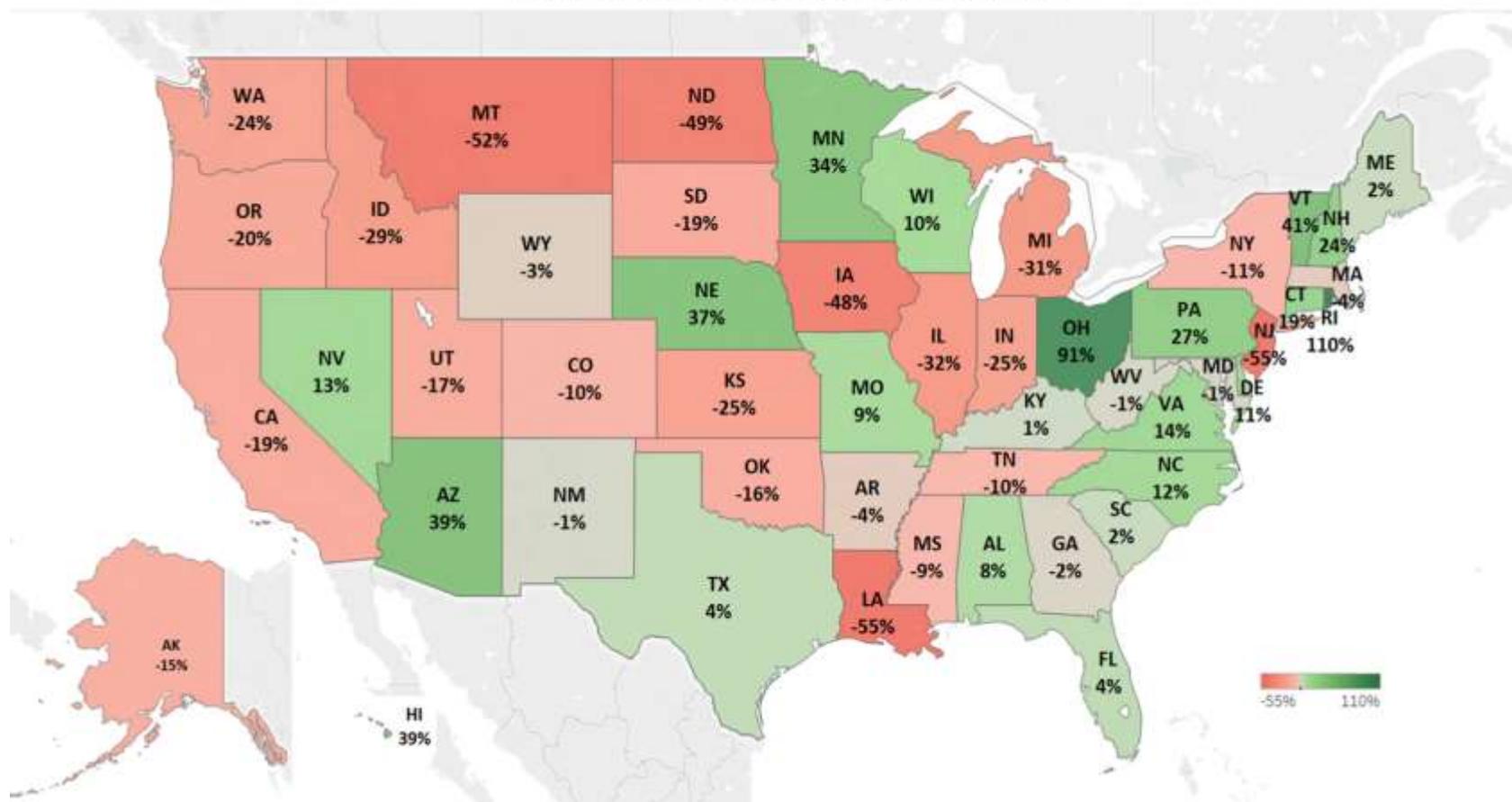


Figure 61, Change from 2007-2017 in Broiler Chicken AUs

Laying hen animal units in Iowa have increased to 227,000 AUs in 2018, up from only 152,000 AUs in 2015, which shows recovery in the industry from the losses due to the avian influenza outbreak. Iowa accounts for about 14% of all laying hen AUs in the U.S. Other top states for laying hens include Indiana, Ohio, and Pennsylvania.

Laying Hen AUs by State (2018)

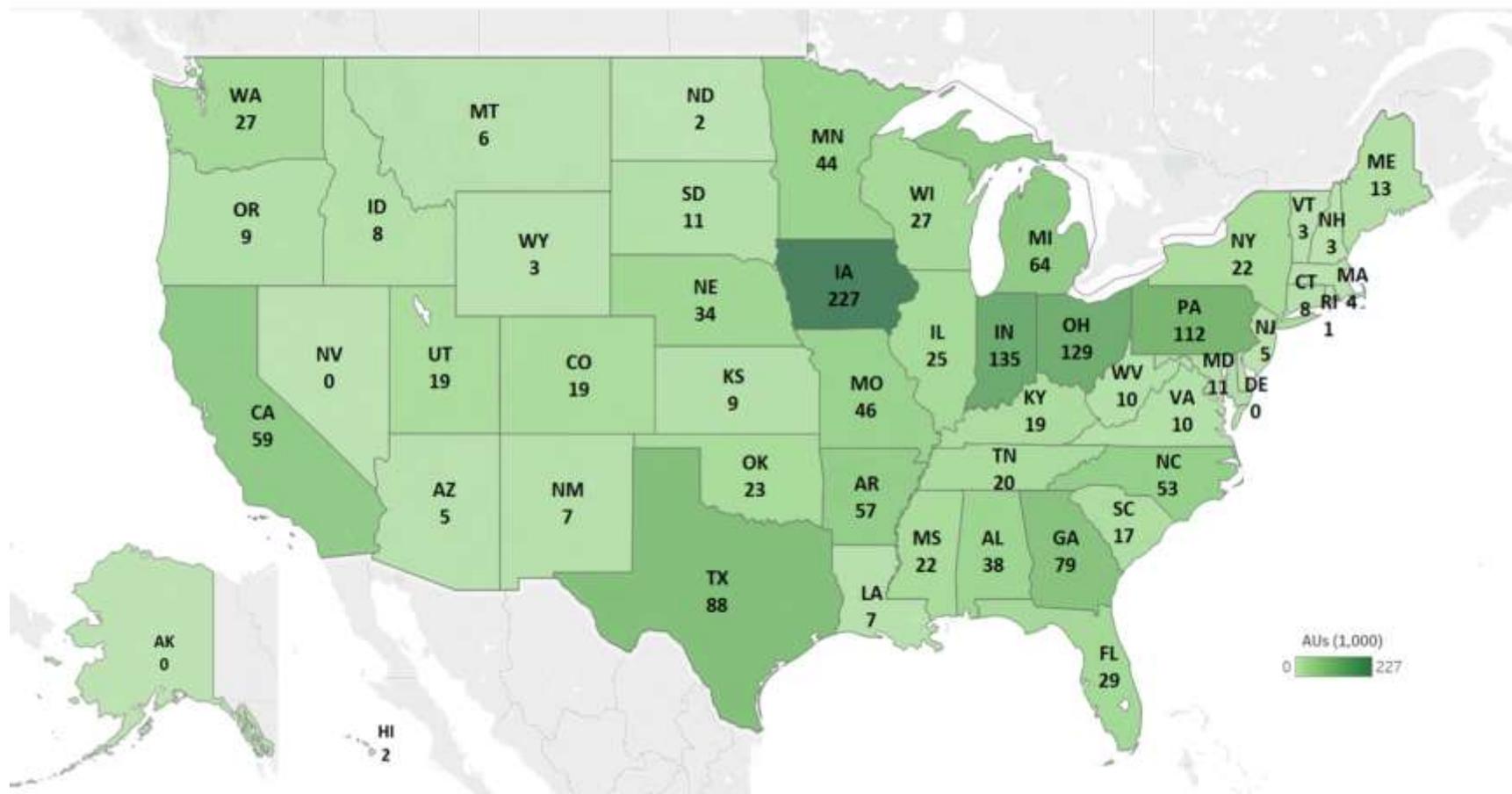


Figure 62, Laying Hen AUs by State (2018)

Iowa has recovered from the avian influence losses in 2015 and had a 7% increase in laying hen AUs over the last decade. States such as Alaska, Idaho, and Louisiana saw large percentage increases, but in real terms of animal units those numbers are small.

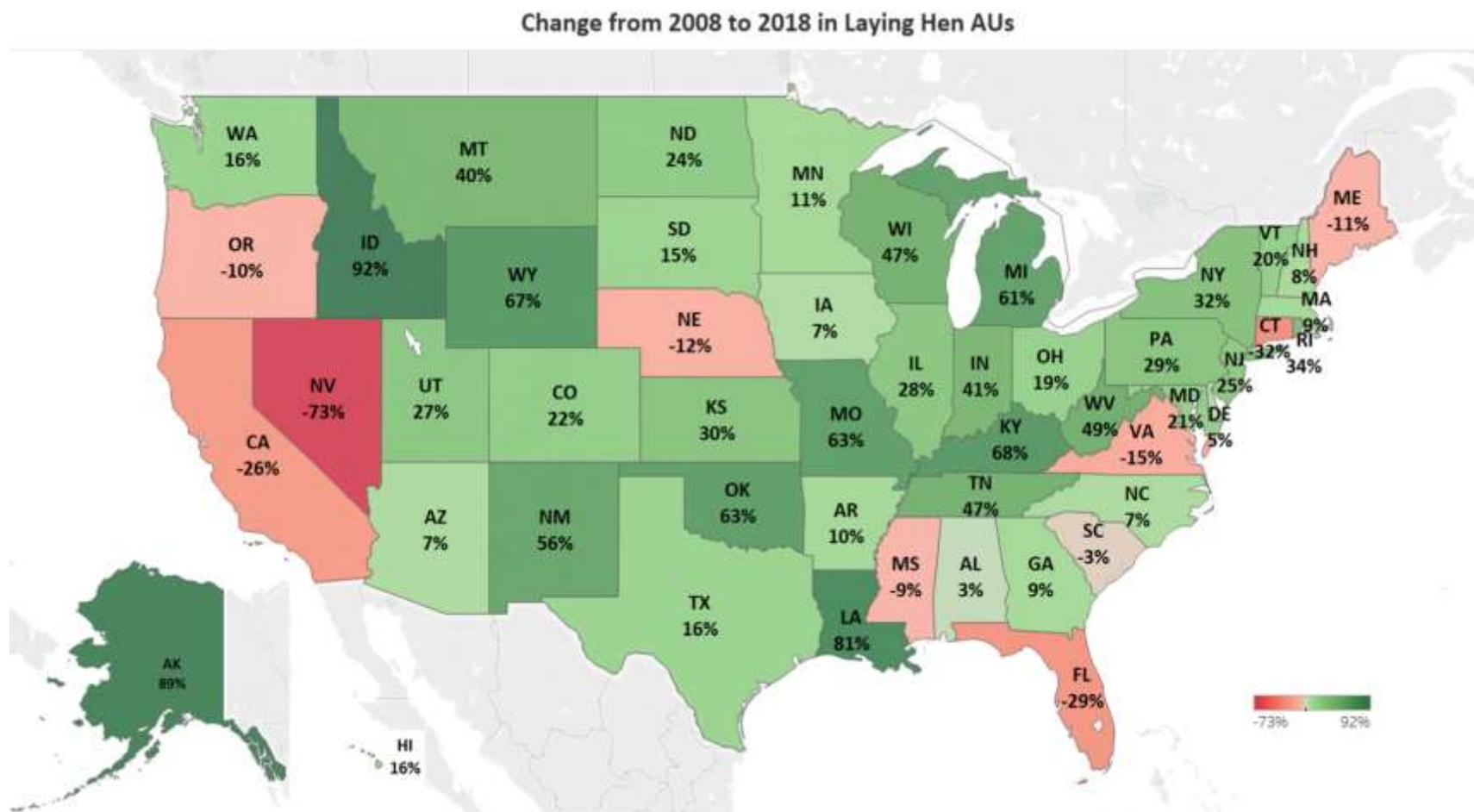


Figure 63, Change from 2008-2018 in Laying Hen AUs

In 2018, Minnesota has the highest turkey animal units at 587,000, which was about 16% of the total U.S. turkey animal units. Other top states include North Carolina (12%), Arkansas (12%), Indiana (8%), Missouri (7%), and Virginia (6%).

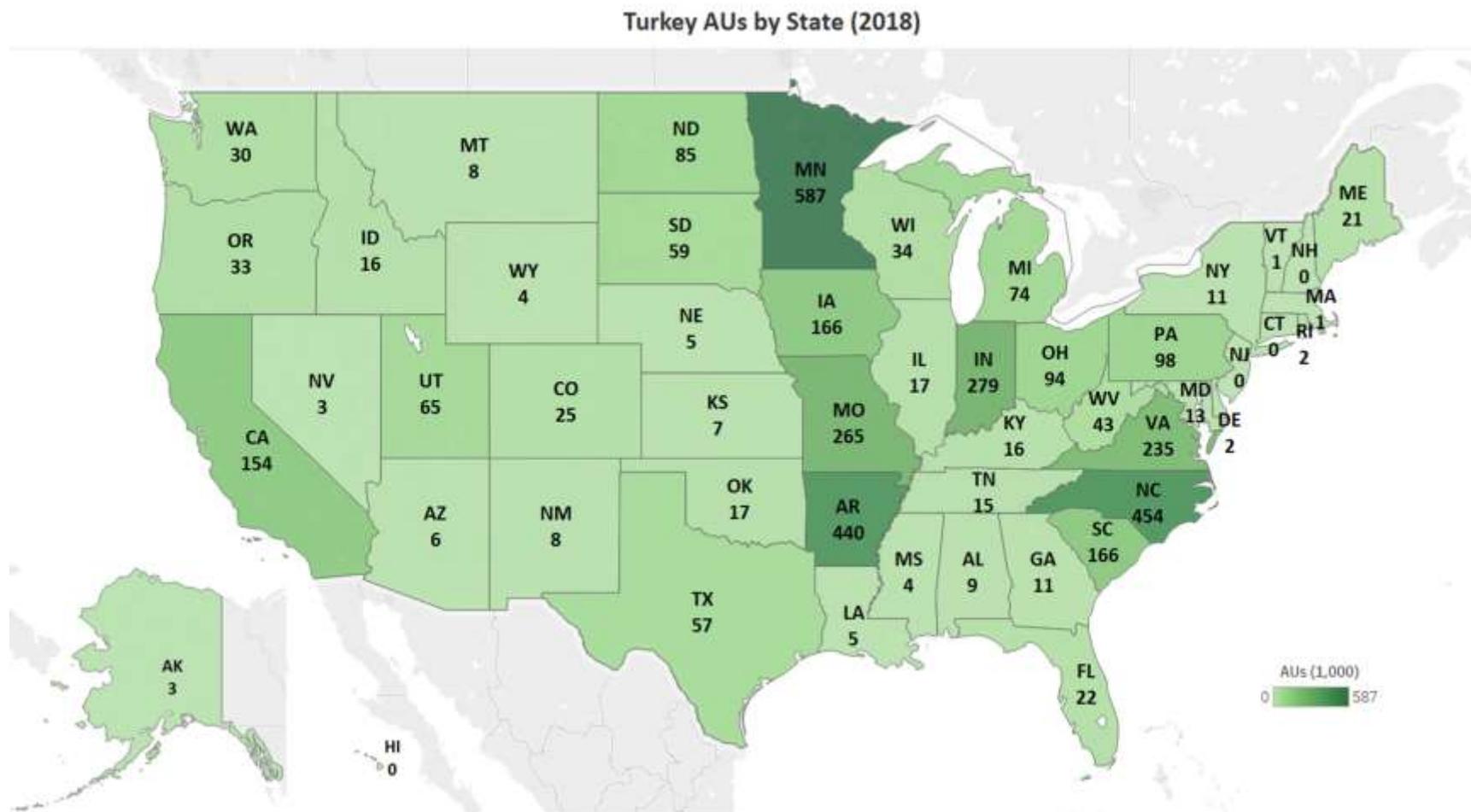


Figure 64, Turkey AUs by State (2018)

Indiana, which is the fourth largest state in turkey animal units, saw a 27% increase from 2008 to 2018, while the largest state in terms of turkey animal units, Minnesota, showed a decline of about 19% over the same time period. Alaska, Georgia, and Louisiana saw large percentage increases in turkey animal units, but those states only account for a small portion of total U.S. turkey AUs.

Change from 2008 to 2018 in Turkey AUs

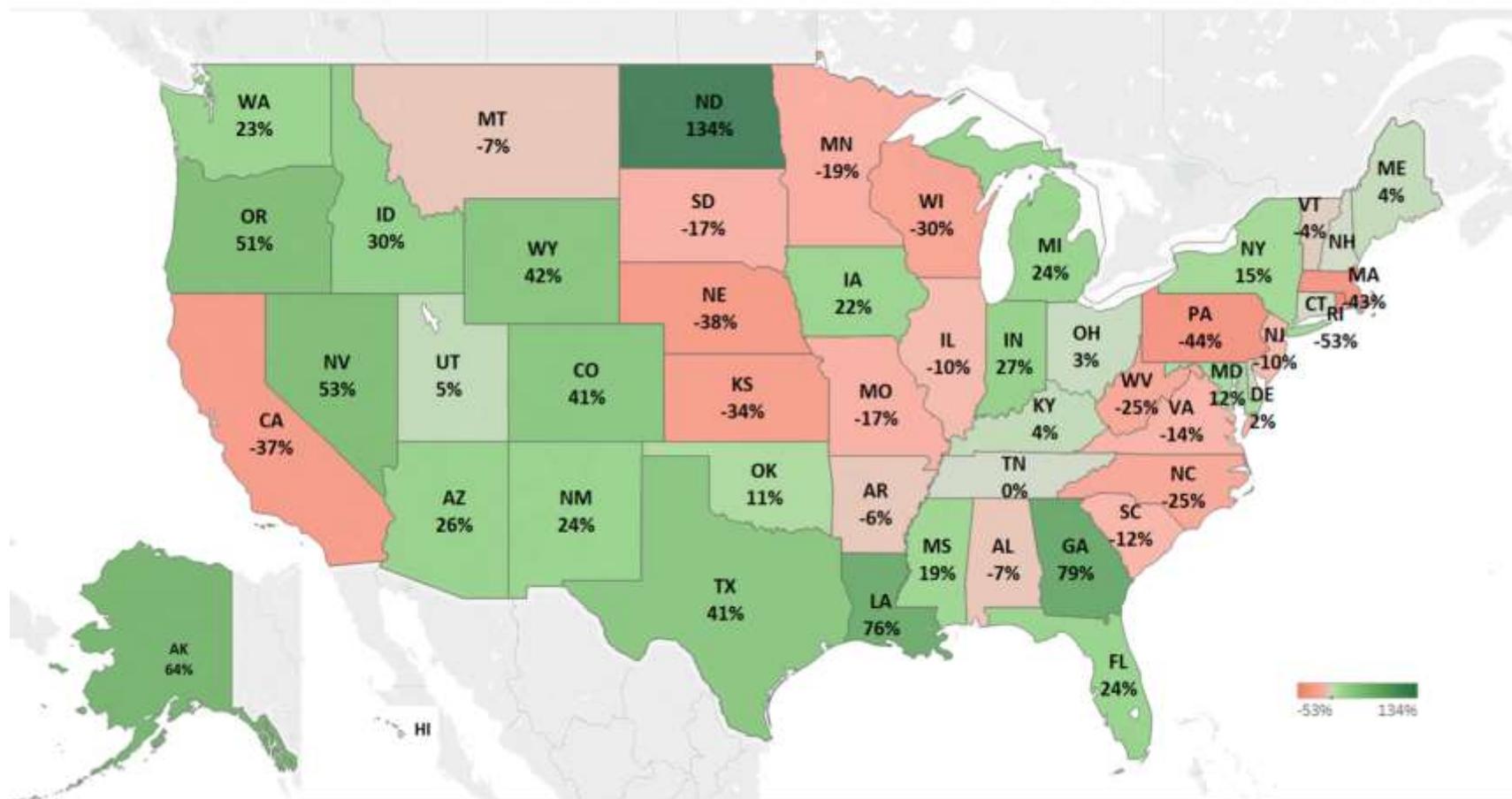


Figure 65, Change from 2008-2018 in Turkey AUs

Iowa, Minnesota and North Carolina were the states that housed the most hog animal units in 2018. Iowa accounts for 31% of the nation’s hog animal units while Minnesota and North Carolina house 12% and 10% of total U.S. hog AUs, respectively.

Hog AUs by State (2018)

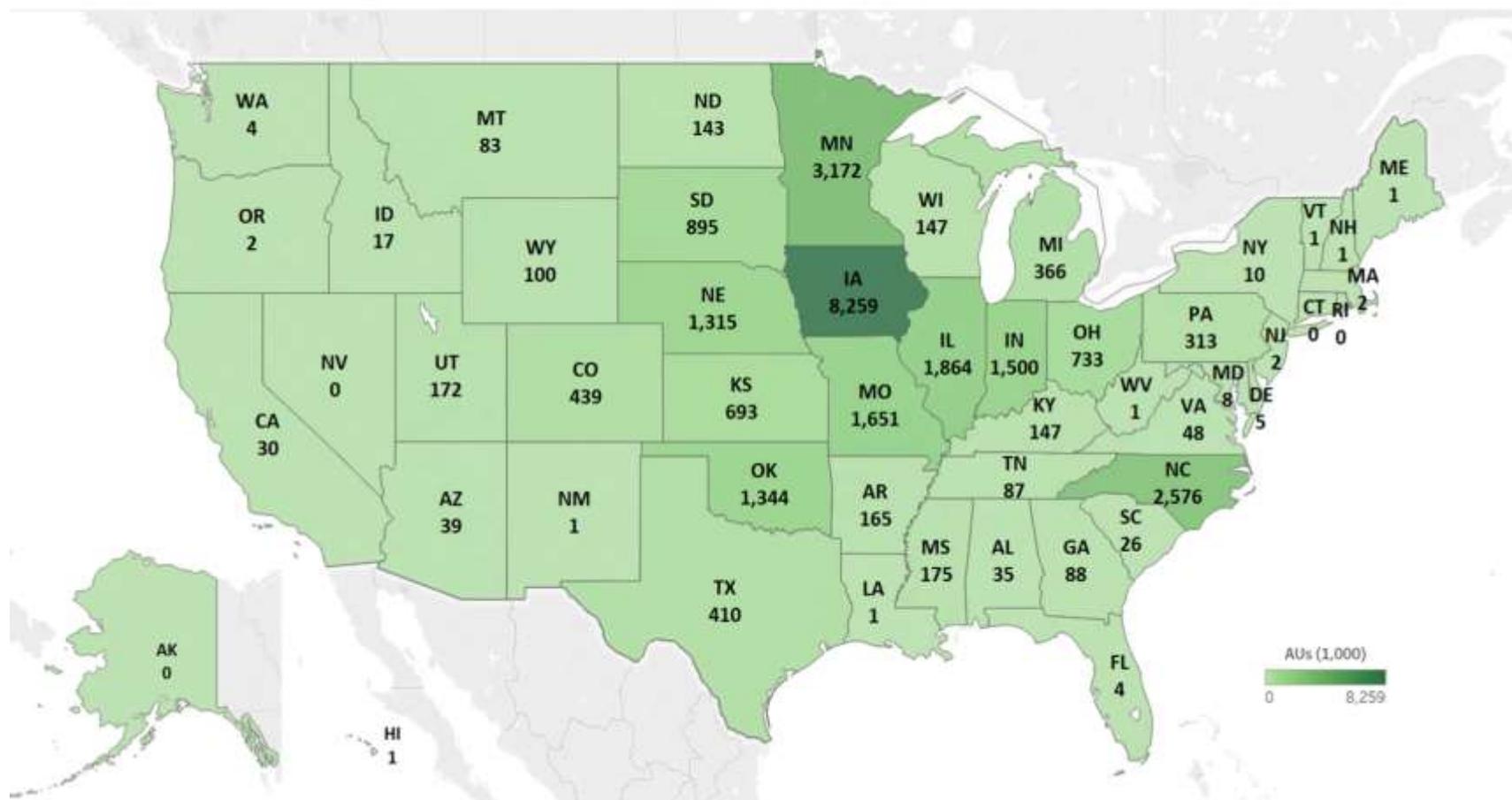


Figure 66, Hog AUs by State (2018)

Iowa, the leading state in hog production, saw a 42% increase from 2008 to 2018 in hog animal units. Illinois, Minnesota and Missouri, some of the leading states for hog animal units, saw increases of 26%, 21% and 21%, respectively. However, North Carolina, the third largest state in terms of hog AUs, declined 12% over the last decade.

Change from 2008 to 2018 in Hog AUs

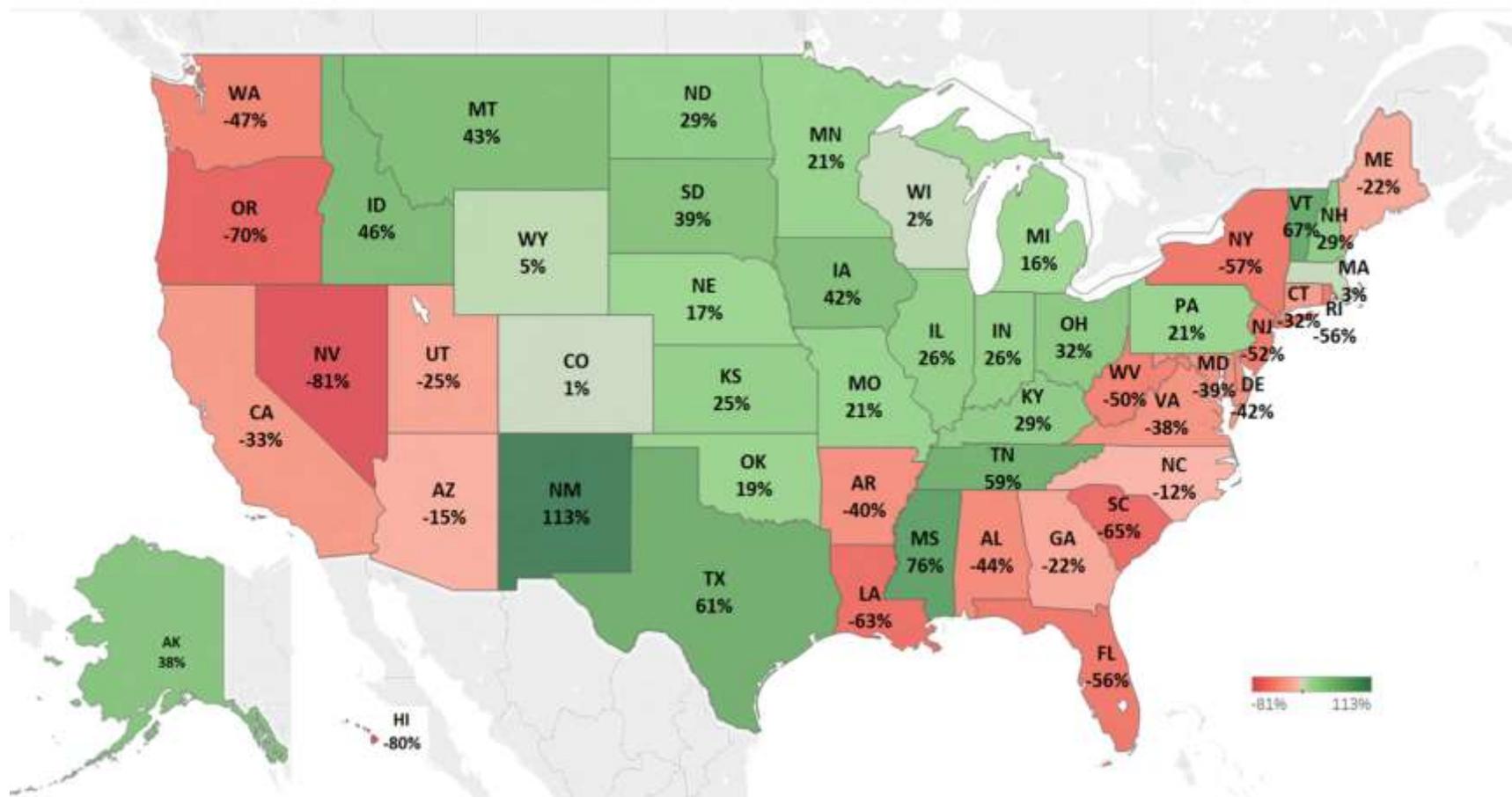


Figure 67, Change from 2008-2018 in Hog AUs

California and Wisconsin are the leading states for dairy cows with nearly 2.4 and nearly 1.8 million animal units, respectively in 2018.

Dairy Cow AUs by State (2018)

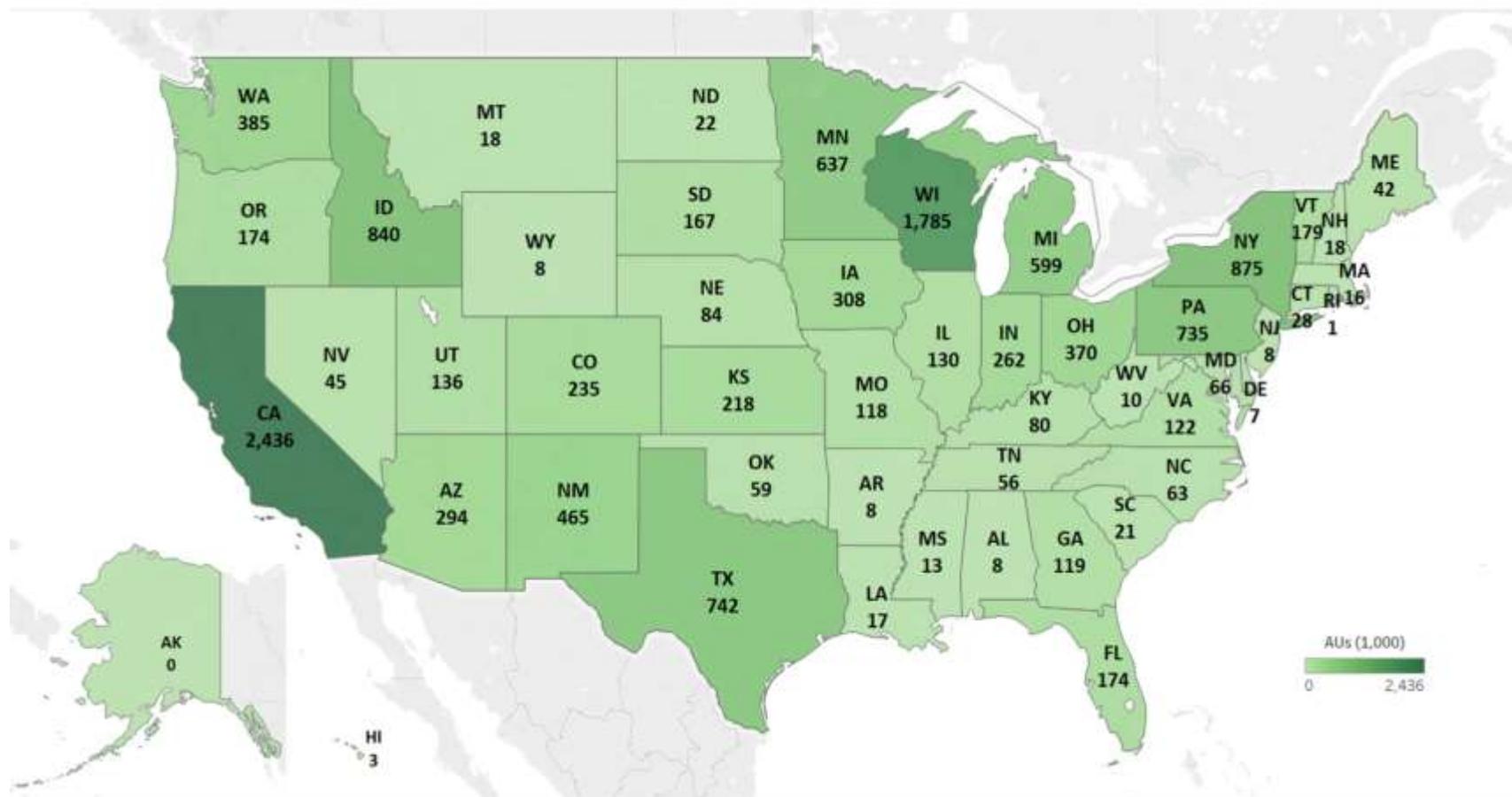


Figure 68, Dairy Cow AUs by State (2018)

Wisconsin, which is known for their large dairy cow population saw a 2% increase from 2008 to 2018, however California saw a 5% decline. During the last decade Michigan and Idaho also increased their dairy cow animal units by 24% and 13%, respectively, and are now some of the top states for dairy cows.

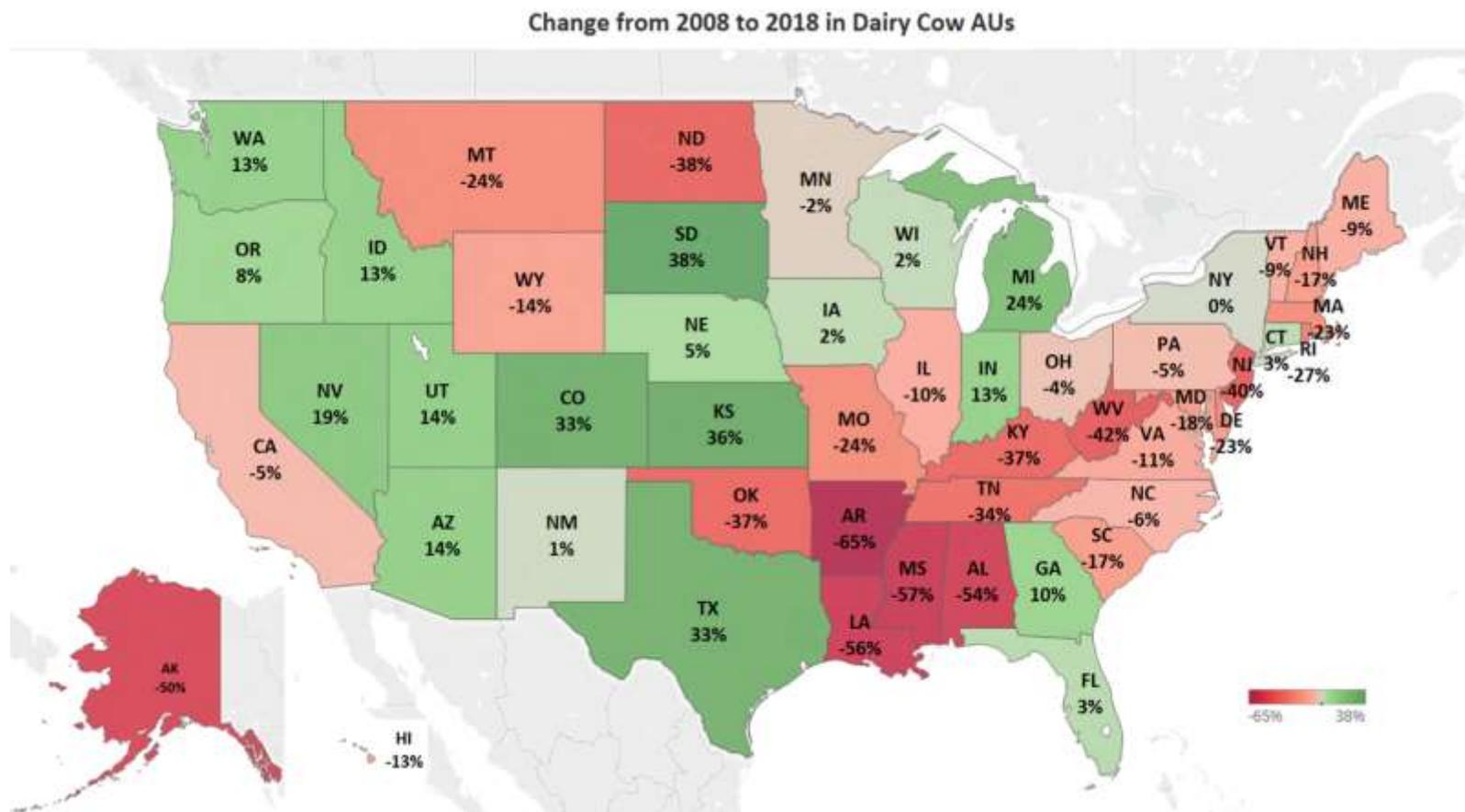


Figure 69, Change from 2008-2018 in Dairy Cow AUs

Nebraska, Texas, and Kansas are the top three states for beef cow animal units, with nearly 7.7, 6.8, and 6.3 million animal units, respectively in 2018. Iowa, Oklahoma, Colorado, California, and South Dakota also exceed 2 million animal units of beef cows.

Beef Cow AUs by State (2018)

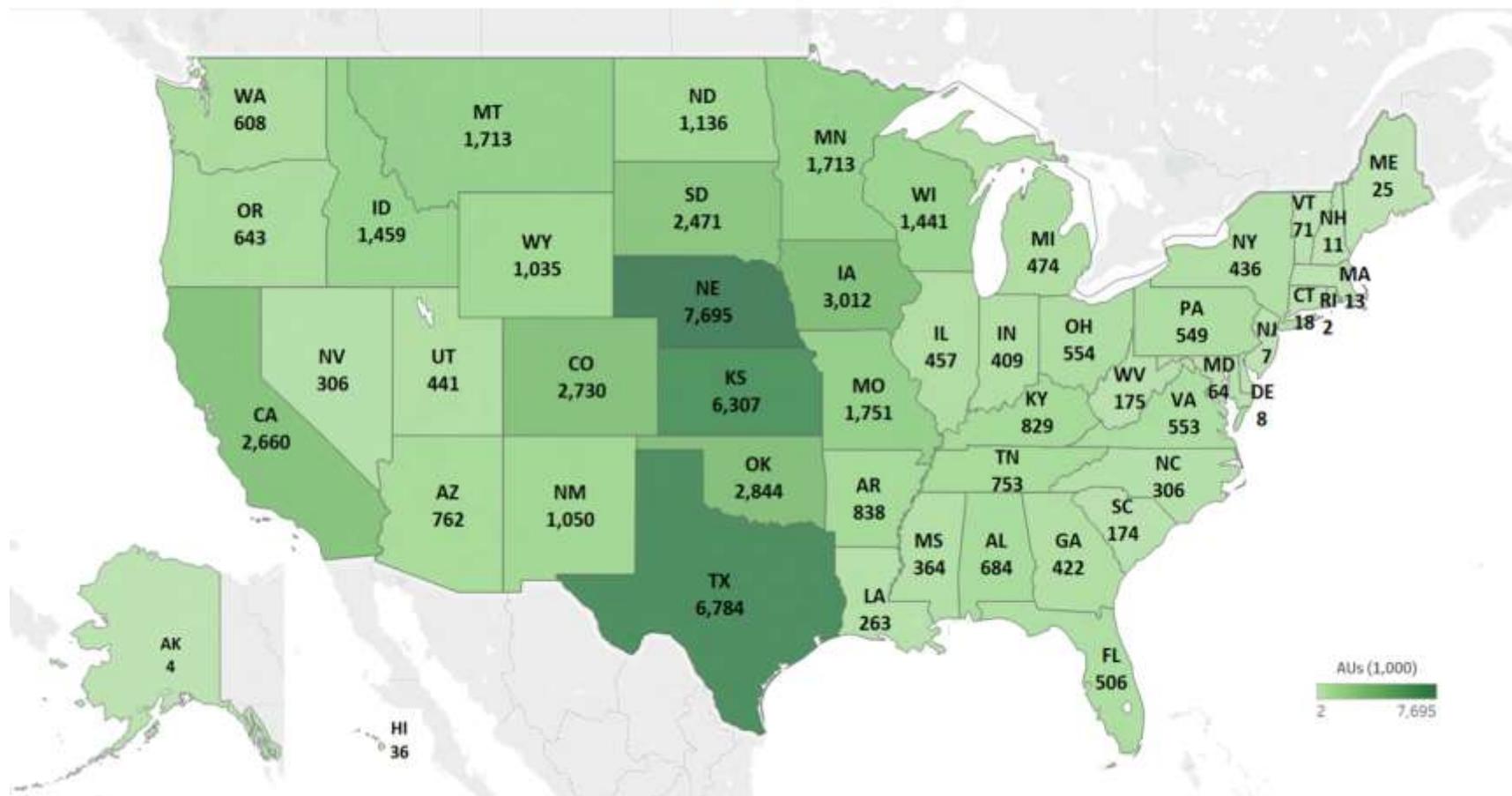


Figure 70, Beef Cow AUs by State (2018)

Nebraska saw a 13% increase in beef cow animal units from 2008 to 2018, while Texas saw a 11% decline. Extremely dry periods during 2011-2013 had a significant impact on movement of cattle from states such as Texas and Kansas further north to Nebraska, Iowa, Minnesota, and other states.

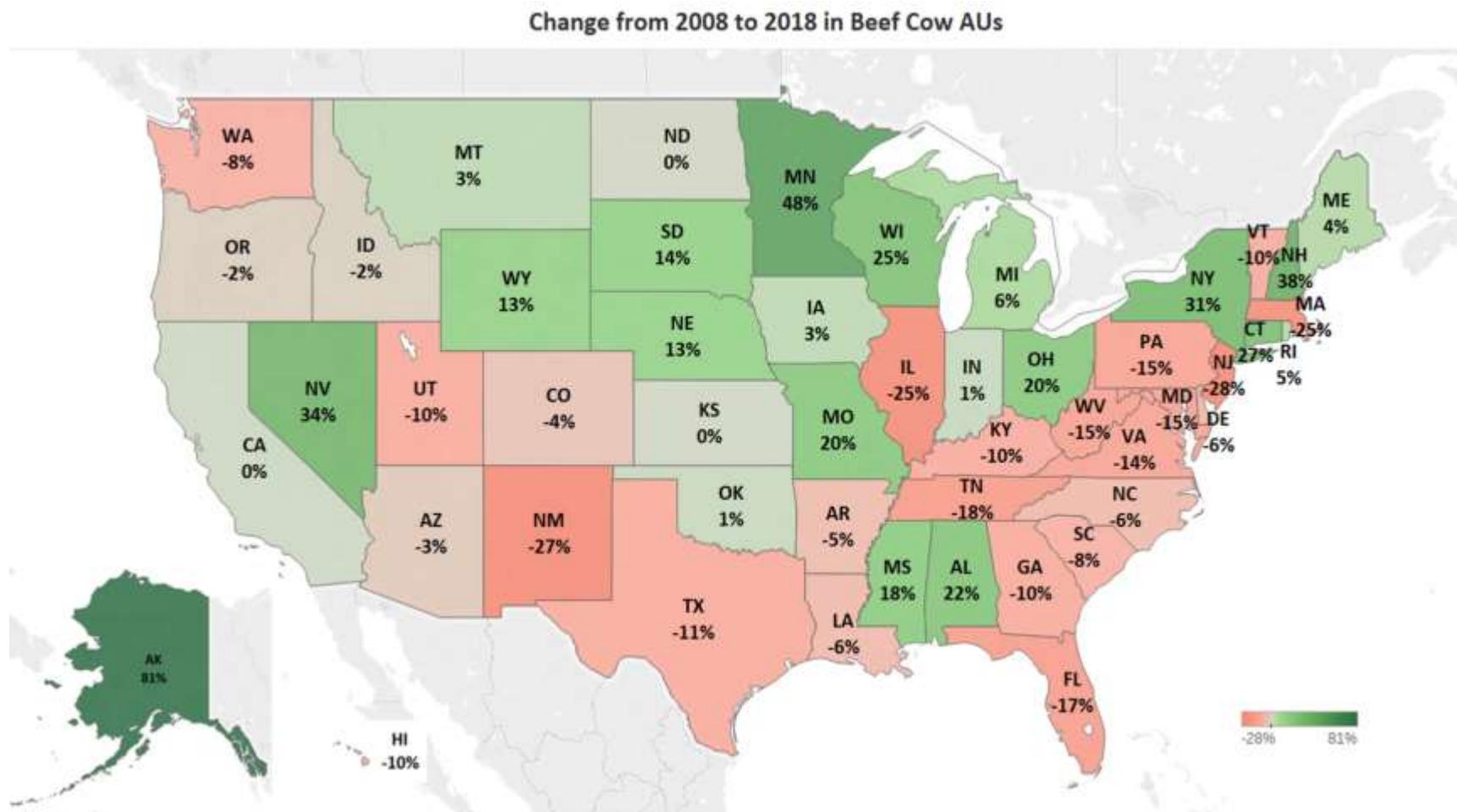
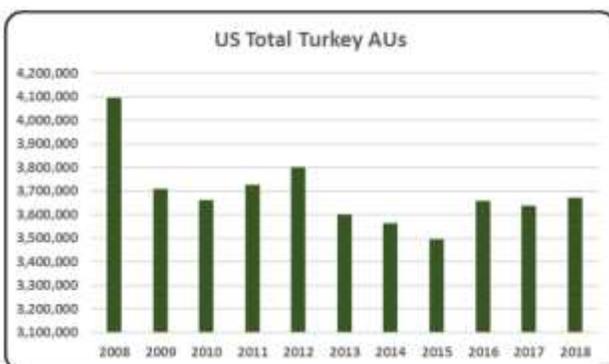
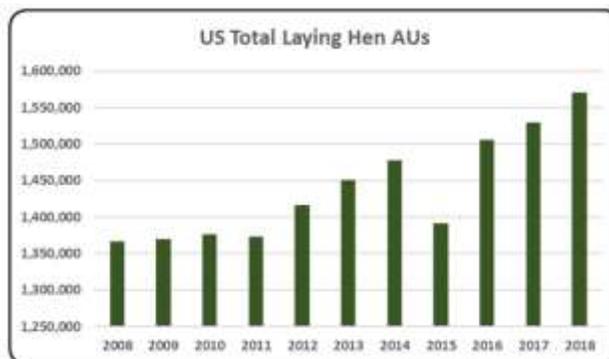
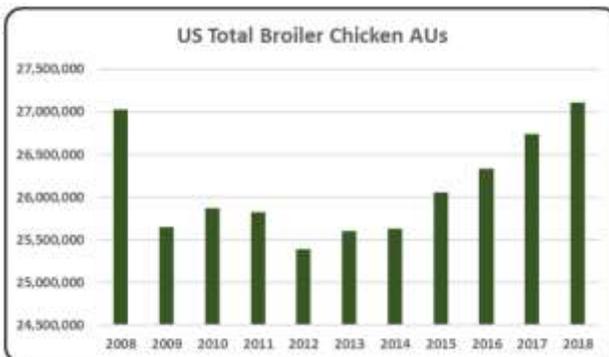
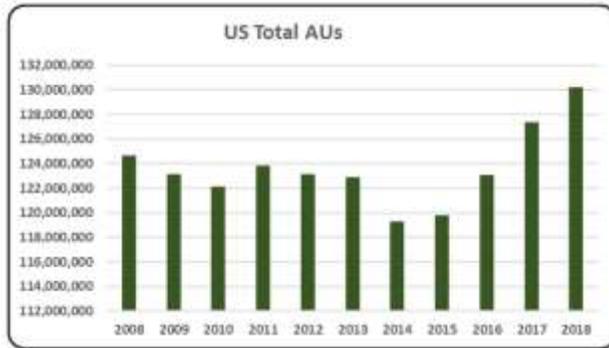
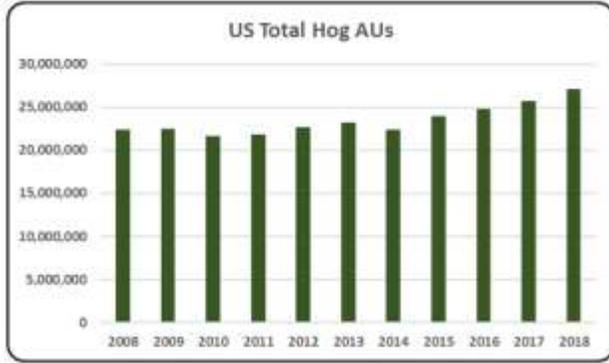


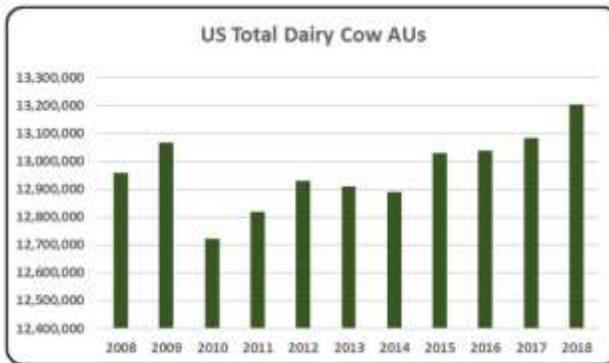
Figure 71, Change from 2008-2018 in Beef Cow AUs



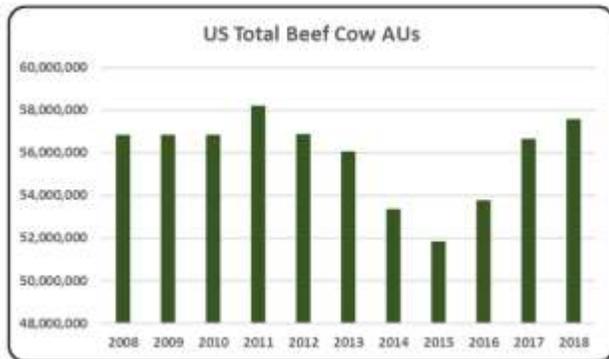
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.



- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.

U.S. Additional Information and Methodology

Animal agriculture is an important part of U.S.'s current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in U.S., of interest is the degree to which the industry impacts the U.S. economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for U.S. animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted U.S.'s economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in U.S. which have occurred. As shown in this state report, U.S. has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in U.S. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

State Level Results

2008-2018 Animal Agriculture: ALABAMA

Alabama Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Alabama animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Alabama. The success of Alabama animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Alabama during 2018 animal agriculture contributed:

- \$11.2 billion in economic output
- 61,956 jobs
- \$2.4 billion in earnings
- \$569.6 million in income taxes paid at local, state, and federal levels
- \$56.7 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Alabama has increased economic output by over \$733.6 million, boosted household earnings by \$153.7 million, contributed 3,928 additional jobs and paid \$36.4 million in additional tax revenues.

Alabama's animal agriculture consumed almost 2.0 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (1.9 million tons)
- Aquaculture (37.6 thousand tons)
- Egg-Laying Hens (32.1 thousand tons)

This report examines animal agriculture in Alabama over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Alabama, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Alabama and beyond.

Alabama Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Alabama's economy. In 2018, Alabama's animal agriculture contributed the following to the economy:

- About \$11.2 billion in economic output
- \$2.4 billion in household earnings
- 61,956 jobs
- \$569.6 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Alabama's animal agriculture has:

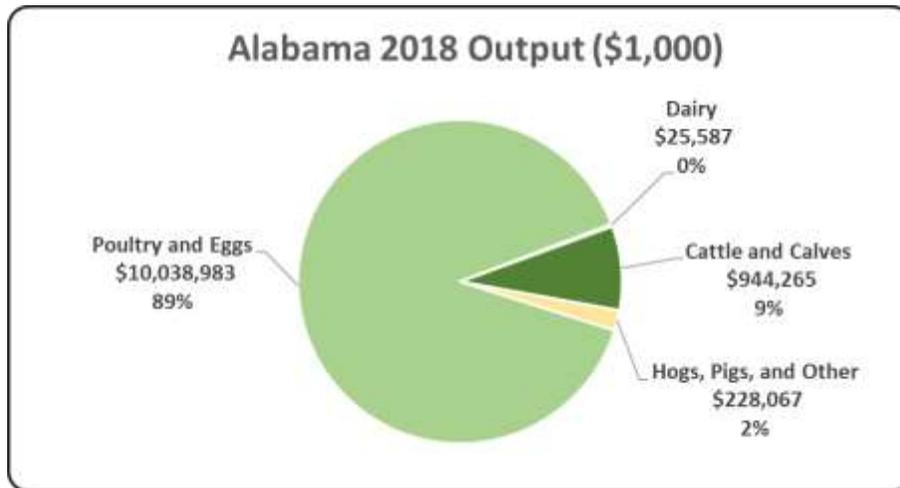
- Increased economic output by \$733.6 million
- Boosted household earnings by \$153.7 million
- Added 3,928 jobs
- Paid an additional \$36.4 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 11,236,902	\$ 733,576	6.98%
Earnings (\$1,000)	\$ 2,403,398	\$ 153,670	6.83%
Employment (Jobs)	61,956	3,928	6.77%
Income Taxes Paid (\$1,000)	\$ 569,605	\$ 36,420	6.83%
Property Taxes Paid in 2017 (\$1,000)	\$ 56,748		

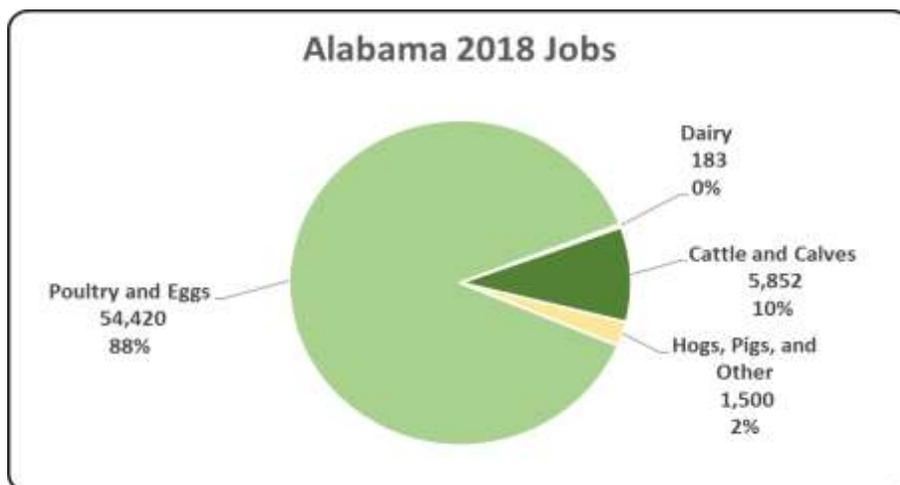
Alabama Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Alabama economy. Animal agriculture’s impact on Alabama total economic output is about \$11.2 billion.



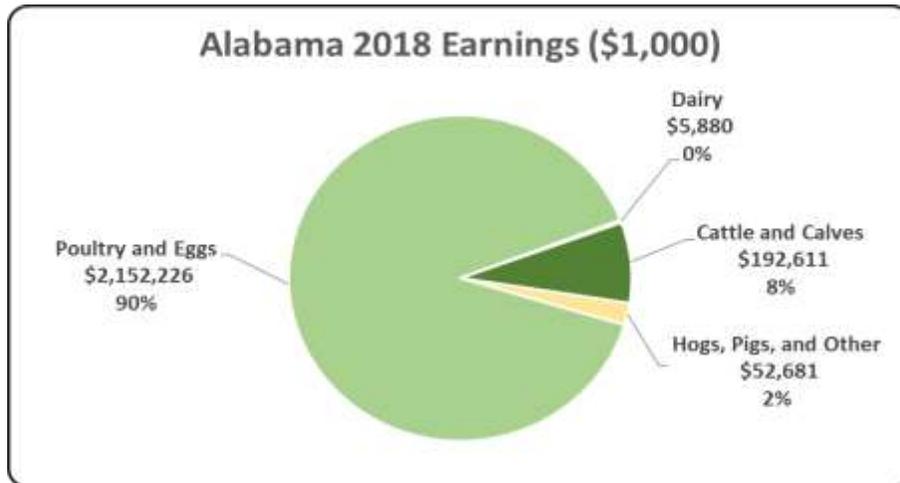
Alabama Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Alabama in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Alabama total jobs, contributing 61,956 jobs within and outside of animal agriculture.



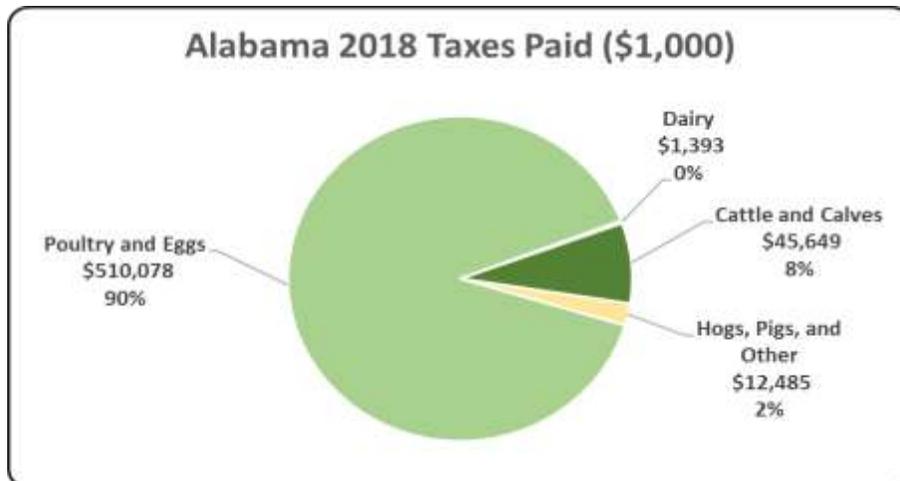
Alabama Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Alabama economy in terms of earnings. Alabama’s animal agriculture contributed about \$2.4 billion to household earnings in 2018.



Alabama Taxes Paid by Animal Agriculture

Alabama’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$569.6 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$56.7 million in property taxes paid by all of Alabama agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



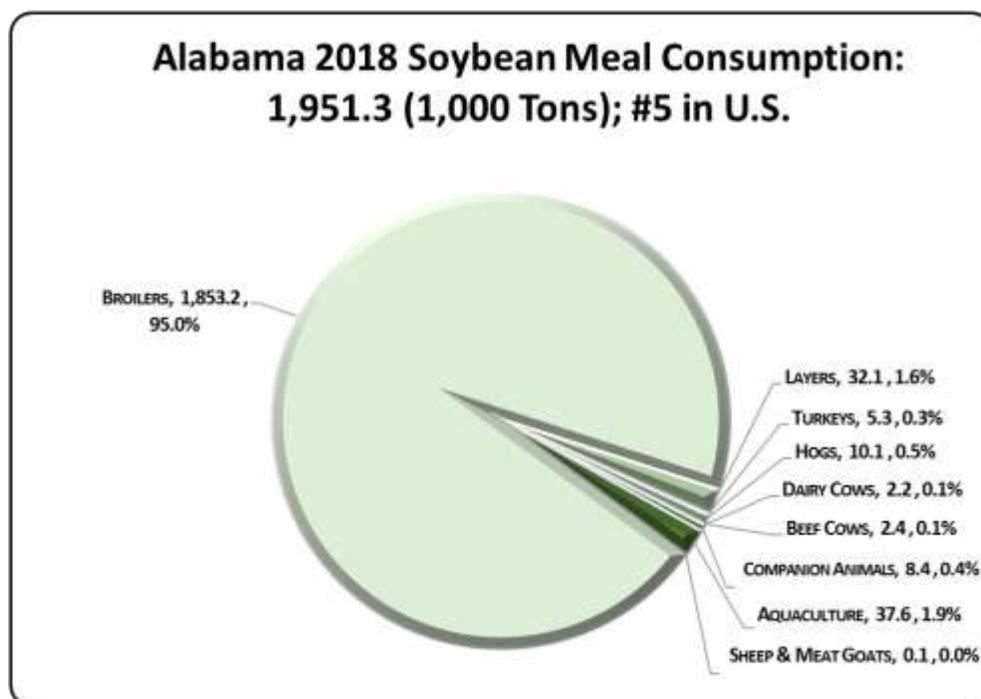
Alabama Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Alabama's animal agriculture consumed almost 2.0 million tons of soybean meal in 2018, placing the state as #5 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Alabama consumed 10,400 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (1.9 million tons)
2. Aquaculture (37.6 thousand tons)
3. Egg-Laying Hens (32.1 thousand tons)

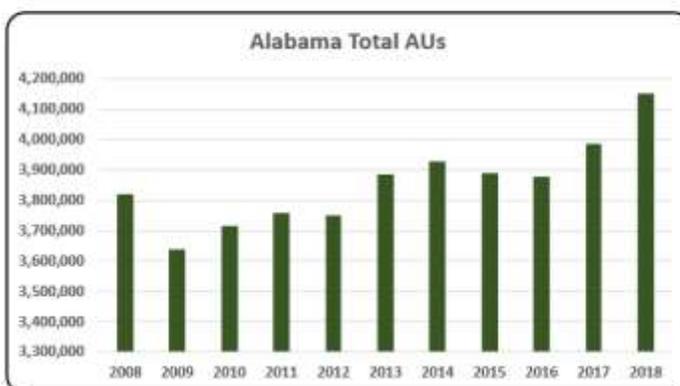
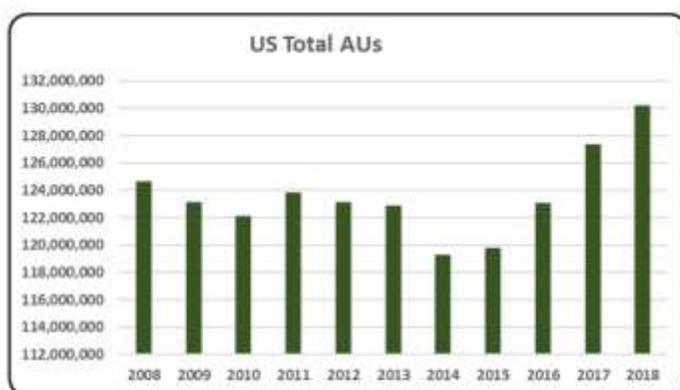


Alabama Animal Unit (AU) Trends

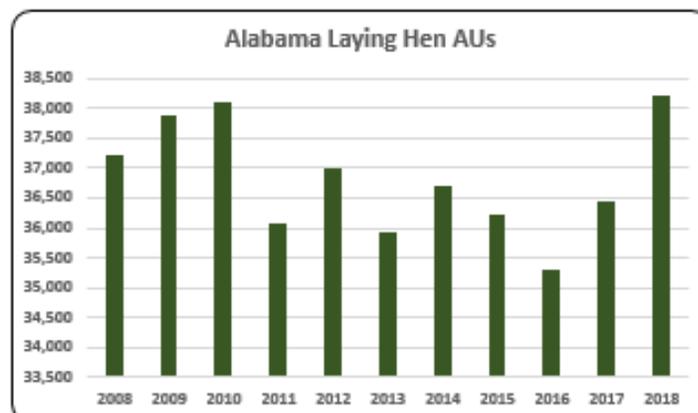
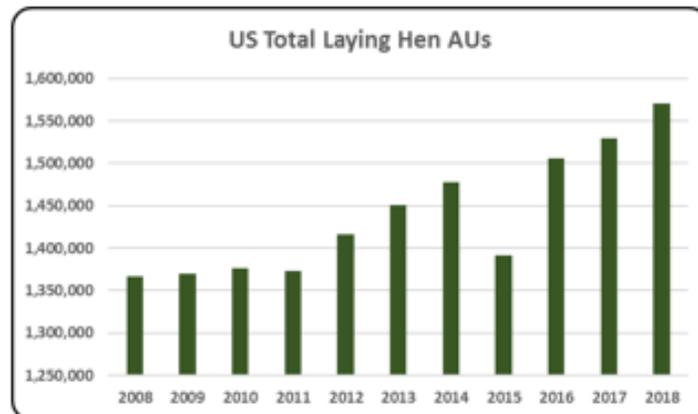
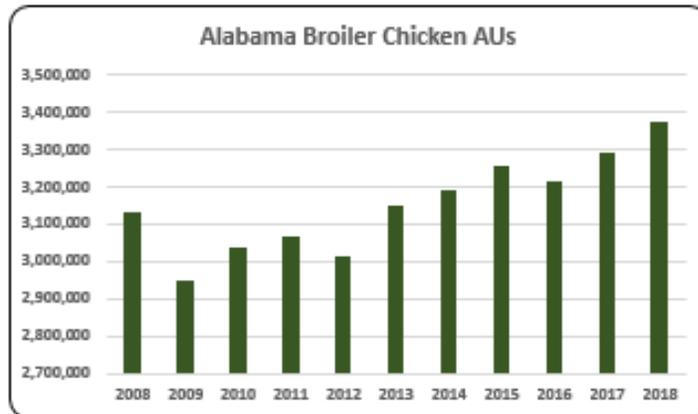
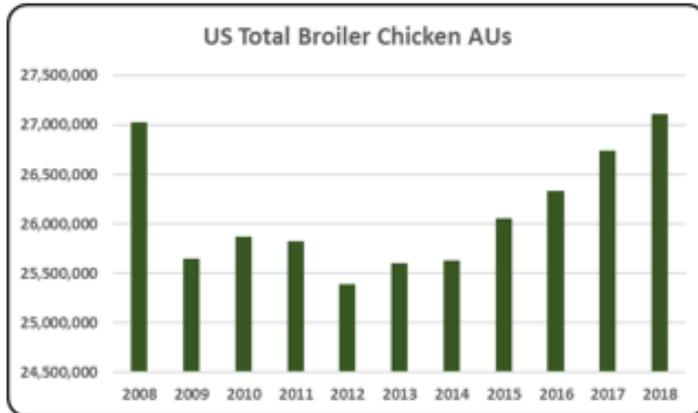
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Alabama. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Alabama and to give perspective on Alabama's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

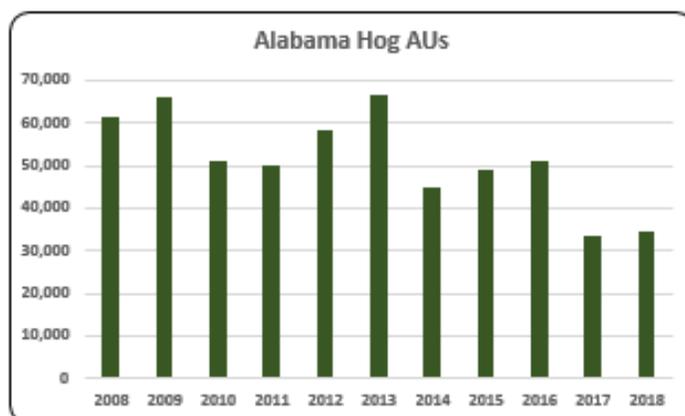
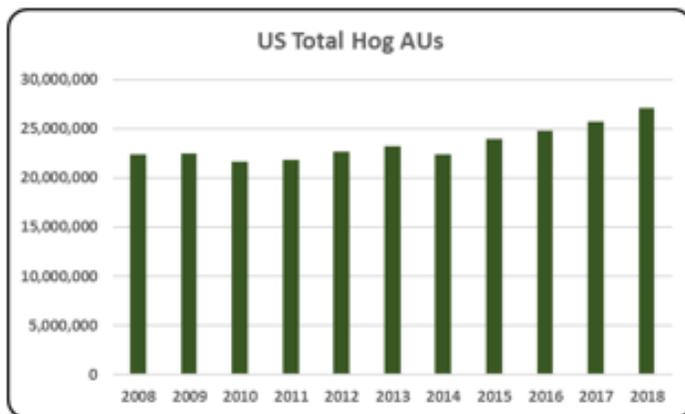
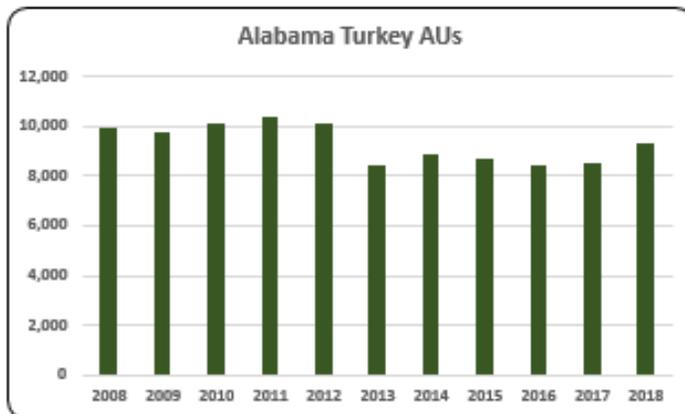
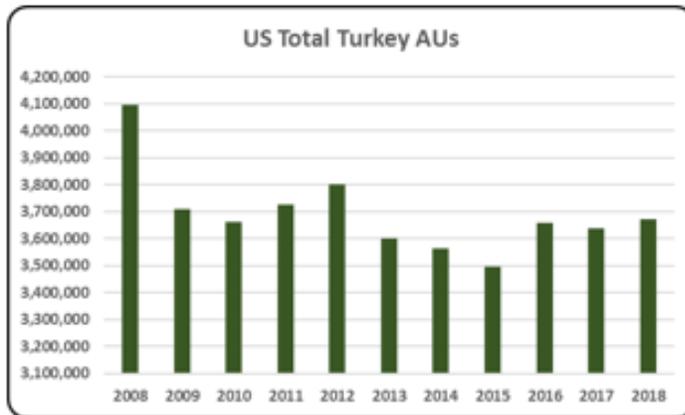
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Alabama, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (3.4 million AUs), Beef Cows (684,450 AUs), and Egg-Laying Hens (38,231 AUs). Total animal units in Alabama during 2018 were 4.2 million AUs.



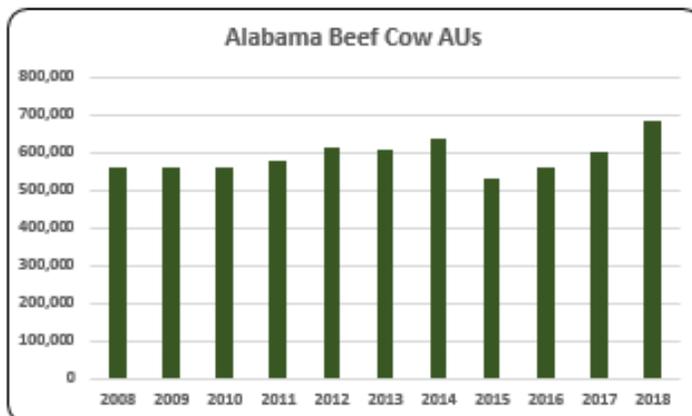
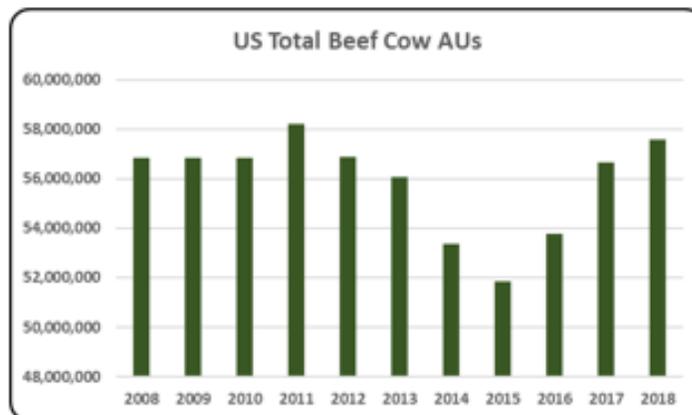
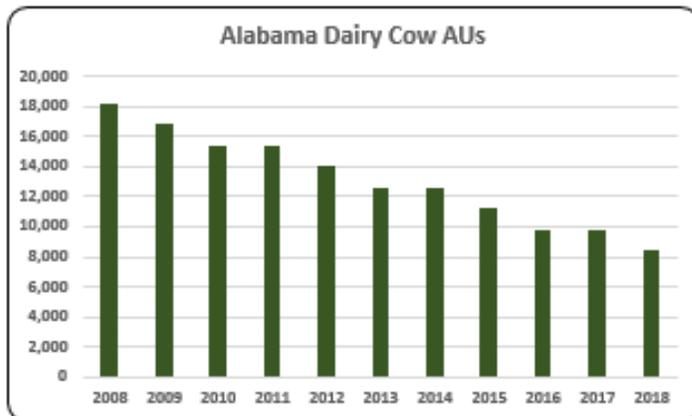
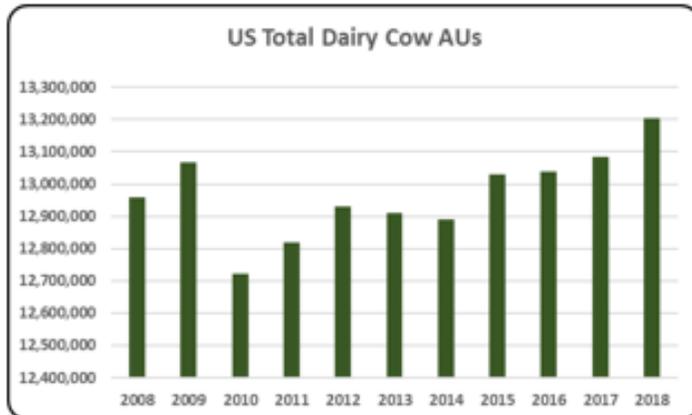
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- On average there were 3.9 million total AUs in the state of Alabama from 2008 to 2018. Total AUs in Alabama saw a 4.2% increase from 2017 to 2018 to 4.2 million AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 81.3% of the 2018 total AUs (3.4 million) in Alabama were broilers. The average broiler AUs during 2008-2018 was 3.2 million.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Alabama in 2018 had 38,231 layer AUs. From 2008 to 2018, the average number of layer AUs in Alabama was 36,832.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs in Alabama increased slightly in 2018 from 2017 by 810 AUs for a total of 9,320 AUs. Alabama had an average 9,328 turkey AUs per year over the past decade.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- In 2018, there were 34,500 hog AUs in Alabama. This number is a 43.8% decline from 2008.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- There were 8,400 dairy cow AUs in 2018 in the state of Alabama. On average from 2008-2018 Alabama had 13,109 dairy cow AUs from 2008 to 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- After broilers, beef cows are the second largest animal sector in Alabama at 684,450 AUs in 2018. Year-over-year there was a 13.4% (80,700 AUs) increase from 2017 to 2018. The average number of beef cows was 590,386 from 2008 to 2018.

Alabama Additional Information and Methodology

Animal agriculture is an important part of Alabama’s current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Alabama, of interest is the degree to which the industry impacts the Alabama economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Alabama animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years’ past. Also presented are estimates of the change in how animal agriculture has impacted Alabama’s economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the “Animal Unit Trends” seeks to quantify production changes in animal agriculture in Alabama which have occurred. As shown in this state report, Alabama has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Alabama. Through in-depth conversations with many of the nation’s top nutritionists and researchers, “bottom up” estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Alabama Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Alabama's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Alabama, \$1.64 to \$2.61 million in total economic activity, \$0.38 to \$0.56 in household wages and 11 to 15 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.945	\$ 0.397	12.1
	Hogs, Pigs, and Other	\$ 1.637	\$ 0.378	10.8
	Poultry and Eggs	\$ 2.612	\$ 0.560	14.2
	Dairy	\$ 2.112	\$ 0.485	15.1

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	559,650	559,650	559,650	579,600	613,425	610,125	634,800	531,150	558,000	603,750	684,450
	Hog and Pig AUs	61,350	66,150	50,850	50,100	58,200	66,300	44,850	49,050	51,000	33,375	34,500
	Broiler AUs	3,134,057	2,949,178	3,041,097	3,067,922	3,016,608	3,151,723	3,190,374	3,254,740	3,216,203	3,292,204	3,377,113
	Turkey AUs	9,968	9,745	10,153	10,334	10,092	8,459	8,878	8,678	8,469	8,510	9,320
	Egg Layer AUs	37,216	37,900	38,096	36,092	36,995	35,943	36,718	36,211	35,317	36,439	38,231
	Dairy AUs	18,200	16,800	15,400	15,400	14,000	12,600	12,600	11,200	9,800	9,800	8,400
	Total Animal Units	3,820,441	3,639,422	3,715,246	3,759,448	3,749,319	3,885,149	3,928,219	3,891,028	3,878,789	3,984,078	4,152,014
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 334,034	\$ 309,827	\$ 408,234	\$ 401,395	\$ 498,843	\$ 466,929	\$ 594,995	\$ 603,038	\$ 452,072	\$ 518,708	\$ 485,533
	Hogs and Pigs (\$1,000)	\$ 28,414	\$ 42,186	\$ 37,691	\$ 35,652	\$ 33,361	\$ 41,233	\$ 35,344	\$ 36,827	\$ 29,168	\$ 19,664	\$ 17,009
	Broilers (\$1,000)	\$ 2,689,160	\$ 2,519,304	\$ 2,789,334	\$ 2,671,518	\$ 2,810,100	\$ 3,564,425	\$ 3,854,232	\$ 3,320,805	\$ 2,864,463	\$ 3,337,005	\$ 3,454,844
	Turkeys (\$1,000)	\$ 9,599	\$ 9,097	\$ 19,948	\$ 15,685	\$ 16,865	\$ 12,225	\$ 8,087	\$ 8,045	\$ 9,098	\$ 6,160	\$ 6,222
	Eggs (\$1,000)	\$ 298,550	\$ 286,893	\$ 291,344	\$ 322,651	\$ 352,021	\$ 388,780	\$ 396,045	\$ 404,090	\$ 367,961	\$ 349,437	\$ 382,196
	Milk (\$1,000)	\$ 39,928	\$ 25,584	\$ 30,420	\$ 33,748	\$ 28,080	\$ 27,729	\$ 30,302	\$ 19,695	\$ 15,732	\$ 16,554	\$ 12,118
	Other	\$ 109,507	\$ 111,688	\$ 113,963	\$ 116,078	\$ 118,282	\$ 119,010	\$ 119,647	\$ 120,342	\$ 120,980	\$ 121,646	\$ 122,286
	Sheep and Lambs (\$1,000)	\$ 229	\$ 250	\$ 364	\$ 319	\$ 362	\$ 447	\$ 440	\$ 492	\$ 486	\$ 509	\$ 505
	Aquaculture (\$1,000)	\$ 109,278	\$ 111,438	\$ 113,599	\$ 115,759	\$ 117,920	\$ 118,563	\$ 119,207	\$ 119,850	\$ 120,494	\$ 121,137	\$ 121,780
	Total (\$1,000)	\$ 3,509,192	\$ 3,304,580	\$ 3,690,933	\$ 3,596,727	\$ 3,857,552	\$ 4,620,331	\$ 5,038,658	\$ 4,512,842	\$ 3,859,474	\$ 4,369,173	\$ 4,480,207

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	22,684	20,314	17,698	17,972	
	Cattle feedlots (112112)	161	16	-	-	
	Dairy cattle and milk production (11212)	215	116	87	92	
	Hog and pig farming (1122)	220	287	177	265	
	Poultry and egg production (1123)	3,450	3,818	3,815	2,709	
	Sheep and goat farming (1124)	697	1,626	1,904	1,915	
	Animal aquaculture and other animal production (1125,1129)	4,667	6,219	4,313	4,526	
Value of Sales (\$1,000)	Cattle and Calves	348,253	408,276	429,349	434,598	
	Hogs and Pigs	39,441	54,618	33,424	22,497	
	Poultry and Eggs	2,137,299	3,113,194	3,624,852	4,151,135	
	Milk*			28,113	17,570	
	Aquaculture	80,976	99,504	117,920	121,137	
	Other (calculated)	22,583	24,701	9,142	21,329	
	Total	2,628,552	3,700,293	4,242,800	4,768,266	
Input Purchases	Livestock and poultry purchased	(Farn	13,420	11,619	11,777	11,933
		\$1,000	505,196	701,381	751,245	867,224
	Breeding livestock purchased	(Farn	7,124	5,994	6,793	7,551
		\$1,000	17,300	56,499	81,263	145,206
	Other livestock and poultry purchased	(Farn	7,830	7,022	6,491	6,198
		\$1,000	487,896	644,882	669,983	722,018
	Feed purchased	(Far	32,201	30,051	29,985	30,366
		\$1,000	927,774	1,611,020	2,195,586	1,813,199

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 944,265	\$ 192,611	5,852	\$ 45,649
	Hogs, Pigs, and Other	\$ 228,067	\$ 52,681	1,500	\$ 12,485
	Poultry and Eggs	\$ 10,038,983	\$ 2,152,226	54,420	\$ 510,078
	Dairy	\$ 25,587	\$ 5,880	183	\$ 1,393
	Total	\$ 11,236,902	\$ 2,403,398	61,956	\$ 569,605
Change from 2008 to 2018	Cattle and Calves	\$ 167,925	\$ 34,253	1,041	\$ 8,118
	Hogs, Pigs, and Other	\$ (41,796)	\$ (9,654)	(275)	\$ (2,288)
	Poultry and Eggs	\$ 682,612	\$ 146,343	3,700	\$ 34,683
	Dairy	\$ (75,165)	\$ (17,272)	(538)	\$ (4,093)
	Total	\$ 733,576	\$ 153,670	3,928	\$ 36,420
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.945	\$ 0.397	12.1	
	Hogs, Pigs, and Other	\$ 1.637	\$ 0.378	10.8	
	Poultry and Eggs	\$ 2.612	\$ 0.560	14.2	
	Dairy	\$ 2.112	\$ 0.485	15.1	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				3.5%
	Total				23.7%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: ALASKA

Alaska Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Alaska animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Alaska. In the State of Alaska during 2018, animal agriculture contributed:

- \$74.0 million in economic output
- 334 jobs
- \$15.5 million in earnings
- \$3.1 million in income taxes paid at local, state, and federal levels
- \$2.0 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Alaska has increased economic output by over \$34.7 million, boosted household earnings by \$7.3 million, contributed 156 additional jobs and paid \$1.5 million in additional tax revenues.

Alaska's animal agriculture consumed almost 8,200 tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (4,300 tons)
- Turkeys (2,000 tons)
- Companion Animals (848 tons)

This report examines animal agriculture in Alaska over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Alaska, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a minor contributor to the economic well-being of the people of Alaska and beyond.

Alaska Economic Impact of Animal Agriculture

Animal agriculture is a small part of Alaska's economy. In 2018, Alaska's animal agriculture contributed the following to the economy:

- About \$74.0 million in economic output
- \$15.5 million in household earnings
- 334 jobs
- \$3.1 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Alaska's animal agriculture has:

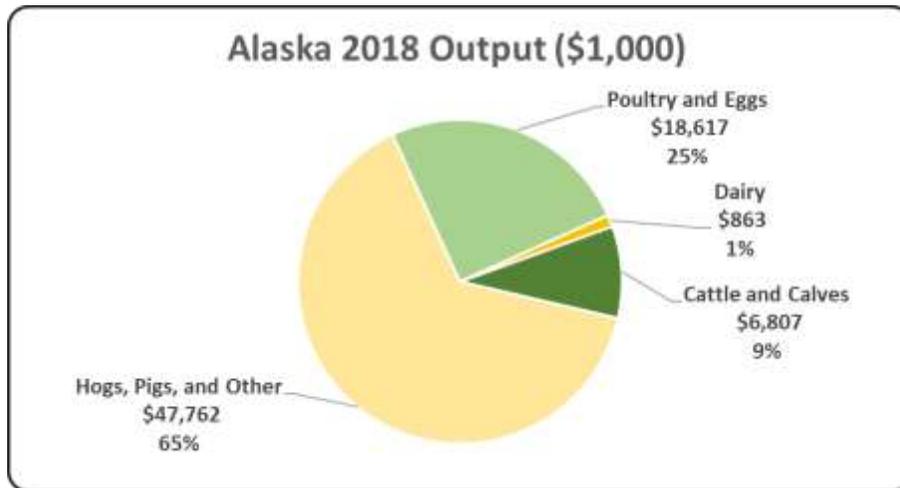
- Increased economic output by \$34.7 million
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- Added 156 jobs
- Paid an additional \$1.5 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 74,049	\$ 34,693	88.15%
Earnings (\$1,000)	\$ 15,533	\$ 7,294	88.53%
Employment (Jobs)	334	156	87.95%
Income Taxes Paid (\$1,000)	\$ 3,138	\$ 1,473	88.53%
Property Taxes Paid in 2017 (\$1,000)	\$ 1,997		

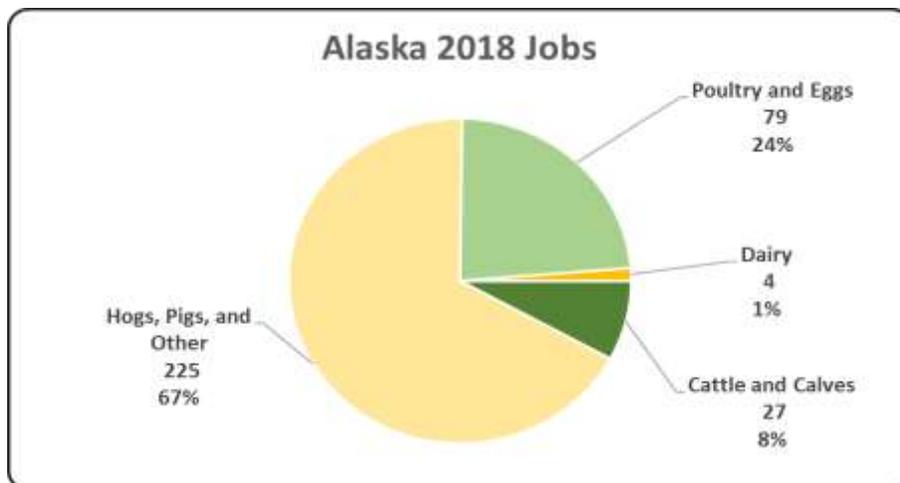
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Alaska Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Alaska in terms of animal agriculture jobs. As shown, animal agriculture in Alaska contributes 334 jobs within and outside of animal agriculture.



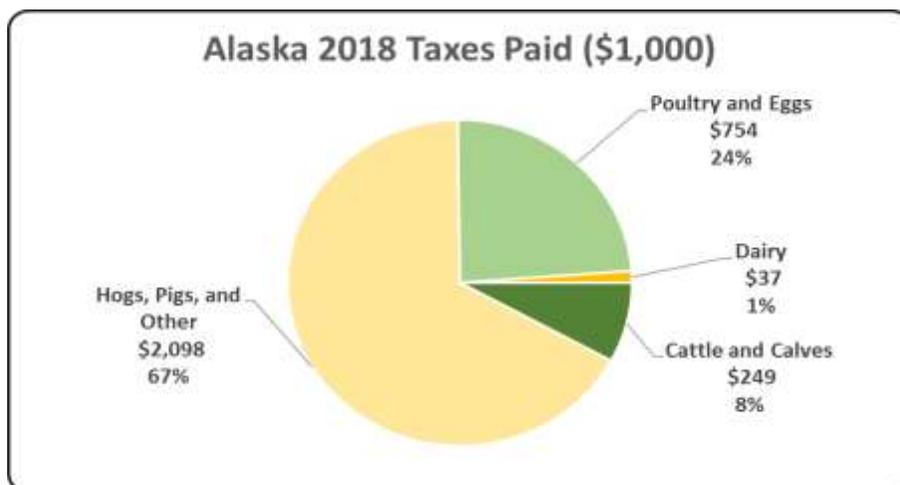
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Alaska’s animal agriculture is not a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$3.1 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$2.0 million in property taxes paid by all of Alaska agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



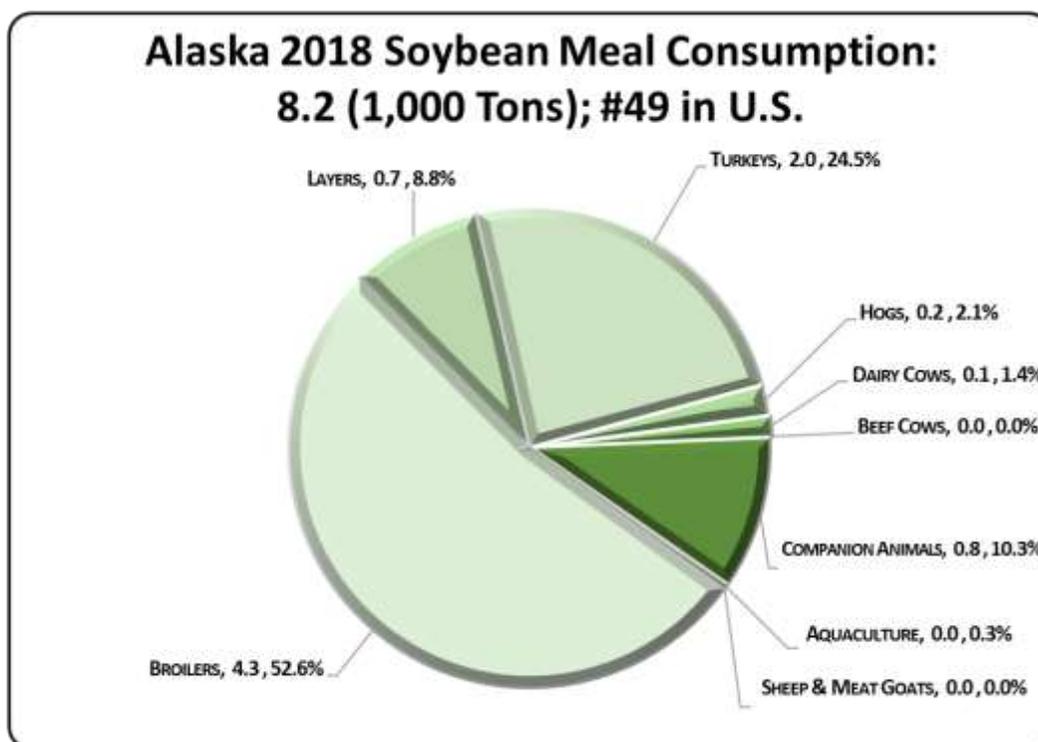
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Alaska's animal agriculture consumed almost 8,200 tons of soybean meal in 2018, placing the state as #49 in the nation in terms of soybean meal consumption (see figure below). The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (4,300 tons)
2. Turkeys (2,000 tons)
3. Companion Animals (848 tons)

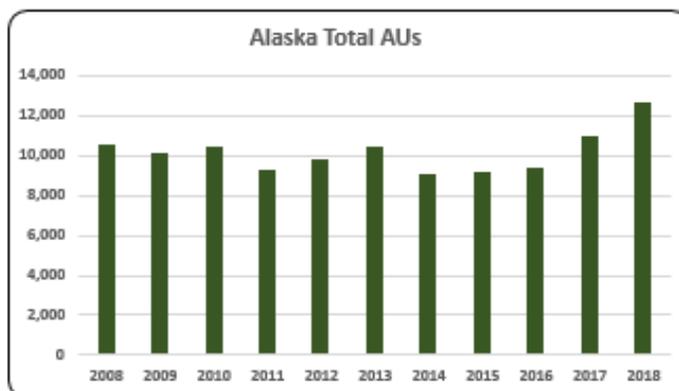
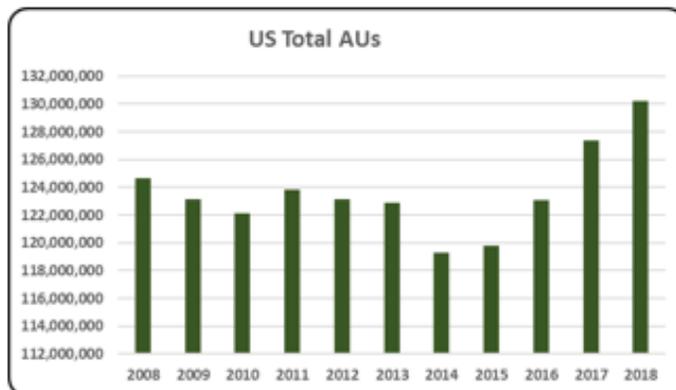


Alaska Animal Unit (AU) Trends

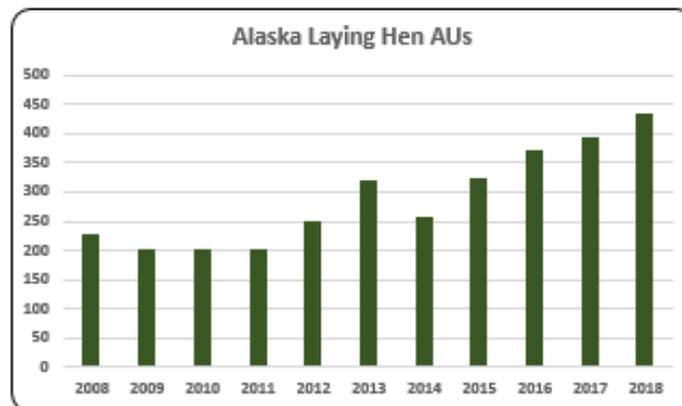
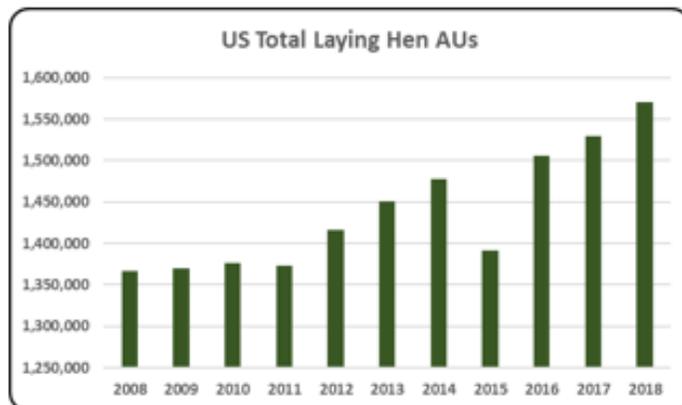
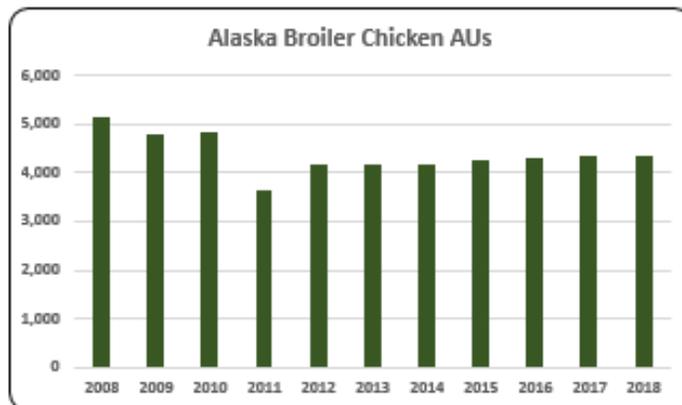
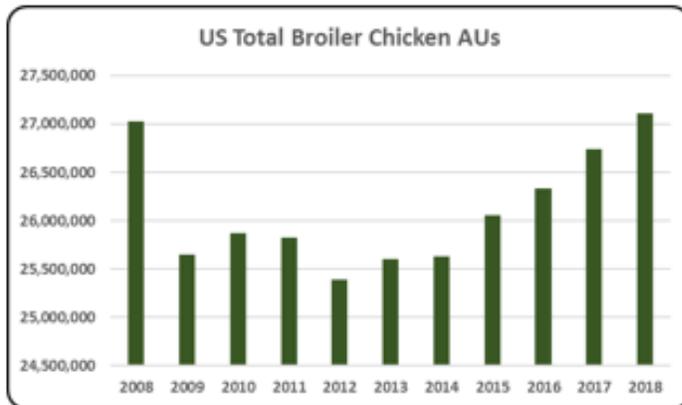
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Alaska. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Alaska and to give perspective on Alaska's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

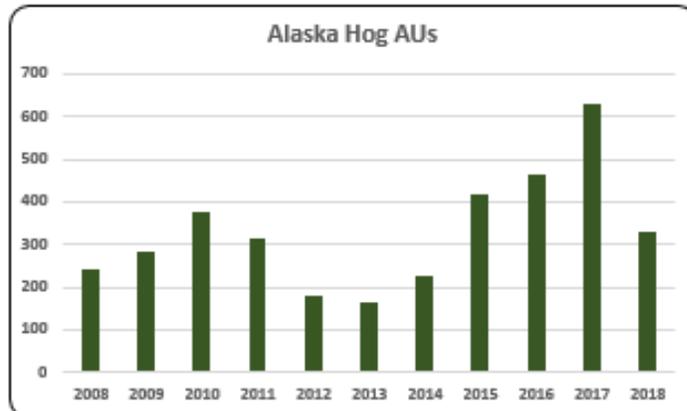
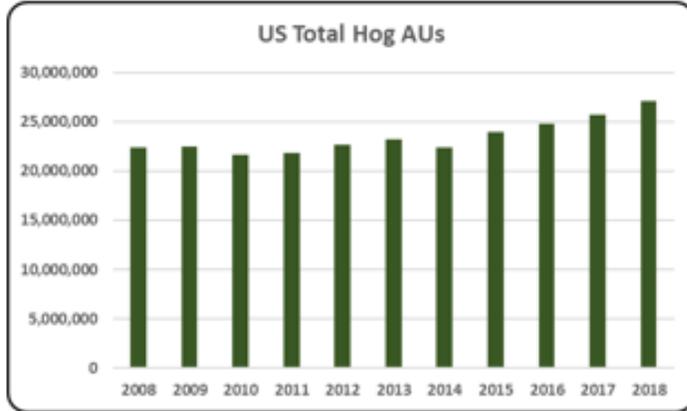
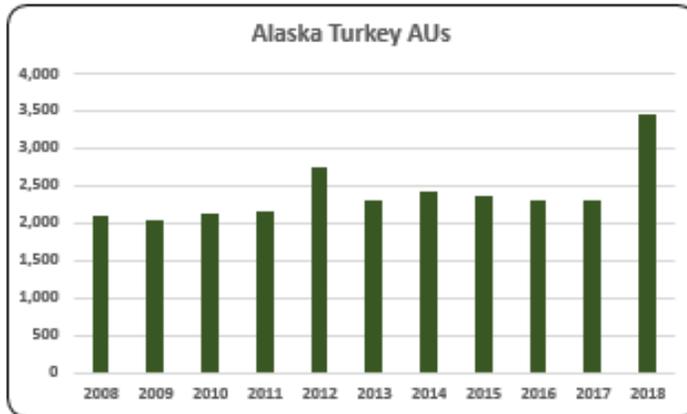
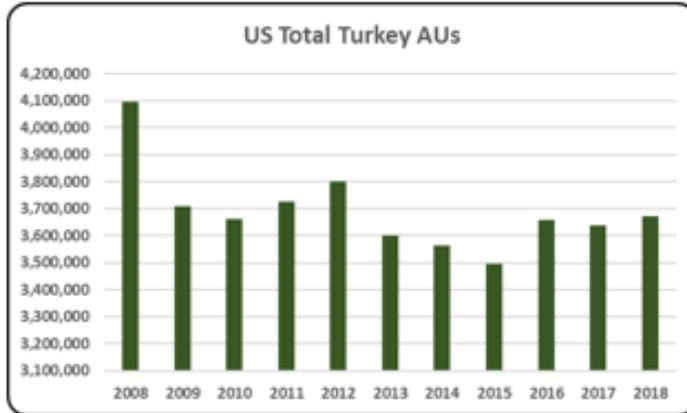
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Alaska, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (4,361 AUs), Beef Cows (3,645 AUs), and Turkeys (3,448 AUs). Total animal units in Alaska during 2018 were 12,640 AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Alaska is one of the few states with very low animal production. There were 12,640 AUs in 2018 for all species included in this study. The average AUs from 2008 to 2018 was 10,171.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- In 2018, 34.50% (4,361) of all animal units in Alaska were in the broiler industry. The average number of broiler AUs from 2008-2018 was 4,361.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 436 laying hen AUs in 2018 in Alaska, representing 0.03% of all layers in the U.S. On average there were 290 layer AUs from 2008 to 2018.

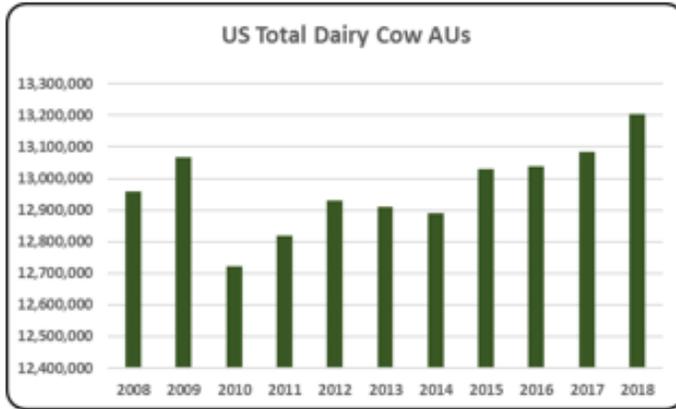


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

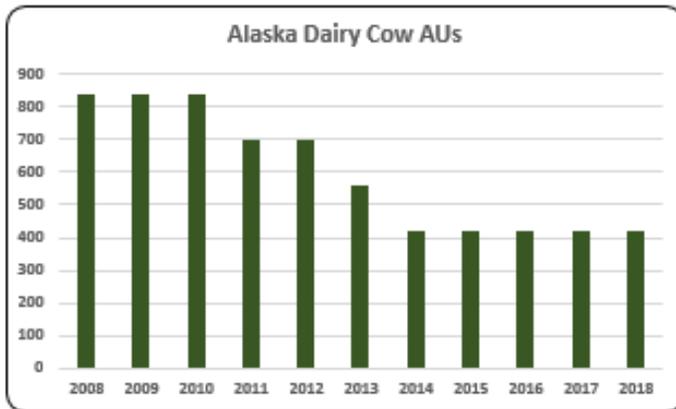
- There were 3,448 turkey AUs in 2018 in Alaska, a 64.3% increase since 2008.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

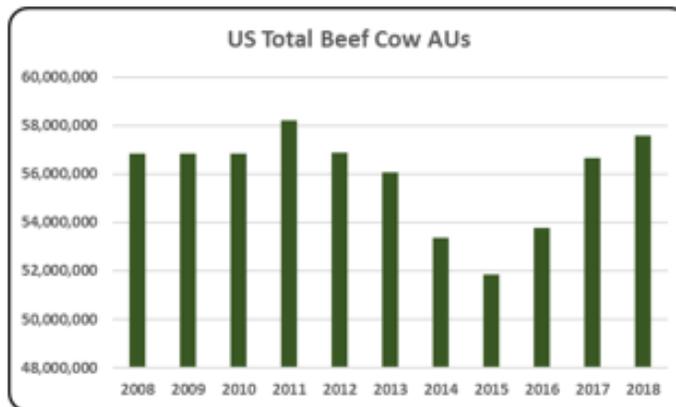
- Hog numbers in Alaska are minimal with only 330 AUs in 2018 and an average of 330 AUs for the decade.



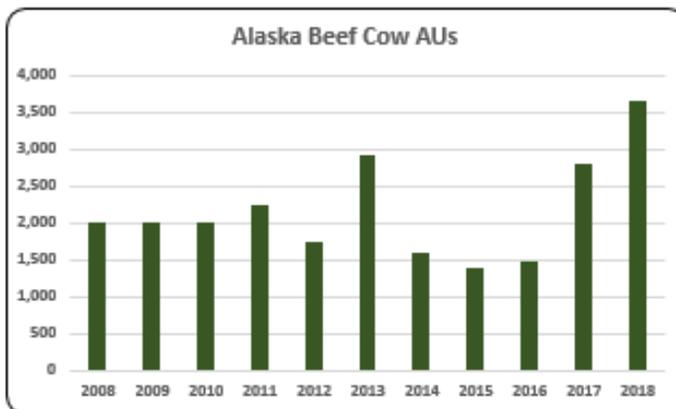
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- The number of dairy cows in the state has decreased since 2008. Dairy cow AUs were 840 in 2008 compared to 420 in 2018.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Alaska beef cow AUs averaged 2,168 from 2008 to 2018. Beef cow AUs decreased 81.3% from 2008 with a total of 3,645 AUs in 2018.

Alaska Additional Information and Methodology

Animal agriculture is a small part of Alaska's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Alaska, of interest is the degree to which the industry impacts the Alaska economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Alaska animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Alaska's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Alaska which have occurred. As shown in this state report, Alaska has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Alaska. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Alaska Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Alaska’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Alaska, \$1.30 to \$1.40 million in total economic activity, \$0.25 to \$0.29 in household wages and 5 to 7 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.364	\$ 0.247	5.3
	Hogs, Pigs, and Other	\$ 1.303	\$ 0.283	6.1
	Poultry and Eggs	\$ 1.359	\$ 0.272	5.7
	Dairy	\$ 1.401	\$ 0.294	6.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	2,010	2,010	2,010	2,250	1,725	2,925	1,605	1,380	1,485	2,805	3,645
	Hog and Pig AUs	240	285	375	315	180	165	225	420	465	630	330
	Broiler AUs	5,145	4,784	4,848	3,653	4,196	4,181	4,157	4,265	4,297	4,358	4,361
	Turkey AUs	2,099	2,052	2,137	2,176	2,752	2,307	2,421	2,367	2,310	2,321	3,448
	Egg Layer AUs	230	203	202	203	250	319	258	326	372	393	436
	Dairy AUs	840	840	840	700	700	560	420	420	420	420	420
	Total Animal Units	10,564	10,174	10,413	9,297	9,803	10,457	9,087	9,177	9,348	10,927	12,640
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,205	\$ 2,162	\$ 2,371	\$ 2,563	\$ 1,620	\$ 1,021	\$ 2,831	\$ 3,092	\$ 3,421	\$ 4,182	\$ 4,990
	Hogs and Pigs (\$1,000)	\$ 378	\$ 547	\$ 586	\$ 422	\$ 272	\$ 261	\$ 401	\$ 515	\$ 502	\$ 758	\$ 406
	Broilers (\$1,000)	\$ 4,121	\$ 3,556	\$ 3,716	\$ 3,253	\$ 4,181	\$ 5,094	\$ 5,344	\$ 4,662	\$ 4,145	\$ 4,868	\$ 7,706
	Turkeys (\$1,000)	\$ 2,547	\$ 2,414	\$ 4,200	\$ 3,302	\$ 3,551	\$ 2,574	\$ 1,703	\$ 2,194	\$ 2,481	\$ 1,680	\$ 2,302
	Eggs (\$1,000)	\$ 1,546	\$ 1,100	\$ 1,208	\$ 1,324	\$ 1,485	\$ 1,678	\$ 2,686	\$ 4,478	\$ 1,761	\$ 2,381	\$ 3,695
	Milk (\$1,000)	\$ 1,699	\$ 1,470	\$ 1,732	\$ 1,670	\$ 1,368	\$ 704	\$ 767	\$ 770	\$ 767	\$ 638	\$ 616
	Other	\$ 13,246	\$ 17,383	\$ 21,526	\$ 25,658	\$ 29,796	\$ 30,878	\$ 31,954	\$ 33,034	\$ 34,110	\$ 35,181	\$ 36,258
	Sheep and Lambs (\$1,000)	\$ 14	\$ 15	\$ 22	\$ 20	\$ 22	\$ 28	\$ 27	\$ 30	\$ 30	\$ 24	\$ 24
	Aquaculture (\$1,000)	\$ 13,232	\$ 17,368	\$ 21,503	\$ 25,639	\$ 29,774	\$ 30,851	\$ 31,927	\$ 33,004	\$ 34,080	\$ 35,157	\$ 36,234
	Total (\$1,000)	\$ 24,742	\$ 28,632	\$ 35,338	\$ 38,193	\$ 42,273	\$ 42,210	\$ 45,686	\$ 48,746	\$ 47,188	\$ 49,688	\$ 55,973

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	31	41	51	55
	Cattle feedlots (112112)	8	4	1	-
	Dairy cattle and milk production (11212)	15	6	6	8
	Hog and pig farming (1122)	13	14	9	14
	Poultry and egg production (1123)	14	32	26	37
	Sheep and goat farming (1124)	11	19	27	31
	Animal aquaculture and other animal production (1125,1129)	137	167	158	173
Value of Sales (\$1,000)	Cattle and Calves	759	768	1,085	2,234
	Hogs and Pigs	205	242	338	756
	Poultry and Eggs	104	207	353	withheld
	Milk*			withheld	withheld
	Aquaculture	20,807	28,540	29,774	35,157
	Other (calculated)	479	1,027	withheld	2,670
	Total	22,354	30,784	31,550	40,817
Input Purchases	Livestock and poultry purchased (Farms)	117	118	168	181
	\$1,000	569	303	569	845
	Breeding livestock purchased (Farms)	51	46	46	55
	\$1,000	432	107	250	209
	Other livestock and poultry purchased (Farms)	80	86	148	146
	\$1,000	137	196	320	636
	Feed purchased (Farms)	293	299	364	417
\$1,000	4,078	5,096	6,386	6,950	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 6,807	\$ 1,233	27	\$ 249
	Hogs, Pigs, and Other	\$ 47,762	\$ 10,387	225	\$ 2,098
	Poultry and Eggs	\$ 18,617	\$ 3,733	79	\$ 754
	Dairy	\$ 863	\$ 181	4	\$ 37
	Total	\$ 74,049	\$ 15,533	334	\$ 3,138

Change from 2008 to 2018	Cattle and Calves	\$ 4,843	\$ 877	19	\$ 177
	Hogs, Pigs, and Other	\$ 26,552	\$ 5,774	125	\$ 1,166
	Poultry and Eggs	\$ 5,281	\$ 1,059	22	\$ 214
	Dairy	\$ (1,982)	\$ (416)	(10)	\$ (84)
	Total	\$ 34,693	\$ 7,294	156	\$ 1,473

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.364	\$ 0.247	5.3
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	Poultry and Eggs	\$ 1.359	\$ 0.272	5.7
	Dairy	\$ 1.401	\$ 0.294	6.9

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	0.0%
	Total	20.2%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: ARIZONA

Arizona Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Arizona's animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Arizona. The success of Arizona animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Arizona during 2018 animal agriculture contributed:

- \$2.7 billion in economic output
- 19,423 jobs
- \$625.2 million in earnings
- \$148.6 million in income taxes paid at local, state, and federal levels
- \$42.5 million in the form of property taxes

Arizona's animal agriculture consumed almost 121.8 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (74.1 thousand tons)
- Companion Animals (12.6 thousand tons)
- Hogs (12.0 thousand tons)

This report examines animal agriculture in Arizona over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Arizona, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a moderate contributor to the economic well-being of the people of Arizona and beyond.

Arizona Economic Impact of Animal Agriculture

Animal agriculture is a moderate but shrinking part of Arizona’s economy. In 2018, Arizona’s animal agriculture contributed the following to the economy:

- About \$2.7 billion in economic output
- \$625.2 million in household earnings
- 19,423 jobs
- \$148.6 million in income taxes

During the last decade, Arizona’s animal agriculture industry has:

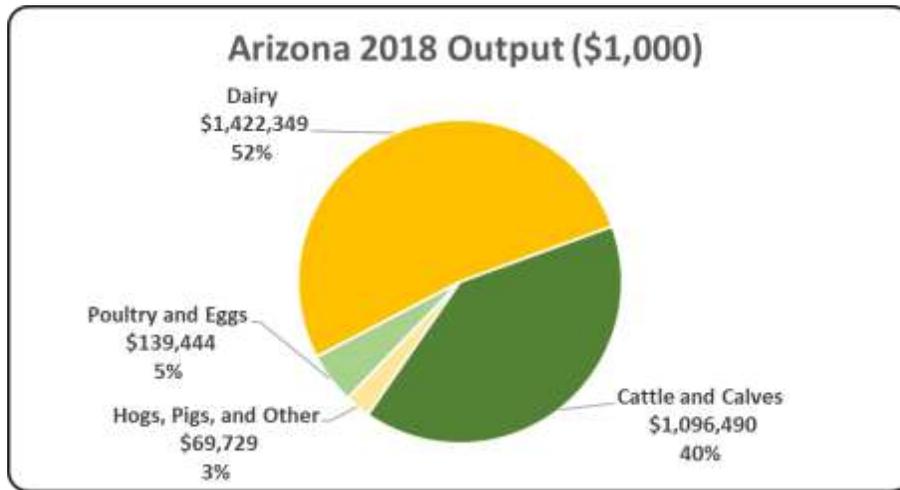
- Increased economic output by \$6.4 million
- Reduced household earnings by \$7.1 million
- Shrunk -243 jobs
- Paid \$1.7 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,728,011	\$ 6,368	0.23%
Earnings (\$1,000)	\$ 625,226	\$ (7,054)	-1.12%
Employment (Jobs)	19,423	(243)	-1.24%
Income Taxes Paid (\$1,000)	\$ 148,585	\$ (1,676)	-1.12%
Property Taxes Paid in 2017 (\$1,000)	\$ 42,478		

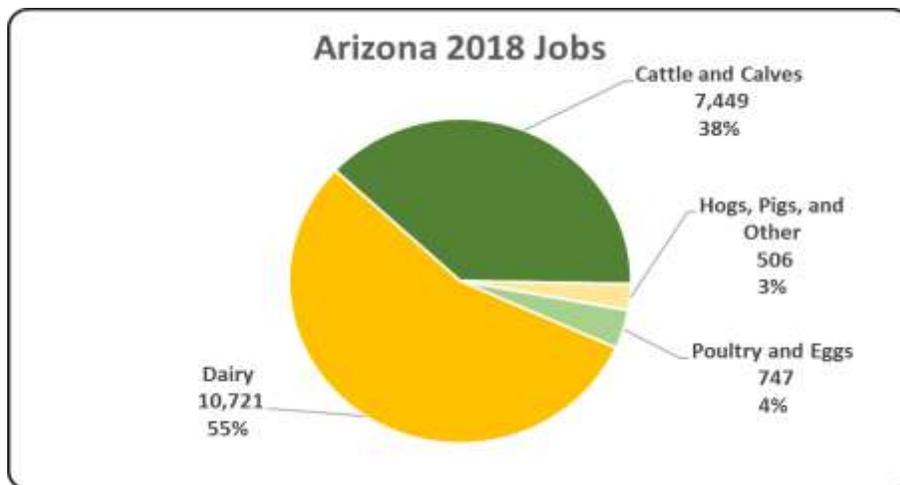
Arizona Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Arizona economy. Animal agriculture’s impact on Arizona total economic output is about \$2.7 billion.



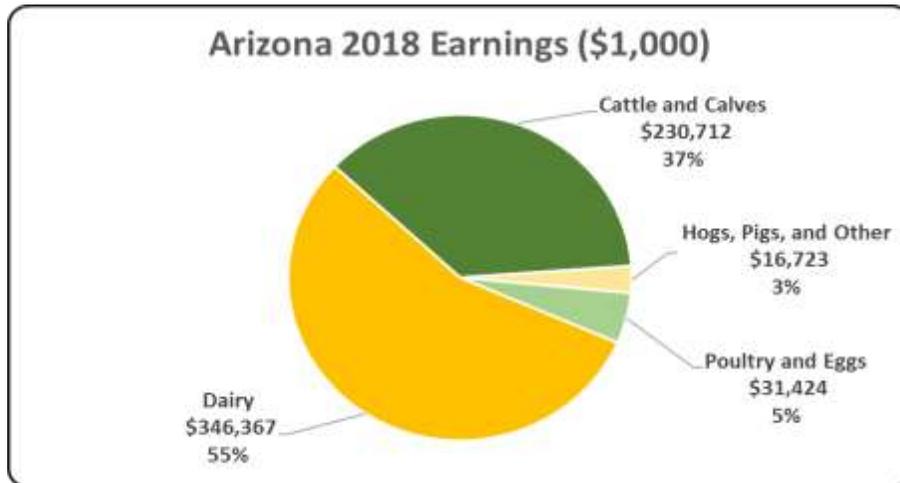
Arizona Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Arizona in terms of animal agriculture jobs. As shown, animal agriculture contributes 19,423 jobs within and outside of animal agriculture.



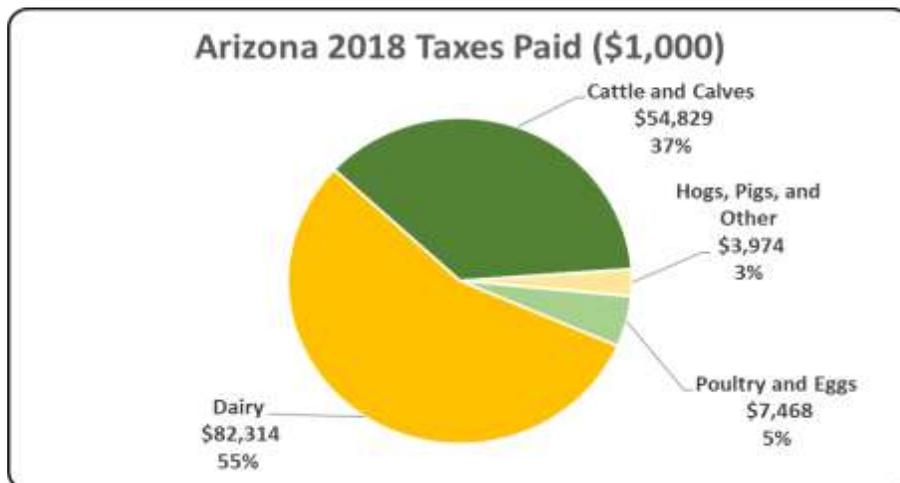
Arizona Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Arizona economy in terms of earnings. Arizona’s animal agriculture contributed about \$625.2 million to household earnings in 2018.



Arizona Taxes Paid by Animal Agriculture

Arizona’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$148.6 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$42.5 million in property taxes paid by all of Arizona agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



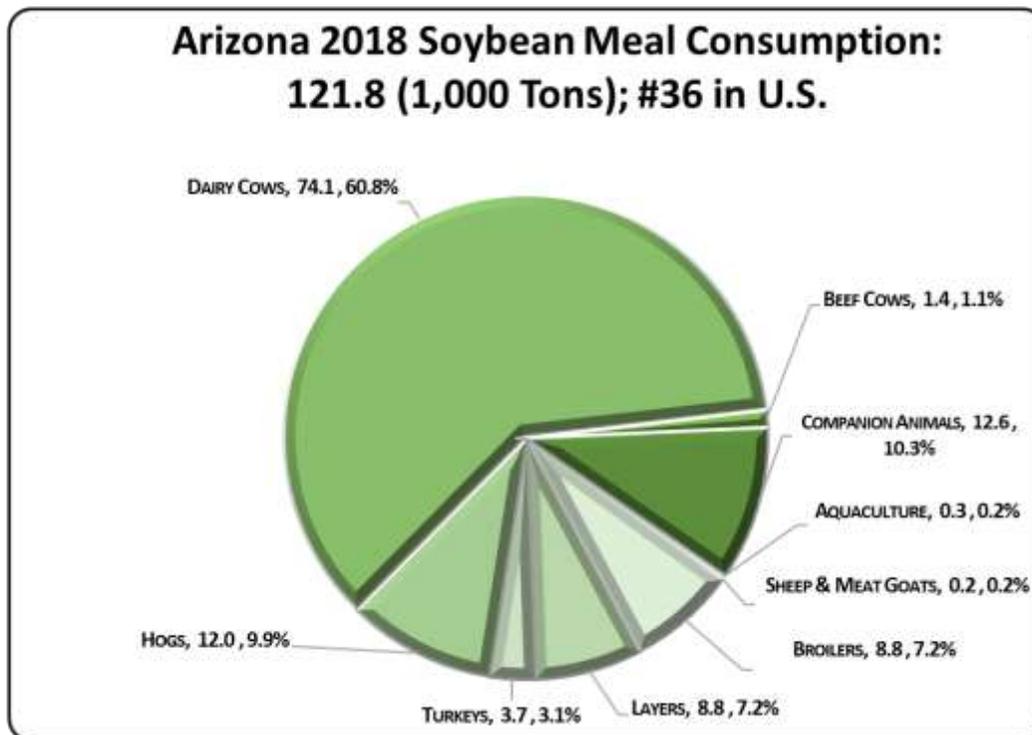
Arizona Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Arizona's animal agriculture consumed almost 121.8 thousand tons of soybean meal in 2018, placing the state as #36 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Arizona consumed 15.6 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (74.1 thousand tons)
2. Companion Animals (12.6 thousand tons)
3. Hogs (12.0 thousand tons)

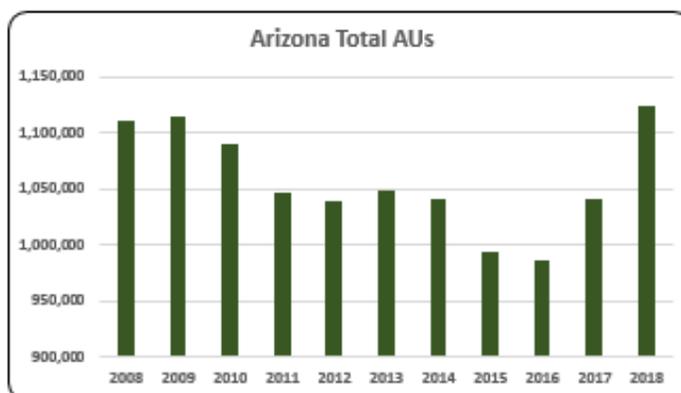
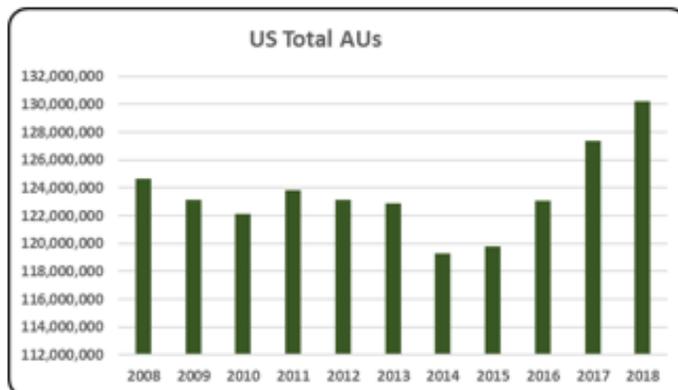


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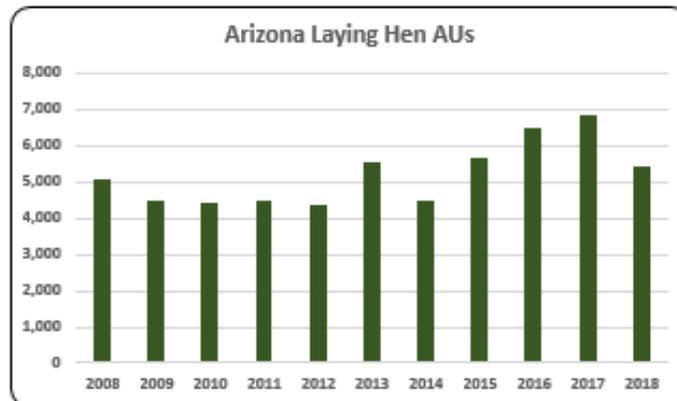
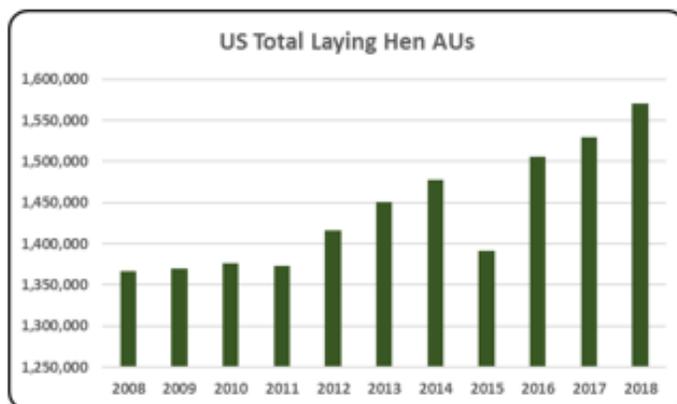
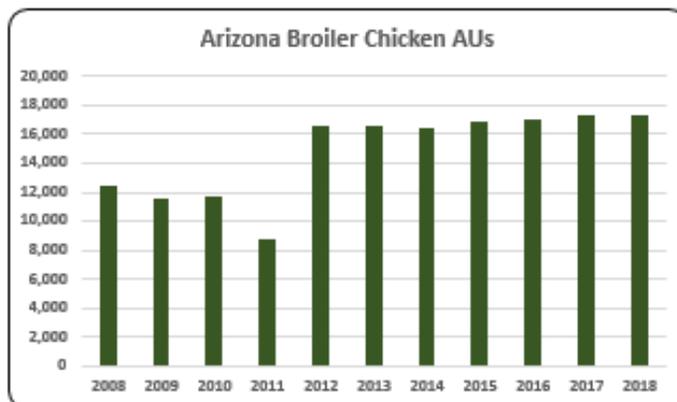
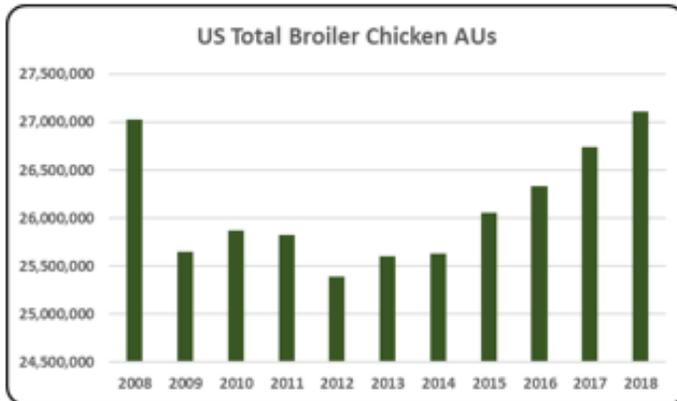
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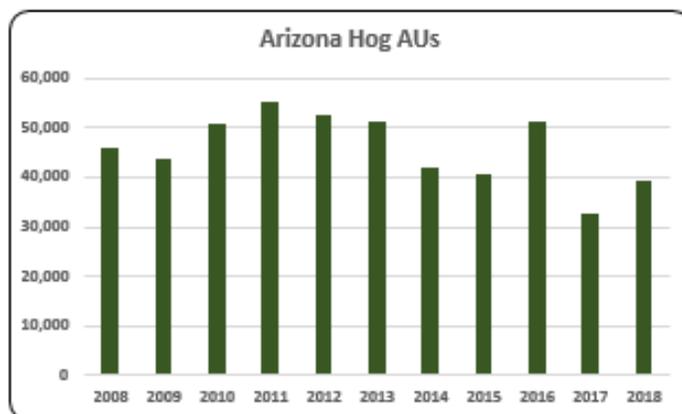
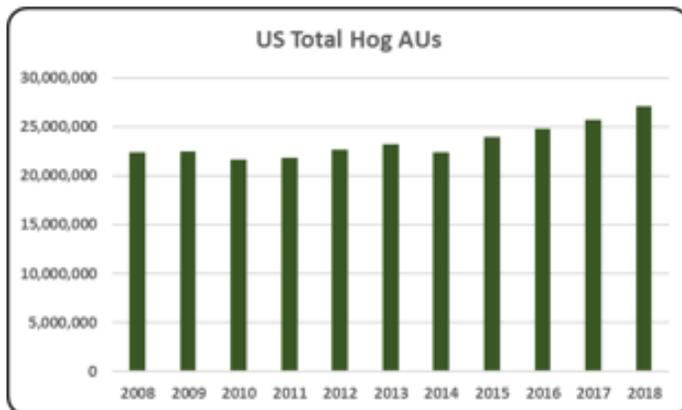
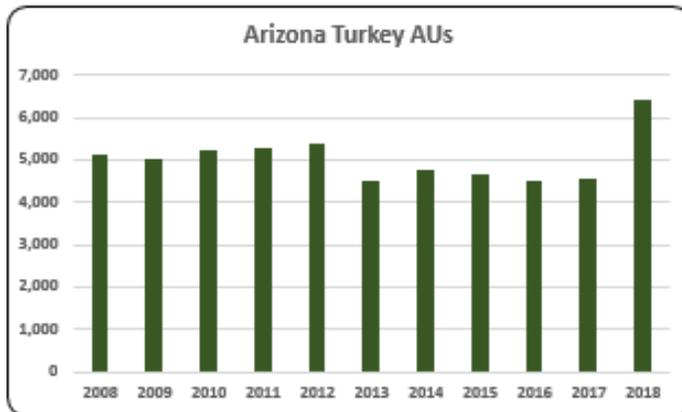
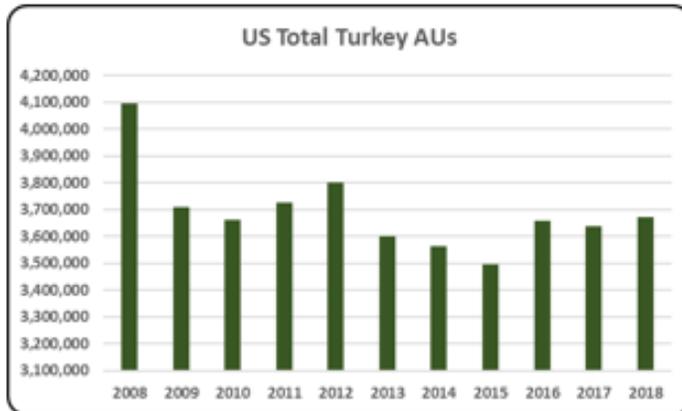
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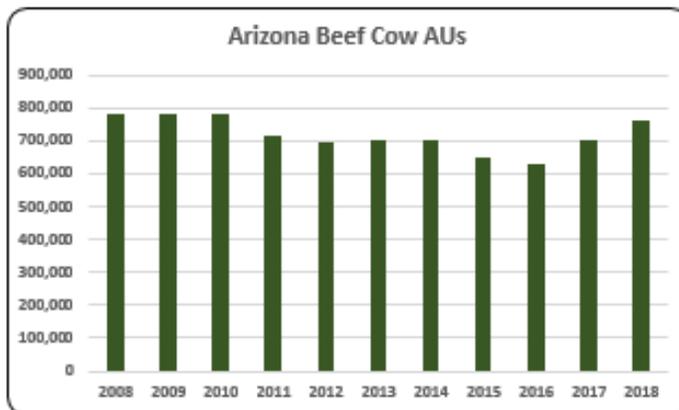
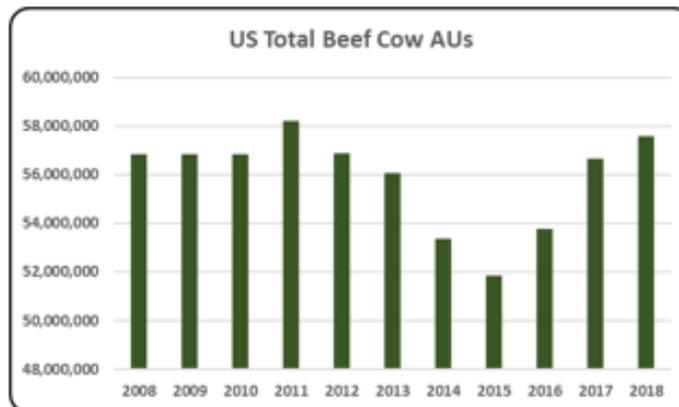
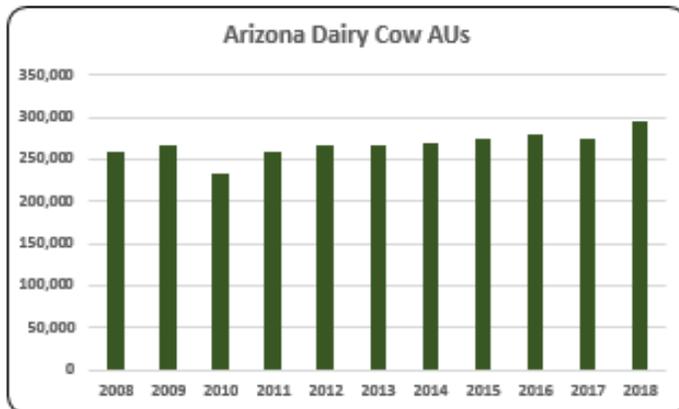
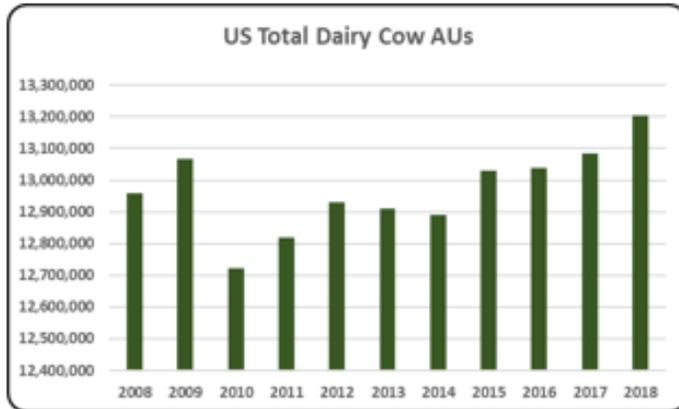
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Arizona's total AUs have hovered around 1 million since before 2008. The total AUs in Arizona in 2015 and 2016 were the lowest in recent years with 993,916 in 2015 and 979,886 in 2016. In 2018 AUs increased to 1.1 million.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average from 2006 to 2016, broiler chicken AUs were about 26.3 million. In 2016, broiler AUs rebounded 2.8% from the low AUs numbers in 2013 (a 730 thousand AU increase).
- The 2018 Arizona broiler AUs were 17,254. Of the 27.1 million U.S. broiler AUs, Arizona’s 2018 broiler AUs represented only 0.06% of the U.S. total.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layer AUs in 2018 were 5,409, this is 0.48% of all AUs in Arizona. Since 2008, layer numbers in Arizona have increased almost 7.3%.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkeys are a very small animal industry in Arizona, representing just over half-a-percent of the total AUs in the state in 2018 at 6,431. This was a 41.5% increase year-over-year from 2017 to 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Arizona hog AUs averaged 45,989 AUs over the past decade. In 2018 hog AUs increased to 39,150 from a 32,700 in 2017, the lowest of the decade.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- On average, there were 267,273 dairy cow AUs in Arizona from 2008 to 2018. In 2018, Arizona dairy cow AUs reached a record number of 294,000 AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Arizona beef cow AUs in 2018 came in at 761,850. Arizona beef cow AUs averaged 719,918 over the past decade.

Arizona Additional Information and Methodology

Animal agriculture is a moderate part of Arizona’s current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Arizona, of interest is the degree to which the industry impacts the Arizona economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Arizona animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years’ past. Also presented are estimates of the change in how animal agriculture has impacted Arizona’s economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the “Animal Unit Trends” seeks to quantify production changes in animal agriculture in Arizona which have occurred. As shown in this state report, Arizona has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Arizona. Through in-depth conversations with many of the nation’s top nutritionists and researchers, “bottom up” estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Arizona Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Arizona's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Arizona, \$1.52 to \$1.84 million in total economic activity, \$0.36 to \$0.45 in household wages and 9 to 14 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.808	\$ 0.380	12.3
	Hogs, Pigs, and Other	\$ 1.516	\$ 0.364	11.0
	Poultry and Eggs	\$ 1.654	\$ 0.373	8.9
	Dairy	\$ 1.843	\$ 0.449	13.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	783,900	783,900	783,900	713,250	695,100	704,700	705,600	653,400	628,275	705,225	761,850
	Hog and Pig AUs	46,200	43,800	50,850	55,200	52,725	51,450	42,000	40,650	51,150	32,700	39,150
	Broiler AUs	12,434	11,561	11,716	8,828	16,601	16,543	16,449	16,873	16,999	17,243	17,254
	Turkey AUs	5,115	5,001	5,210	5,303	5,390	4,518	4,742	4,635	4,523	4,545	6,431
	Egg Layer AUs	5,043	4,459	4,430	4,456	4,357	5,553	4,495	5,675	6,477	6,838	5,409
	Dairy AUs	259,000	266,000	233,800	259,000	266,000	266,000	268,800	273,000	280,000	274,400	294,000
	Total Animal Units	1,111,692	1,114,721	1,089,906	1,046,037	1,040,172	1,048,763	1,042,086	994,233	987,424	1,040,951	1,124,094
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 400,883	\$ 321,152	\$ 372,692	\$ 594,015	\$ 615,659	\$ 624,078	\$ 693,792	\$ 644,700	\$ 514,051	\$ 584,578	\$ 606,499
	Hogs and Pigs (\$1,000)	\$ 41,713	\$ 38,575	\$ 51,594	\$ 63,606	\$ 55,619	\$ 58,422	\$ 53,303	\$ 41,013	\$ 47,820	\$ 32,873	\$ 37,573
	Broilers (\$1,000)	\$ 9,959	\$ 8,593	\$ 8,979	\$ 7,861	\$ 16,541	\$ 20,155	\$ 21,144	\$ 18,446	\$ 16,401	\$ 19,259	\$ 15,639
	Turkeys (\$1,000)	\$ 4,702	\$ 4,456	\$ 10,236	\$ 8,049	\$ 8,654	\$ 6,273	\$ 4,150	\$ 4,297	\$ 4,859	\$ 3,290	\$ 4,293
	Eggs (\$1,000)	\$ 26,931	\$ 19,168	\$ 21,041	\$ 23,070	\$ 25,873	\$ 29,231	\$ 46,789	\$ 78,001	\$ 30,674	\$ 41,475	\$ 64,360
	Milk (\$1,000)	\$ 765,776	\$ 493,922	\$ 660,009	\$ 873,774	\$ 793,408	\$ 875,355	\$ 1,091,096	\$ 757,440	\$ 730,387	\$ 836,670	\$ 771,590
	Other	\$ 5,934	\$ 6,871	\$ 7,815	\$ 9,419	\$ 9,990	\$ 8,697	\$ 8,603	\$ 9,143	\$ 8,911	\$ 8,706	\$ 8,419
	Sheep and Lambs (\$1,000)	\$ 3,314	\$ 3,566	\$ 3,824	\$ 4,742	\$ 4,627	\$ 3,489	\$ 3,549	\$ 4,244	\$ 4,166	\$ 4,116	\$ 3,983
	Aquaculture (\$1,000)	\$ 2,620	\$ 3,305	\$ 3,991	\$ 4,677	\$ 5,363	\$ 5,208	\$ 5,054	\$ 4,899	\$ 4,745	\$ 4,590	\$ 4,436
	Total (\$1,000)	\$ 1,255,898	\$ 892,737	\$ 1,132,367	\$ 1,579,795	\$ 1,525,744	\$ 1,622,211	\$ 1,918,878	\$ 1,553,041	\$ 1,353,104	\$ 1,526,851	\$ 1,508,373

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	2,067	4,901	4,201	5,572
	Cattle feedlots (112112)	61	65	14	40
	Dairy cattle and milk production (11212)	140	146	102	116
	Hog and pig farming (1122)	73	86	213	130
	Poultry and egg production (1123)	107	468	267	143
	Sheep and goat farming (1124)	230	2,513	4,593	5,139
	Animal aquaculture and other animal production (1125,1129)	1,874	3,056	5,506	4,550
Value of Sales (\$1,000)	Cattle and Calves	403,959	585,479	700,307	641,182
	Hogs and Pigs	withheld	withheld	withheld	withheld
	Poultry and Eggs	withheld	withheld	withheld	withheld
	Milk*			762,957	856,376
	Aquaculture	755	2,713	5,363	withheld
	Other (calculated)	50,174	98,837	11,276	260,232
	Total	454,888	687,029	1,479,903	1,757,790
Input Purchases	Livestock and poultry purchased	(Farms) 1,631	2,283	3,226	3,654
		\$1,000 171,369	315,343	166,502	217,994
	Breeding livestock purchased	(Farms) 954	1,374	1,817	2,189
		\$1,000 21,233	46,303	20,253	44,067
	Other livestock and poultry purchased	(Farms) 869	1,257	1,783	1,927
		\$1,000 150,137	269,040	146,249	173,927
	Feed purchased	(Farms) 4,524	12,611	16,346	16,414
	\$1,000 307,212	617,035	795,229	948,609	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,096,490	\$ 230,712	7,449	\$ 54,829
	Hogs, Pigs, and Other	\$ 69,729	\$ 16,723	506	\$ 3,974
	Poultry and Eggs	\$ 139,444	\$ 31,424	747	\$ 7,468
	Dairy	\$ 1,422,349	\$ 346,367	10,721	\$ 82,314
	Total	\$ 2,728,011	\$ 625,226	19,423	\$ 148,585
Change from 2008 to 2018	Cattle and Calves	\$ 230,369	\$ 48,472	1,565	\$ 11,519
	Hogs, Pigs, and Other	\$ (16,598)	\$ (3,981)	(120)	\$ (946)
	Poultry and Eggs	\$ 57,218	\$ 12,894	307	\$ 3,064
	Dairy	\$ (264,621)	\$ (64,440)	(1,995)	\$ (15,314)
	Total	\$ 6,368	\$ (7,054)	(243)	\$ (1,676)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.808	\$ 0.380	12.3	
	Hogs, Pigs, and Other	\$ 1.516	\$ 0.364	11.0	
	Poultry and Eggs	\$ 1.654	\$ 0.373	8.9	
	Dairy	\$ 1.843	\$ 0.449	13.9	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.6%	
	Total			23.8%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: ARKANSAS

Arkansas Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Arkansas animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Arkansas. The success of Arkansas animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Arkansas during 2018 animal agriculture contributed:

- \$15.2 billion in economic output
- 69,935 jobs
- \$3.2 billion in earnings
- \$771.7 million in income taxes paid at local, state, and federal levels
- \$100.3 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Arkansas has increased economic output by over \$979.8 million, boosted household earnings by \$205.5 million, contributed 4,064 additional jobs and paid \$49.5 million in additional tax revenues.

Arkansas's animal agriculture consumed almost 2.3 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (1.9 million tons)
- Turkeys (273.3 thousand tons)
- Egg-Laying Hens (57.5 thousand tons)

This report examines animal agriculture in Arkansas over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Arkansas, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Arkansas and beyond.

Arkansas Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Arkansas's economy. In 2018, Arkansas's animal agriculture contributed the following to the economy:

- About \$15.2 billion in economic output
- \$3.2 billion in household earnings
- 69,935 jobs
- \$771.7 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Arkansas's animal agriculture has:

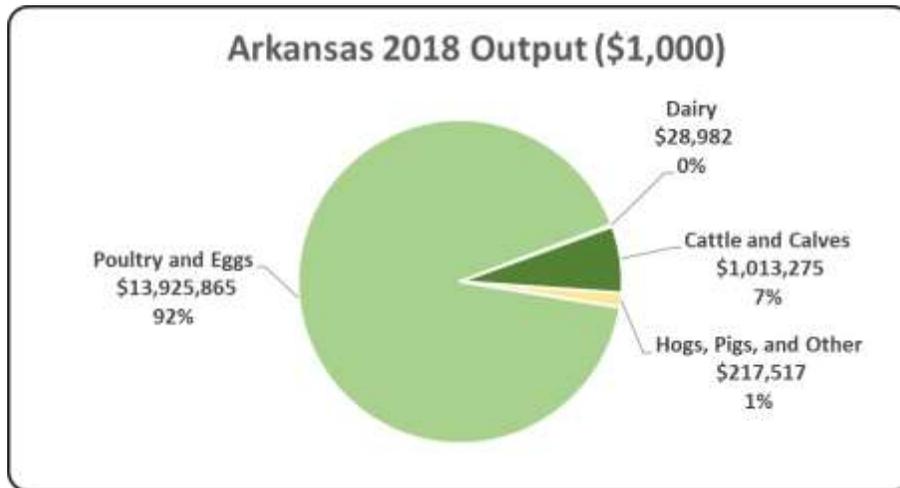
- Increased economic output by \$979.8 million
- Boosted household earnings by \$205.5 million
- Added 4,064 jobs
- Paid an additional \$49.5 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 15,185,638	\$ 979,762	6.90%
Earnings (\$1,000)	\$ 3,202,098	\$ 205,531	6.86%
Employment (Jobs)	69,935	4,064	6.17%
Income Taxes Paid (\$1,000)	\$ 771,706	\$ 49,533	6.86%
Property Taxes Paid in 2017 (\$1,000)	\$ 100,315		

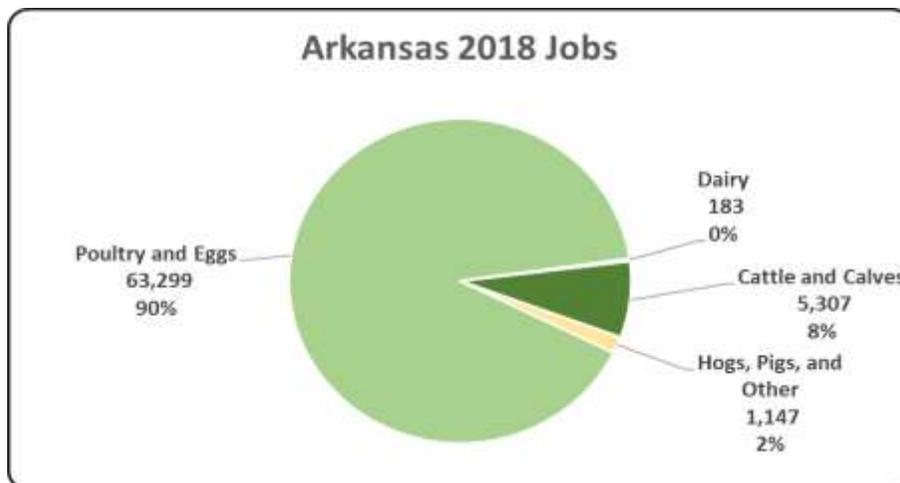
Arkansas Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Arkansas economy. Animal agriculture’s impact on Arkansas total economic output is about \$15.2 billion



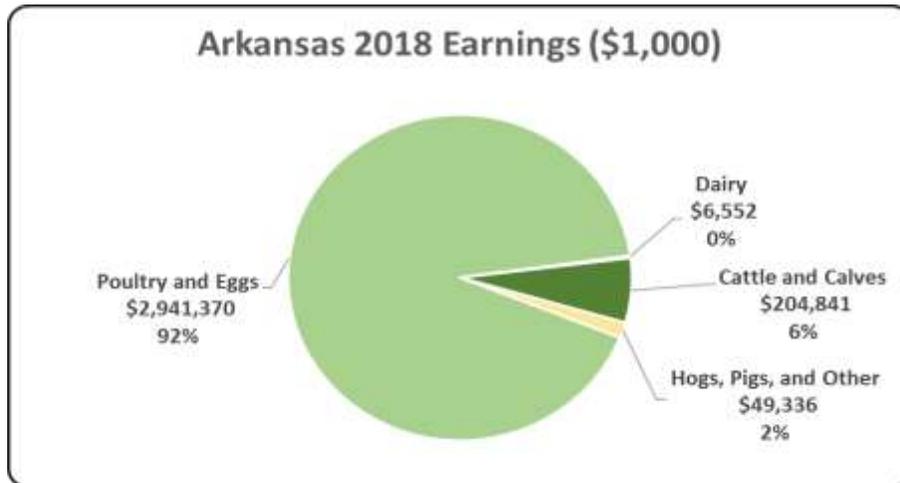
Arkansas Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Arkansas in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Arkansas total jobs, contributing 69,935 jobs within and outside of animal agriculture.



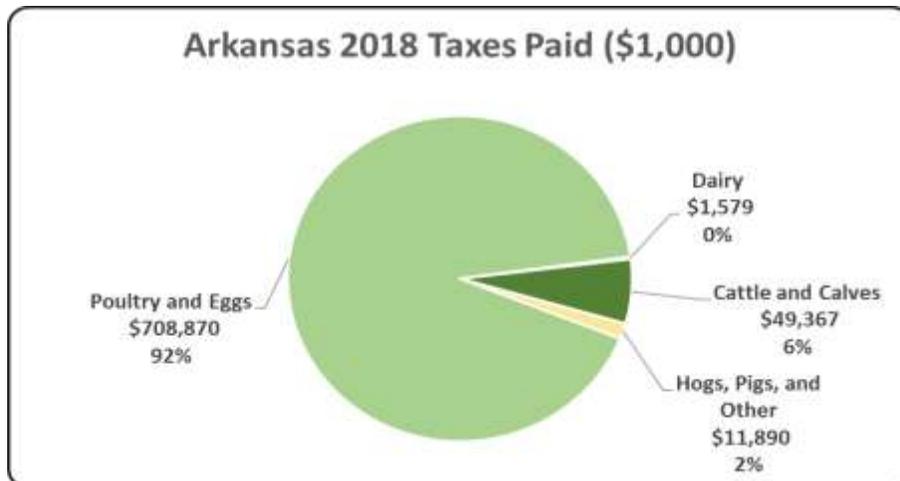
Arkansas Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Arkansas economy in terms of earnings. Arkansas’s animal agriculture contributed about \$3.2 billion to household earnings in 2018.



Arkansas Taxes Paid by Animal Agriculture

Arkansas’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$771.7 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$100.3 million in property taxes paid by all of Arkansas agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



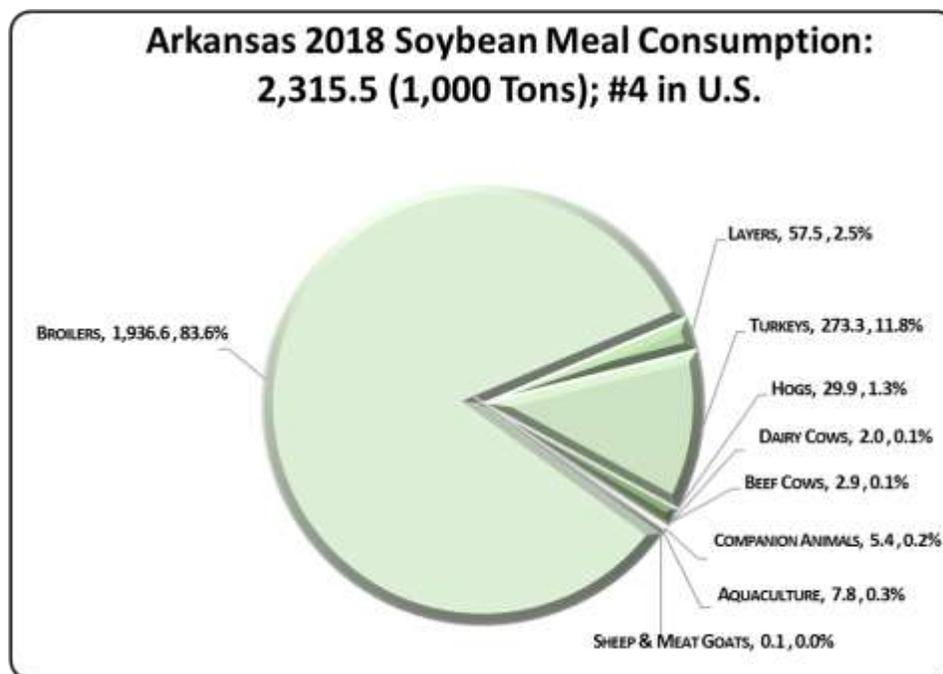
Arkansas Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Arkansas's animal agriculture consumed almost 2.3 million tons of soybean meal in 2018, placing the state as #4 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Arkansas consumed 12.3 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (1.9 million tons)
2. Turkeys (273.3 thousand tons)
3. Egg-Laying Hens (57.5 thousand tons)

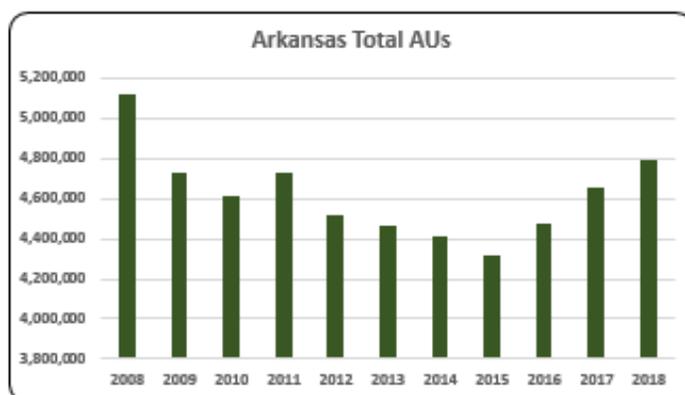
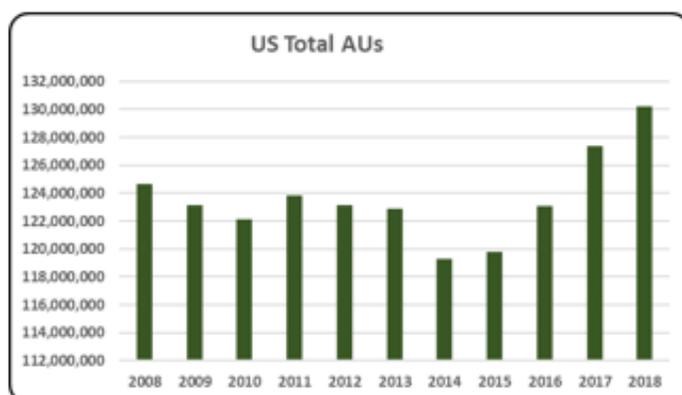


Arkansas Animal Unit (AU) Trends

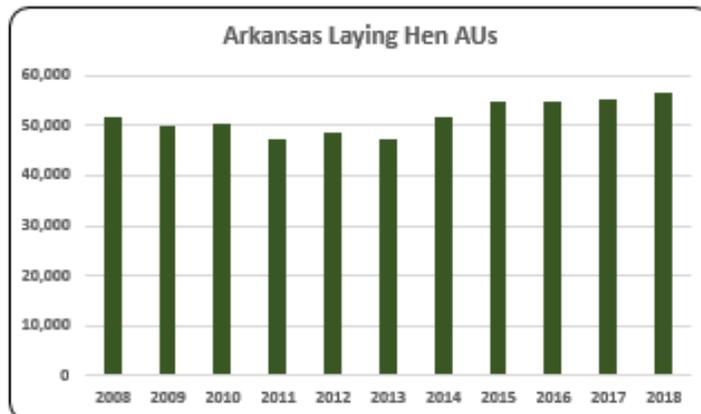
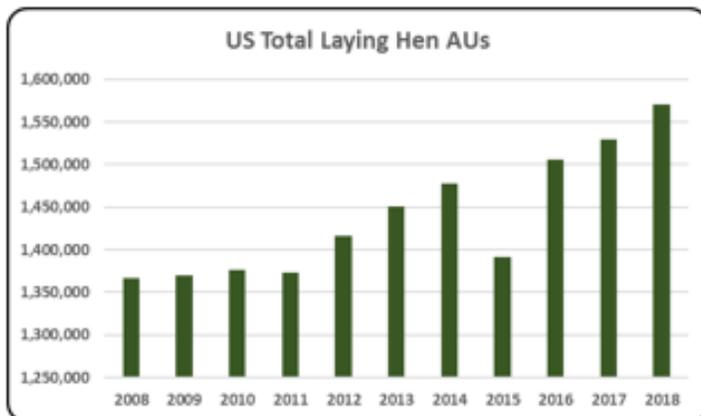
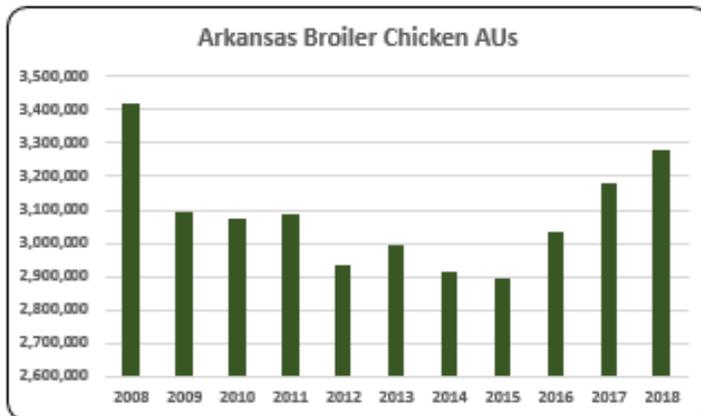
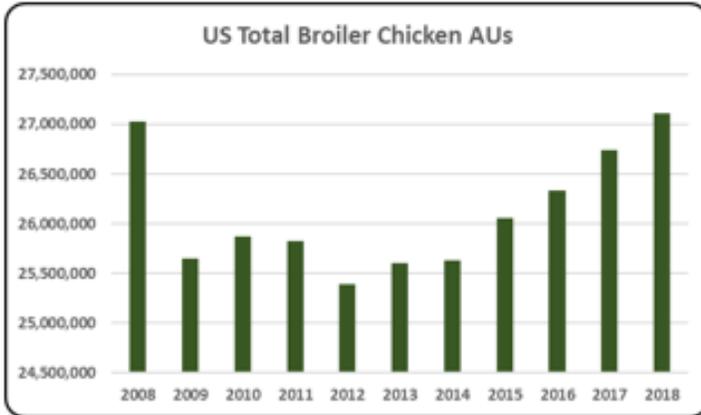
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Arkansas. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Arkansas and to give perspective on Arkansas's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

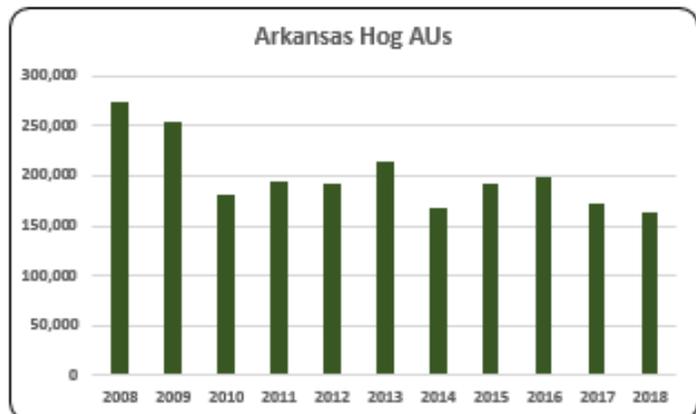
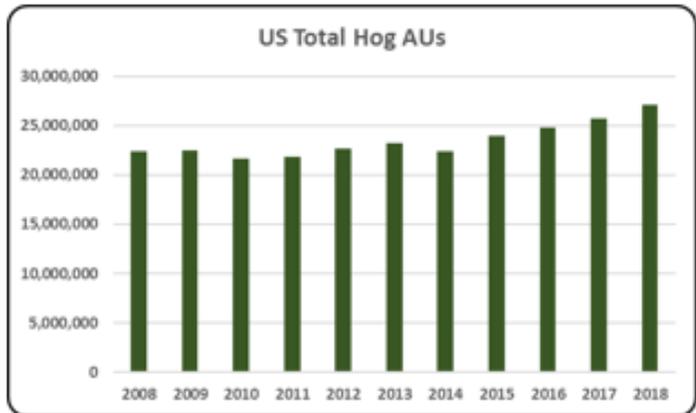
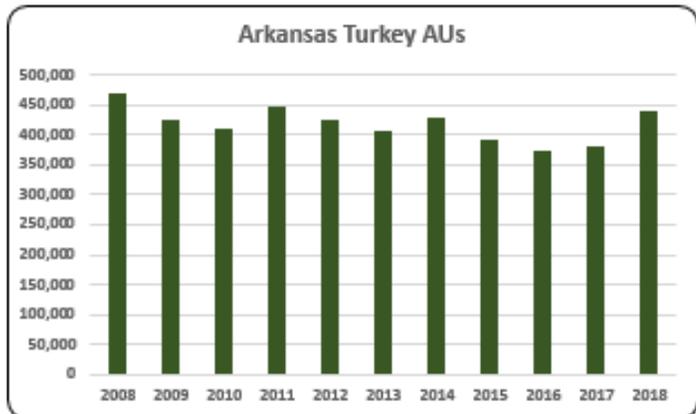
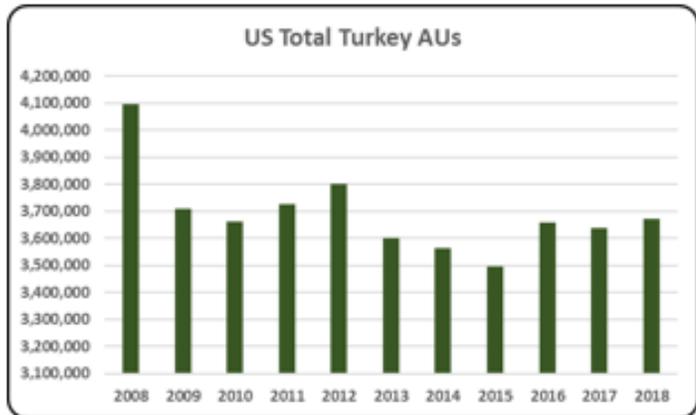
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Arkansas, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (3.3 million AUs), Beef Cows (837,750 AUs), and Turkeys (440,023 AUs). Total animal units in Arkansas during 2018 were 4.8 million AUs.



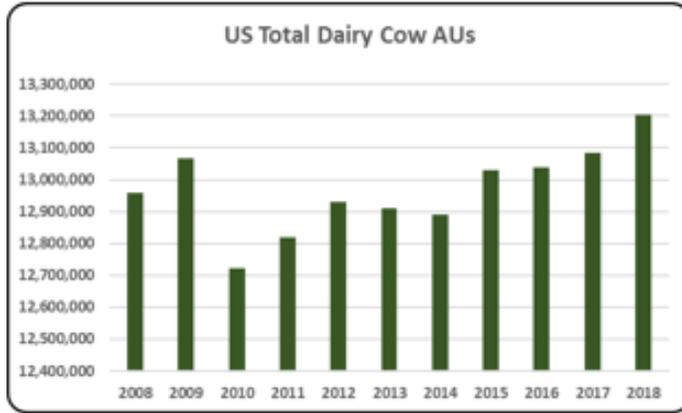
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 3.7% (4.8 million AUs) of the total U.S. AUs were in Arkansas in 2018. Overall AUs in Arkansas have decreased from ten years ago by 6.5% (334,421 AUs) from 5.1 million AUs in 2008 to 4.8 million AUs in 2018.



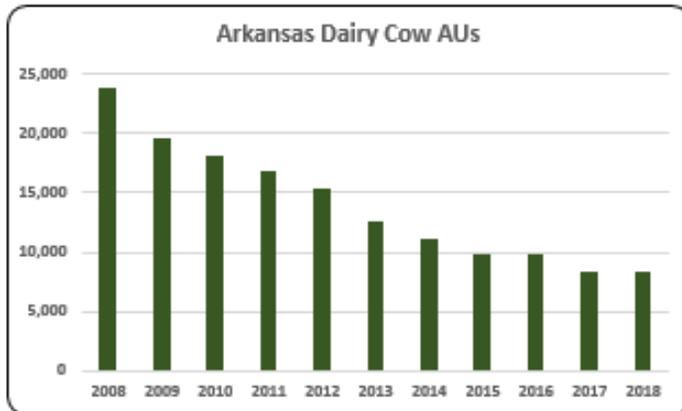
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler chickens are the largest animal sector in Arkansas in terms of animal units, representing about 68.5% (3.3 million) of all AUs in the Arkansas in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Arkansas layer AUs rose to 56,720 in 2018. Layer AUs increased by 7.3% (4,994 AUs) from 2008 to 2018.



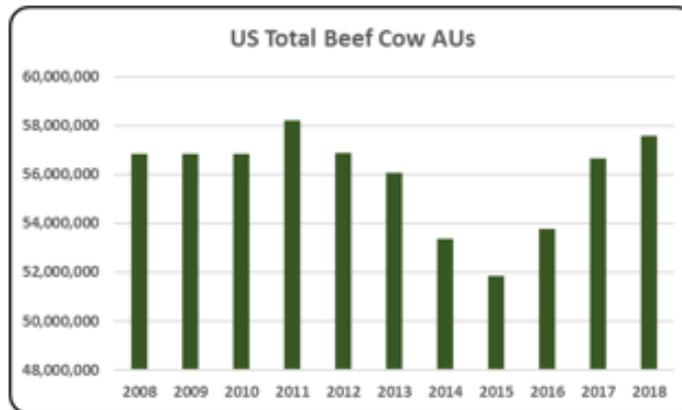
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs in 2018 were at a total of 440,023. The average number of turkey AUs in the last decade was 418,222 AUs. Year-over-year from 2017 to 2018 Arkansas turkey AUs increased by 16.0% (60,823 AUs).
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs increased to 164,550 AUs in 2018. This is a 40.0% decrease in hog AUs compared to 2008. Overall, hog AUs represented 3.4% of all AUs in the state.



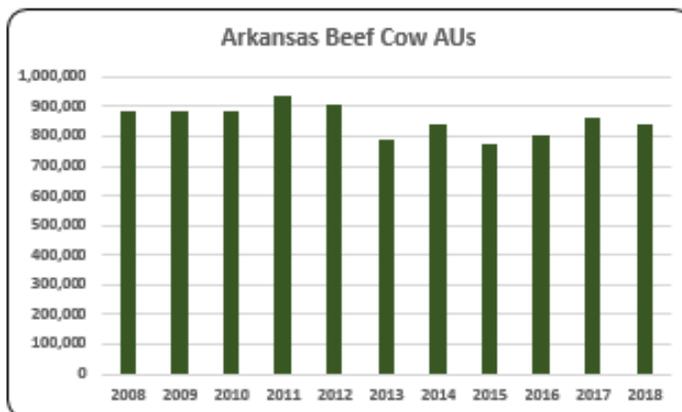
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Dairy cow AUs have consistently decreased throughout the past decade from 23,800 in 2008 to 8,400 in 2018 or 64.7%.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Arkansas' beef cows are the second largest animal unit sector in the state with an average of 854,441 beef cow AUs during the last ten years (2008-2018).

Arkansas Additional Information and Methodology

Animal agriculture is an important part of Arkansas's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Arkansas, of interest is the degree to which the industry impacts the Arkansas economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Arkansas animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Arkansas's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Arkansas which have occurred. As shown in this state report, Arkansas has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Arkansas. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Arkansas Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Arkansas's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Arkansas, \$1.69 to \$2.83 million in total economic activity, \$0.38 to \$0.60 in household wages and 9 to 15 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.439	\$ 0.493	12.8
	Hogs, Pigs, and Other	\$ 1.690	\$ 0.383	8.9
	Poultry and Eggs	\$ 2.830	\$ 0.598	12.9
	Dairy	\$ 2.304	\$ 0.521	14.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	884,250	884,250	884,250	936,150	904,200	789,000	838,950	773,850	806,700	859,500	837,750
	Hog and Pig AUs	274,500	255,000	181,800	193,800	192,600	214,650	168,450	191,400	198,450	172,950	164,550
	Broiler AUs	3,420,365	3,092,179	3,070,820	3,086,550	2,933,648	2,994,828	2,915,668	2,891,365	3,033,768	3,182,805	3,281,843
	Turkey AUs	469,365	426,371	411,077	447,108	425,034	406,563	429,965	392,999	372,743	379,199	440,023
	Egg Layer AUs	51,727	50,076	50,448	47,288	48,544	47,250	51,943	54,905	54,916	55,185	56,720
	Dairy AUs	23,800	19,600	18,200	16,800	15,400	12,600	11,200	9,800	9,800	8,400	8,400
	Total Animal Units	5,124,007	4,727,476	4,616,595	4,727,696	4,519,426	4,464,891	4,416,175	4,314,319	4,476,377	4,658,039	4,789,287
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 423,360	\$ 415,817	\$ 432,186	\$ 486,144	\$ 485,745	\$ 474,912	\$ 612,860	\$ 635,468	\$ 432,994	\$ 450,154	\$ 415,498
	Hogs and Pigs (\$1,000)	\$ 89,283	\$ 75,690	\$ 80,809	\$ 95,731	\$ 79,885	\$ 104,985	\$ 82,975	\$ 69,971	\$ 64,682	\$ 57,388	\$ 56,311
	Broilers (\$1,000)	\$ 2,934,800	\$ 2,641,460	\$ 2,861,875	\$ 2,687,720	\$ 2,879,200	\$ 3,628,889	\$ 3,831,300	\$ 3,312,358	\$ 3,136,206	\$ 3,802,234	\$ 4,089,868
	Turkeys (\$1,000)	\$ 335,121	\$ 254,424	\$ 309,372	\$ 394,705	\$ 400,718	\$ 357,896	\$ 452,684	\$ 456,934	\$ 432,587	\$ 336,201	\$ 303,629
	Eggs (\$1,000)	\$ 427,404	\$ 372,702	\$ 366,173	\$ 406,514	\$ 438,769	\$ 454,913	\$ 490,121	\$ 572,449	\$ 485,411	\$ 479,956	\$ 527,651
	Milk (\$1,000)	\$ 37,014	\$ 22,110	\$ 26,163	\$ 29,601	\$ 24,472	\$ 21,840	\$ 24,480	\$ 16,471	\$ 13,280	\$ 14,773	\$ 12,580
	Other	\$ 92,340	\$ 86,209	\$ 80,185	\$ 73,977	\$ 67,871	\$ 68,703	\$ 69,429	\$ 70,223	\$ 70,950	\$ 71,706	\$ 72,435
	Sheep and Lambs (\$1,000)	\$ 265	\$ 289	\$ 421	\$ 369	\$ 418	\$ 516	\$ 509	\$ 569	\$ 563	\$ 585	\$ 581
	Aquaculture (\$1,000)	\$ 92,075	\$ 85,920	\$ 79,764	\$ 73,609	\$ 67,453	\$ 68,187	\$ 68,920	\$ 69,654	\$ 70,387	\$ 71,121	\$ 71,855
	Total (\$1,000)	\$ 4,339,322	\$ 3,868,412	\$ 4,156,762	\$ 4,174,392	\$ 4,376,660	\$ 5,112,138	\$ 5,563,849	\$ 5,133,874	\$ 4,636,110	\$ 5,212,412	\$ 5,477,972

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	23,888	22,854	22,009	21,319	
	Cattle feedlots (112112)	781	65	3	-	
	Dairy cattle and milk production (11212)	348	291	106	64	
	Hog and pig farming (1122)	444	396	228	277	
	Poultry and egg production (1123)	4,737	4,212	3,298	3,127	
	Sheep and goat farming (1124)	419	775	1,111	1,315	
	Animal aquaculture and other animal production (1125,1129)	4,406	4,922	4,148	3,612	
Value of Sales (\$1,000)	Cattle and Calves	421,226	625,996	766,476	737,961	
	Hogs and Pigs	123,803	84,202	47,178	69,438	
	Poultry and Eggs	2,617,592	3,716,164	4,011,725	5,112,242	
	Milk*			28,225	15,515	
	Aquaculture	92,638	118,744	67,453	71,121	
	Other (calculated)	20,706	17,957	8,123	19,953	
	Total	3,275,965	4,563,063	4,929,180	6,026,230	
Input Purchases	Livestock and poultry purchased	(Farms)	15,183	12,921	12,996	14,200
		\$1,000	515,620	828,459	891,909	1,006,252
	Breeding livestock purchased	(Farms)	8,543	7,012	7,686	9,065
		\$1,000	22,752	49,799	108,357	208,808
	Other livestock and poultry purchased	(Farms)	8,638	7,713	7,155	7,440
		\$1,000	492,868	778,660	783,552	797,444
Feed purchased	(Farms)	34,143	30,394	32,540	31,653	
	\$1,000	1,250,849	2,023,611	2,617,016	2,134,507	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,013,275	\$ 204,841	5,307	\$ 49,367
	Hogs, Pigs, and Other	\$ 217,517	\$ 49,336	1,147	\$ 11,890
	Poultry and Eggs	\$ 13,925,865	\$ 2,941,370	63,299	\$ 708,870
	Dairy	\$ 28,982	\$ 6,552	183	\$ 1,579
	Total	\$ 15,185,638	\$ 3,202,098	69,935	\$ 771,706
Change from 2008 to 2018	Cattle and Calves	\$ (220,552)	\$ (44,586)	(1,155)	\$ (10,745)
	Hogs, Pigs, and Other	\$ (149,187)	\$ (33,837)	(787)	\$ (8,155)
	Poultry and Eggs	\$ 1,422,424	\$ 300,439	6,466	\$ 72,406
	Dairy	\$ (72,924)	\$ (16,485)	(459)	\$ (3,973)
	Total	\$ 979,762	\$ 205,531	4,064	\$ 49,533
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.439	\$ 0.493	12.8	
	Hogs, Pigs, and Other	\$ 1.690	\$ 0.383	8.9	
	Poultry and Eggs	\$ 2.830	\$ 0.598	12.9	
	Dairy	\$ 2.304	\$ 0.521	14.5	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.9%	
	Total			24.1%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: CALIFORNIA

California Executive Summary

The use of soybean meal as a key feed ingredient is an important part of California animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture success in the State of California. The success of California animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of California during 2018:

- \$19.5 billion in economic output
- 89,348 jobs
- \$4.5 billion in earnings
- \$1.2 billion in income taxes paid at local, state, and federal levels
- \$1.1 billion in the form of property taxes

California's animal agriculture consumed almost 907.5 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (574.5 thousand tons)
- Egg-Laying Hens (129.4 thousand tons)
- Turkeys (101.0 thousand tons)

This report examines animal agriculture in California over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in California, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of California and beyond.

California Economic Impact of Animal Agriculture

Animal agriculture is an important part of California's economy. In 2018, California's animal agriculture contributed the following to the economy:

- About \$19.5 billion in economic output
- \$4.5 billion in household earnings
- 89,348 jobs
- \$1.2 billion in income taxes

During the last decade, contractions in California's animal agriculture has:

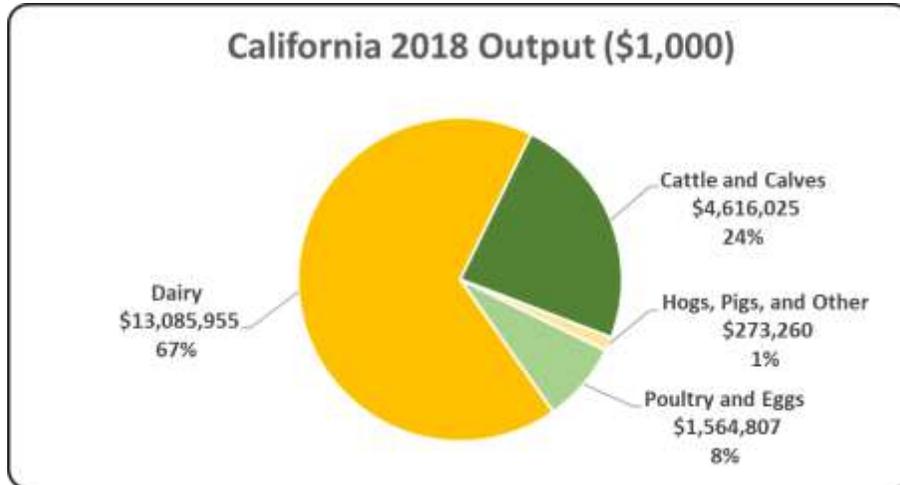
- Decreased economic output by \$2.6 billion
- Reduced household earnings by \$676.9 million
- Shrunk by 13,871 jobs
- Paid \$185.1 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 19,540,046	\$ (2,648,100)	-11.93%
Earnings (\$1,000)	\$ 4,511,787	\$ (676,854)	-13.04%
Employment (Jobs)	89,348	(13,871)	-13.44%
Income Taxes Paid (\$1,000)	\$ 1,233,974	\$ (185,120)	-13.04%
Property Taxes Paid in 2017 (\$1,000)	\$ 1,126,718		

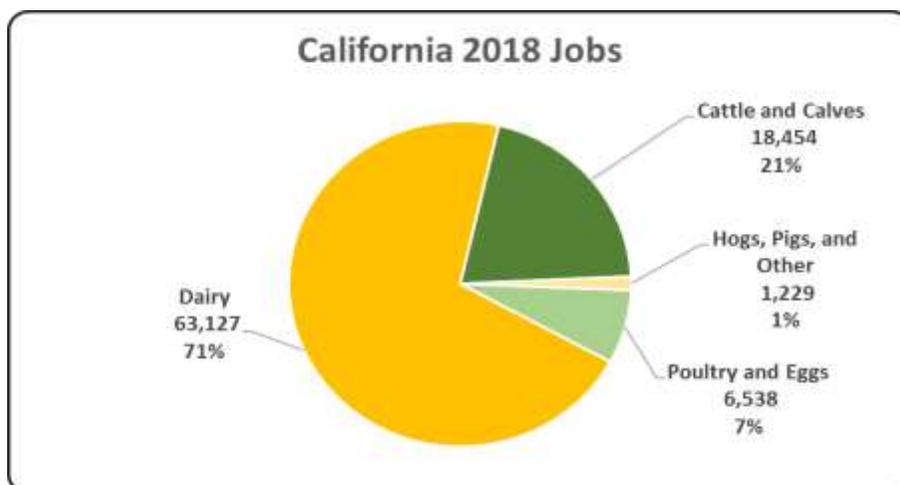
California Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the California economy. Animal agriculture’s impact on California total economic output is about \$19.5 billion.



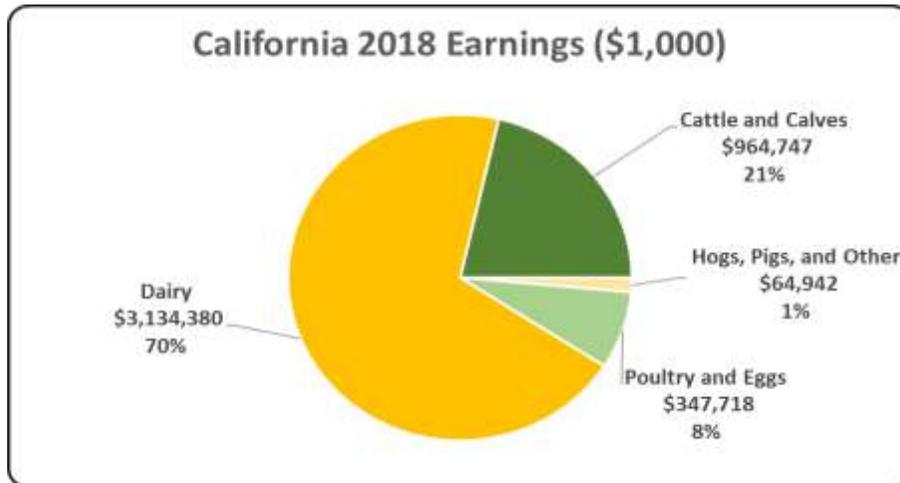
California Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to California in terms of animal agriculture jobs. As shown, animal agriculture contributes 89,348 jobs within and outside of animal agriculture.



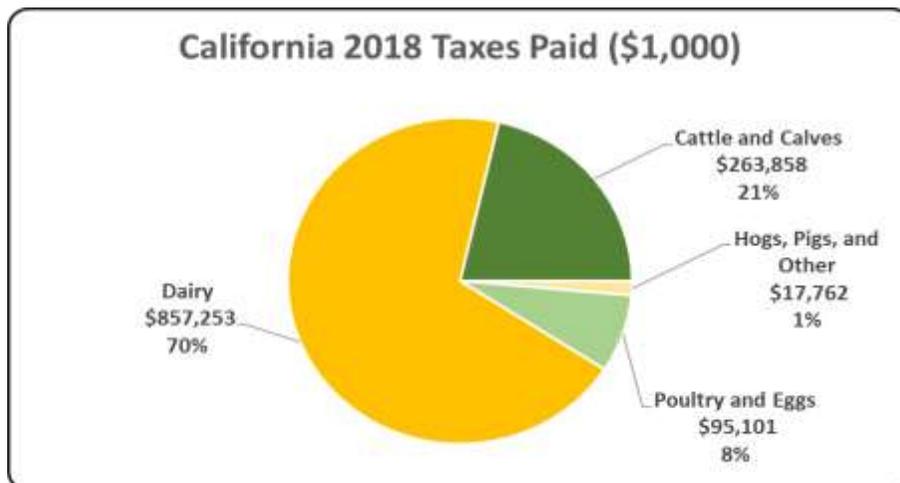
California Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the California economy in terms of earnings. California’s animal agriculture contributed about \$4.5 billion to household earnings in 2018.



California Taxes Paid by Animal Agriculture

California’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$1.2 billion in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$1.1 billion in property taxes paid by all of California agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



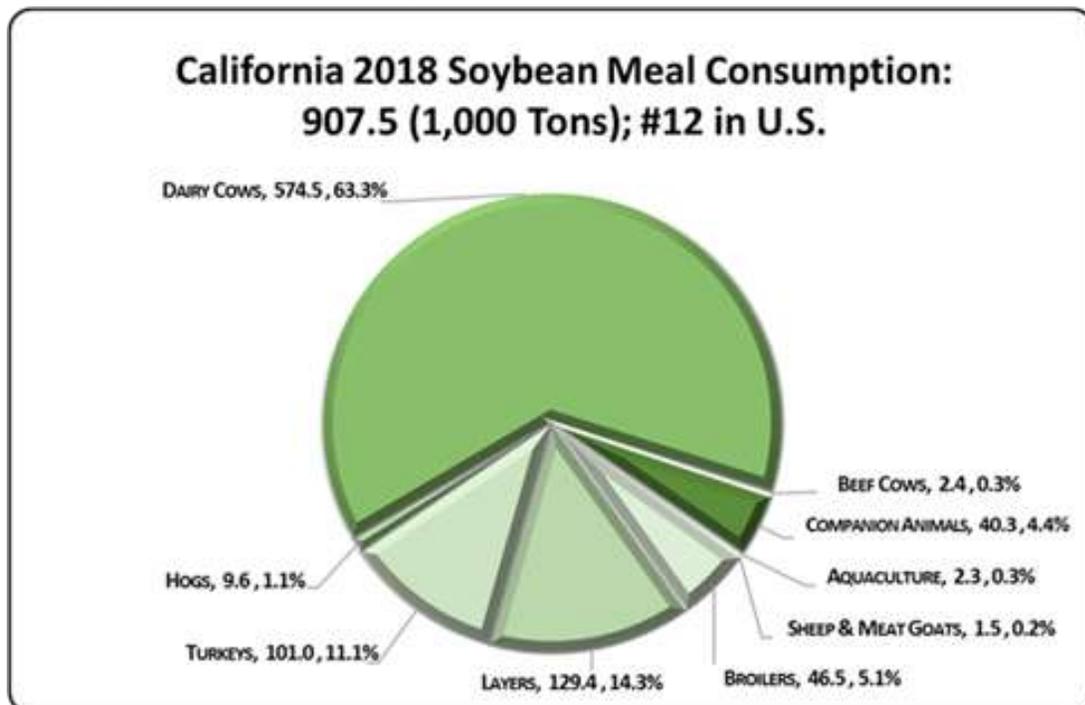
California Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

California's animal agriculture consumed almost 907.5 thousand tons of soybean meal in 2018, placing the state as #12 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in California consumed 66.7 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (574.5 thousand tons)
2. Egg-Laying Hens (129.4 thousand tons)
3. Turkeys (101.0 thousand tons)

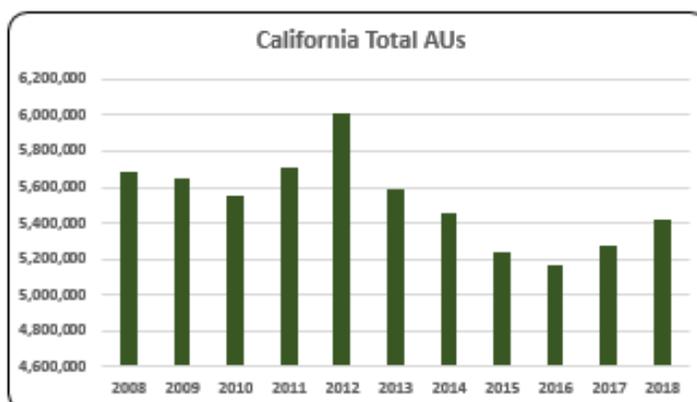
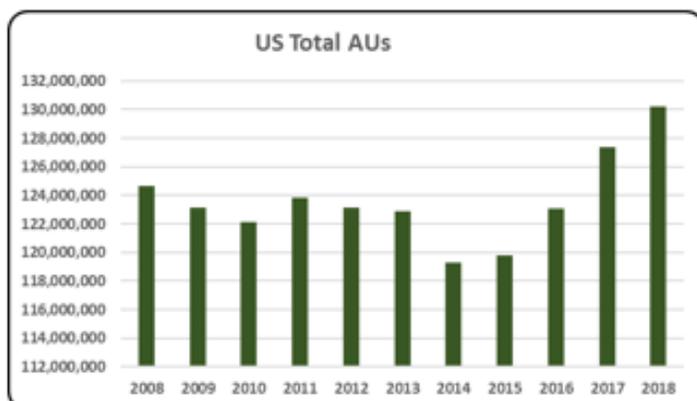


California Animal Unit (AU) Trends

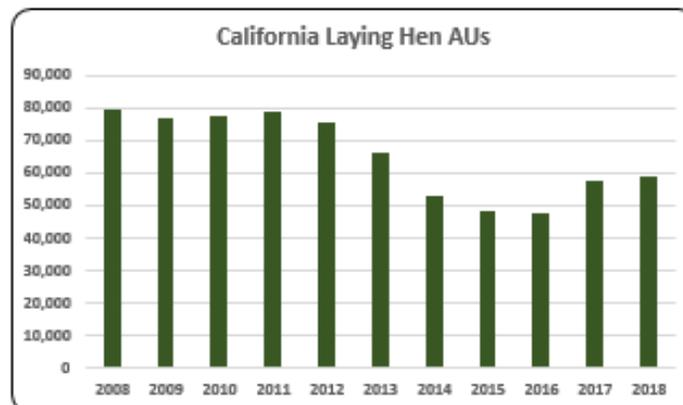
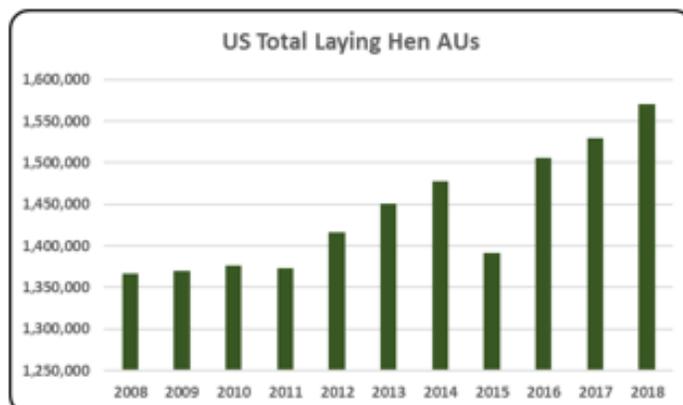
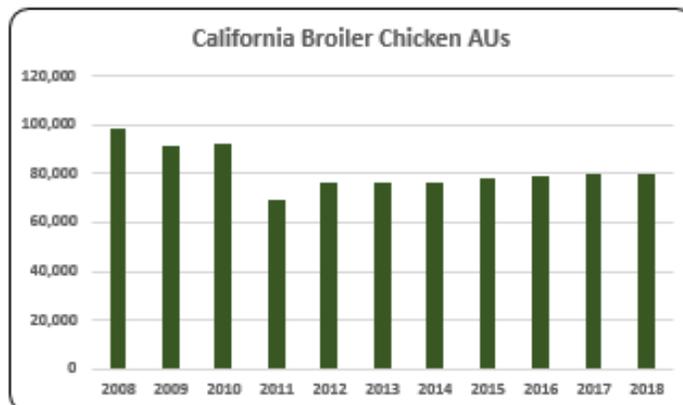
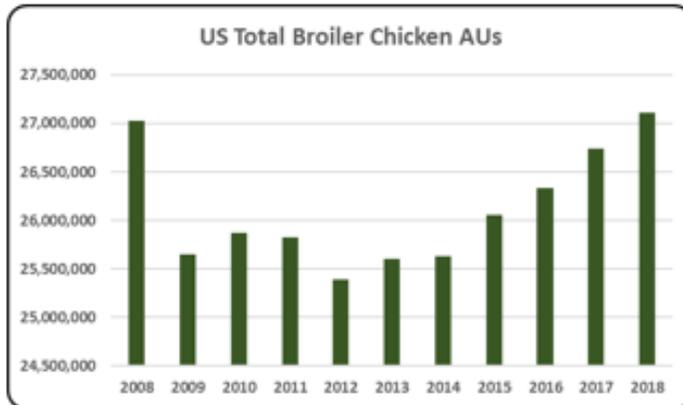
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of California. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to California and to give perspective on California's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

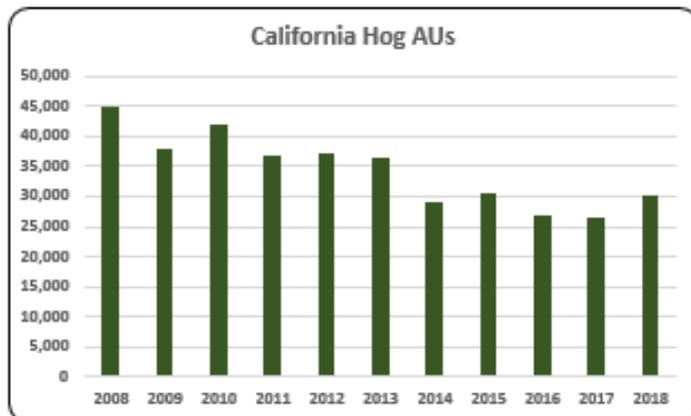
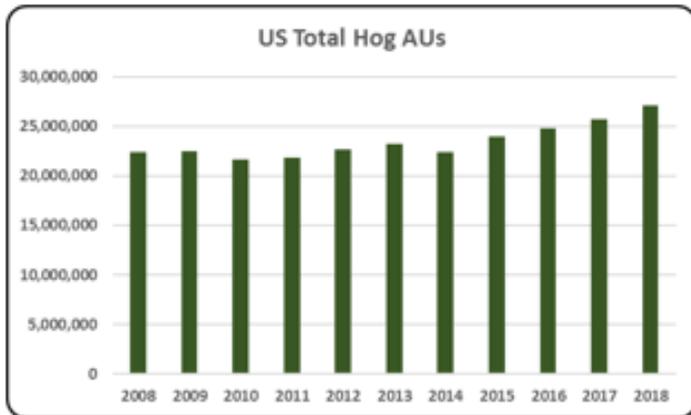
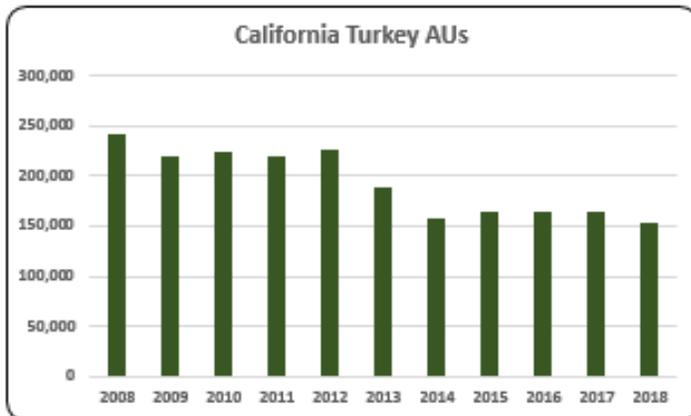
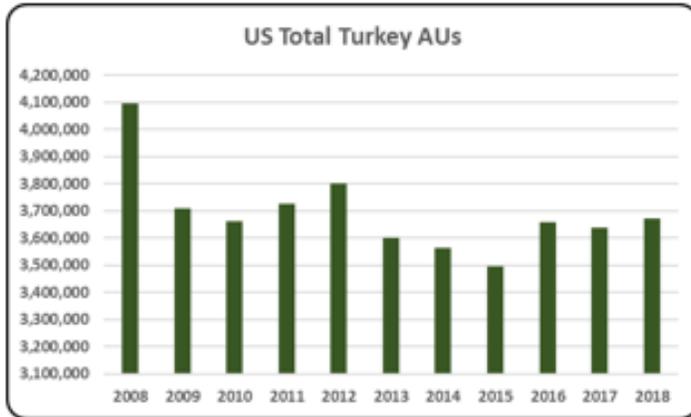
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In California, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (2.7 million AUs), Dairy Cows (2.4 million AUs), and Turkeys (153,659 AUs). Total animal units in California during 2018 were 5.4 million AUs.



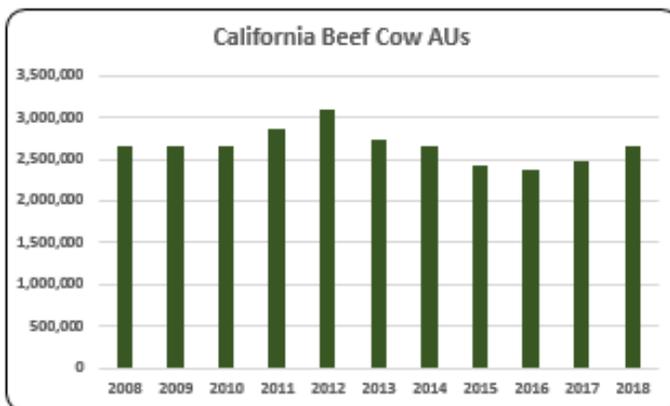
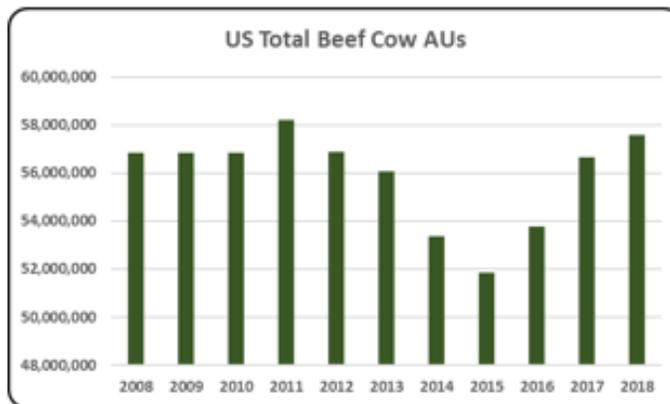
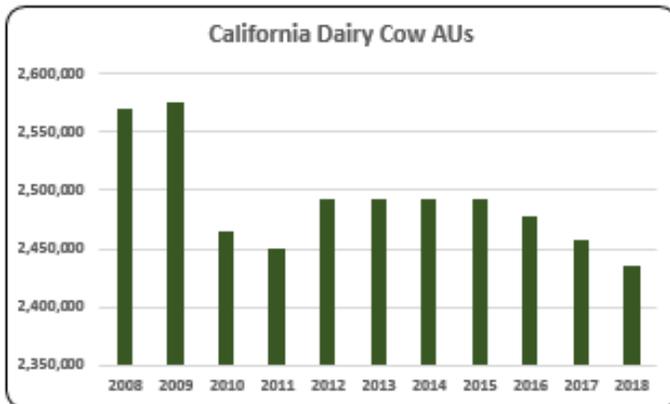
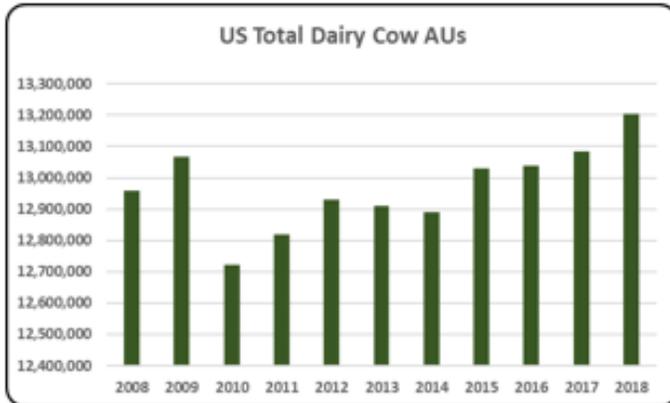
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- California's total AUs in 2018 reached 5.4 million. From 2008 to 2018 AUs in California averaged 5.5 million (3.7% of total U.S. AUs).



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Over the last decade from 2008-2018 there were, on average, 81,586 broiler AUs in California. Overall, broiler numbers in California declined compared to 2008, but broiler AUs over the last four years have been stable between 76,000 and 80,000 AUs, with 2018 having 79,825 broiler AUs.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In 2018, there were 59,292 layer AUs in California. Layer AUs decreased from 2008 to 2018 by 25.6% (20,404 AUs).



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- There were 153,659 turkey AUs in California in 2018 which was a 6.6% (10,899 AUs) decrease from 2017. Turkey AUs decreased 36.6% since 2008.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- California’s hog AUs increased to 30,300 AUs from 2017 which was the lowest of the decade.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- California had 18.5% (2.4 million AUs) of all dairy cow AUs in the U.S. (45.0% of California state AUs) in 2018; however, California’s dairy cow AUs in 2018 (2.4 million) was lower than in 2008 by (133,000 AUs).
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- California’s beef cow AUs in 2018 was 2.7 million AUs. Beef cow AUs averaged 2.7 million AUs for the past decade.

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Animal agriculture is an important part of California's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

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	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.851	\$ 0.387	7.4
	Hogs, Pigs, and Other	\$ 1.600	\$ 0.380	7.2
	Poultry and Eggs	\$ 2.090	\$ 0.464	8.7
	Dairy	\$ 2.052	\$ 0.492	9.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	2,650,500	2,650,500	2,650,500	2,852,250	3,103,050	2,722,650	2,651,850	2,419,350	2,374,350	2,484,600	2,660,100
	Hog and Pig AUs	45,000	37,950	42,000	36,900	37,350	36,600	29,100	30,600	27,000	26,550	30,300
	Broiler AUs	98,188	91,292	92,520	69,714	76,801	76,533	76,098	78,063	78,646	79,773	79,825
	Turkey AUs	242,253	220,537	223,156	219,889	227,173	188,761	157,654	164,345	163,433	164,558	153,659
	Egg Layer AUs	79,697	77,092	77,372	78,876	75,882	66,470	53,160	48,529	48,000	57,638	59,292
	Dairy AUs	2,569,000	2,576,000	2,464,000	2,450,000	2,492,000	2,492,000	2,492,000	2,492,000	2,478,000	2,457,000	2,436,000
	Total Animal Units	5,684,638	5,653,371	5,549,548	5,707,629	6,012,256	5,583,014	5,459,861	5,232,887	5,169,429	5,270,119	5,419,176
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,369,626	\$ 1,097,174	\$ 1,318,469	\$ 2,005,694	\$ 2,319,343	\$ 2,275,348	\$ 2,582,099	\$ 2,461,234	\$ 2,003,012	\$ 2,075,234	\$ 2,493,531
	Hogs and Pigs (\$1,000)	\$ 26,177	\$ 18,979	\$ 23,925	\$ 28,859	\$ 24,991	\$ 21,269	\$ 20,110	\$ 29,667	\$ 24,311	\$ 25,635	\$ 18,019
	Broilers (\$1,000)	\$ 78,642	\$ 67,851	\$ 70,907	\$ 62,078	\$ 76,525	\$ 93,245	\$ 97,821	\$ 85,340	\$ 75,878	\$ 89,099	\$ 82,955
	Turkeys (\$1,000)	\$ 243,005	\$ 181,552	\$ 237,833	\$ 274,105	\$ 295,973	\$ 233,464	\$ 229,449	\$ 275,382	\$ 266,669	\$ 203,818	\$ 162,129
	Eggs (\$1,000)	\$ 440,438	\$ 319,805	\$ 367,788	\$ 387,522	\$ 392,950	\$ 382,690	\$ 422,607	\$ 527,701	\$ 210,160	\$ 267,581	\$ 503,663
	Milk (\$1,000)	\$ 6,930,345	\$ 4,539,929	\$ 5,932,557	\$ 7,687,055	\$ 6,905,525	\$ 7,624,109	\$ 9,365,387	\$ 6,298,138	\$ 6,070,350	\$ 6,566,670	\$ 6,377,171
	Other	\$ 109,747	\$ 118,924	\$ 139,175	\$ 139,661	\$ 157,912	\$ 144,148	\$ 147,520	\$ 159,610	\$ 152,057	\$ 156,579	\$ 152,747
	Sheep and Lambs (\$1,000)	\$ 25,822	\$ 30,226	\$ 45,704	\$ 41,418	\$ 54,896	\$ 40,612	\$ 43,463	\$ 55,033	\$ 46,960	\$ 50,962	\$ 46,610
	Aquaculture (\$1,000)	\$ 83,925	\$ 88,698	\$ 93,471	\$ 98,243	\$ 103,016	\$ 103,536	\$ 104,056	\$ 104,577	\$ 105,097	\$ 105,617	\$ 106,137
	Total (\$1,000)	\$ 9,197,981	\$ 6,344,214	\$ 8,090,653	\$ 10,584,974	\$ 10,173,220	\$ 10,774,273	\$ 12,864,992	\$ 9,837,072	\$ 8,802,437	\$ 9,384,616	\$ 9,790,215

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	11,259	11,153	11,767	10,332
	Cattle feedlots (112112)	553	404	156	97
	Dairy cattle and milk production (11212)	2,361	1,839	1,594	1,321
	Hog and pig farming (1122)	626	425	446	370
	Poultry and egg production (1123)	914	1,798	1,202	856
	Sheep and goat farming (1124)	2,485	3,041	3,246	3,160
	Animal aquaculture and other animal production (1125,1129)	10,035	11,096	7,809	7,067
Value of Sales (\$1,000)	Cattle and Calves	1,582,334	2,536,571	3,259,325	3,111,410
	Hogs and Pigs	27,488	34,188	51,526	31,687
	Poultry and Eggs	1,017,968	1,536,763	1,663,919	1,856,879
	Milk*			6,945,102	6,483,130
	Aquaculture	64,557	102,228	103,016	105,617
	Other (calculated)	152,891	203,121	175,445	211,802
	Total	2,845,238	4,412,871	12,198,333	11,800,525
Input Purchases	Livestock and poultry purchased	(Farms) 10,745	10,881	12,585	16,094
		\$1,000 949,697	1,264,818	1,254,286	1,567,663
	Breeding livestock purchased	(Farms) 6,070	5,951	6,850	6,226
		\$1,000 114,594	186,901	255,730	232,973
	Other livestock and poultry purchased	(Farms) 6,404	6,356	7,673	11,588
		\$1,000 835,104	1,077,917	998,556	1,334,690
Feed purchased	(Farms) 28,663	29,596	30,014	26,540	
	\$1,000 2,494,806	4,274,263	6,069,374	5,127,443	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 4,616,025	\$ 964,747	18,454	\$ 263,858
	Hogs, Pigs, and Other	\$ 273,260	\$ 64,942	1,229	\$ 17,762
	Poultry and Eggs	\$ 1,564,807	\$ 347,718	6,538	\$ 95,101
	Dairy	\$ 13,085,955	\$ 3,134,380	63,127	\$ 857,253
	Total	\$ 19,540,046	\$ 4,511,787	89,348	\$ 1,233,974

Change from 2008 to 2018	Cattle and Calves	\$ 1,586,033	\$ 331,480	6,341	\$ 90,660
	Hogs, Pigs, and Other	\$ 13,330	\$ 3,168	60	\$ 866
	Poultry and Eggs	\$ (338,529)	\$ (75,225)	(1,414)	\$ (20,574)
	Dairy	\$ (3,908,934)	\$ (936,277)	(18,857)	\$ (256,072)
	Total	\$ (2,648,100)	\$ (676,854)	(13,871)	\$ (185,120)

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.851	\$ 0.387	7.4
	Hogs, Pigs, and Other	\$ 1.600	\$ 0.380	7.2
	Poultry and Eggs	\$ 2.090	\$ 0.464	8.7
	Dairy	\$ 2.052	\$ 0.492	9.9

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	7.2%
	Total	27.4%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: COLORADO

Colorado Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Colorado animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Colorado. The success of Colorado animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Colorado during 2018 animal agriculture contributed:

- \$7.4 billion in economic output
- 44,261 jobs
- \$1.6 billion in earnings
- \$400.0 million in income taxes paid at local, state, and federal levels
- \$128.9 million in the form of property taxes

Colorado's animal agriculture consumed almost 295.7 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (121.9 thousand tons)
- Dairy Cows (60.7 thousand tons)
- Broilers (40.9 thousand tons)

This report examines animal agriculture in Colorado over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Colorado, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Colorado and beyond.

Colorado Economic Impact of Animal Agriculture

Animal agriculture is a moderate part of Colorado's economy. In 2018, Colorado's animal agriculture contributed the following to the economy:

- About \$7.4 billion in economic output
- \$1.6 billion in household earnings
- 44,261 jobs
- \$400.0 million in income taxes

During the last decade, Colorado's animal agriculture has:

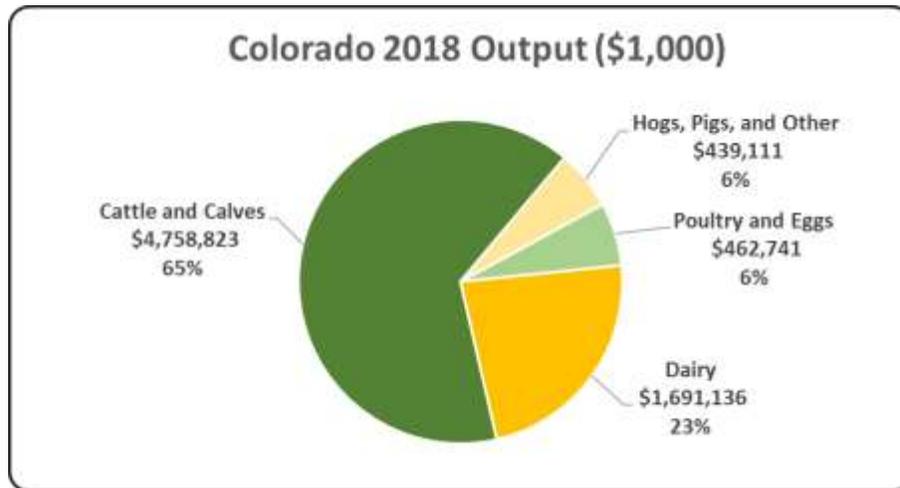
- Decreased economic output by \$24.6 million
- Boosted household earnings by \$900,000
- Added 33 jobs
- Paid an additional \$213,000 in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 7,351,812	\$ (24,570)	-0.33%
Earnings (\$1,000)	\$ 1,610,964	\$ 856	0.05%
Employment (Jobs)	44,261	33	0.07%
Income Taxes Paid (\$1,000)	\$ 400,002	\$ 213	0.05%
Property Taxes Paid in 2017 (\$1,000)	\$ 128,913		

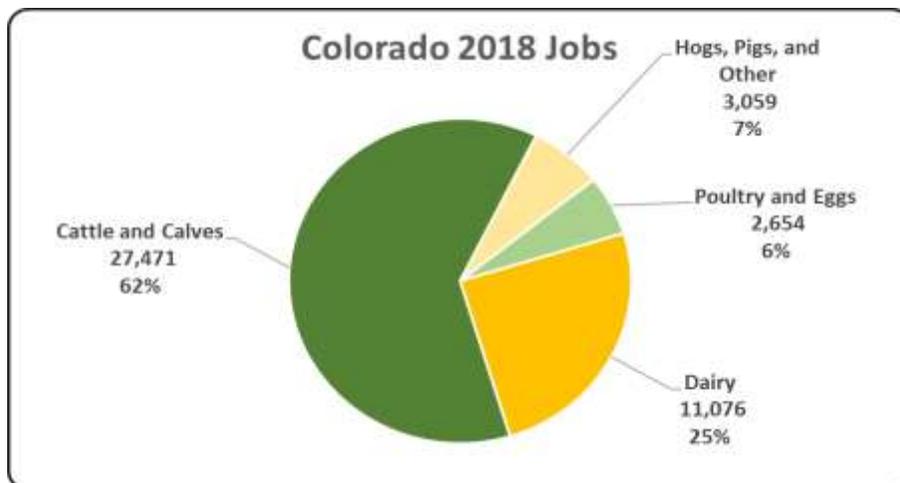
Colorado Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Colorado economy. Animal agriculture’s impact on Colorado total economic output is about \$7.4 billion.



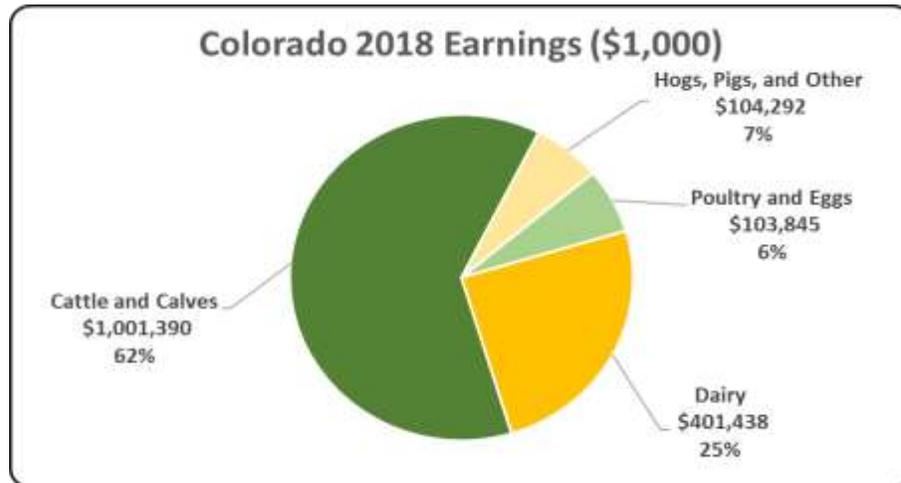
Colorado Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Colorado in terms of animal agriculture jobs. As shown, animal agriculture contributes 44,261 jobs within and outside of animal agriculture.



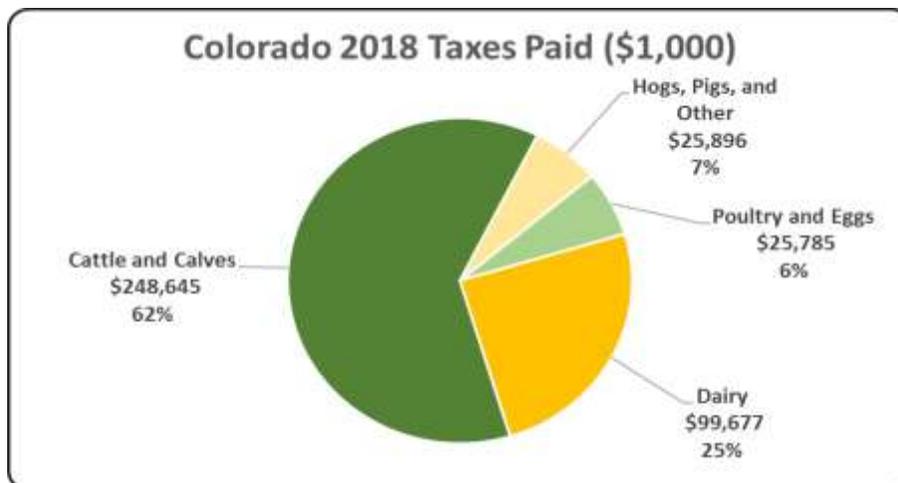
Colorado Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Colorado economy in terms of earnings. Colorado’s animal agriculture contributed about \$1.6 billion to household earnings in 2018.



Colorado Taxes Paid by Animal Agriculture

Colorado’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$400.0 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$128.9 million in property taxes paid by all of Colorado agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



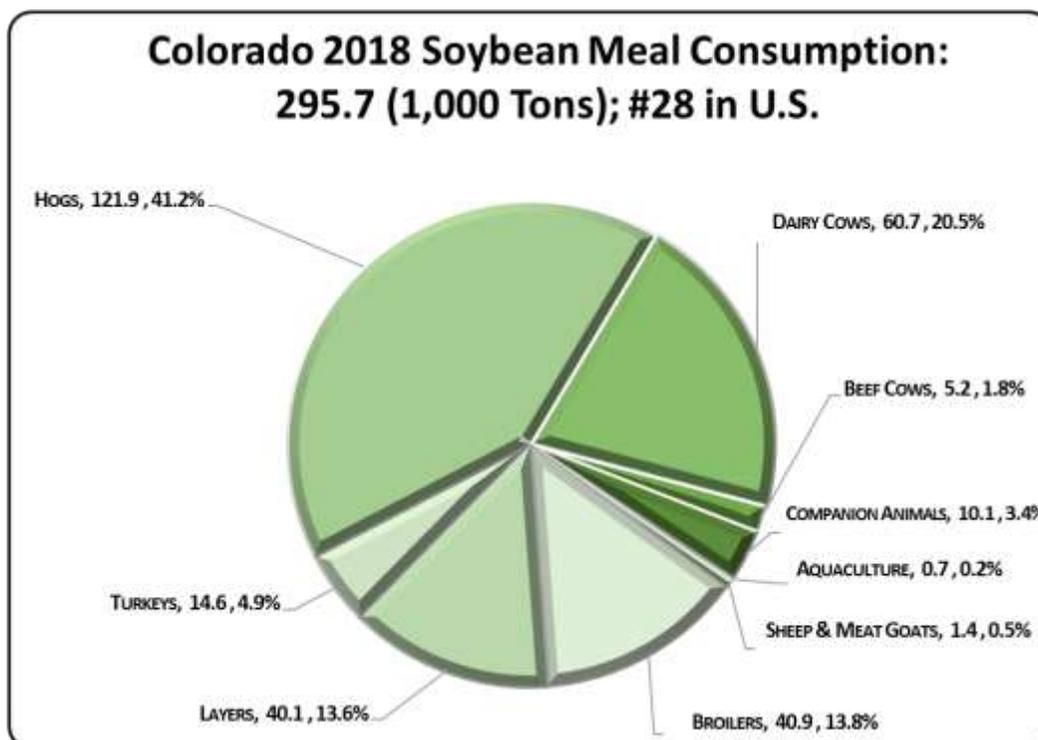
Colorado Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Colorado's animal agriculture consumed almost 295.7 thousand tons of soybean meal in 2018, placing the state as #28 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Colorado consumed 35.1 thousand tons. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (121.9 thousand tons)
2. Dairy Cows (60.7 thousand tons)
3. Broilers (40.9 thousand tons)

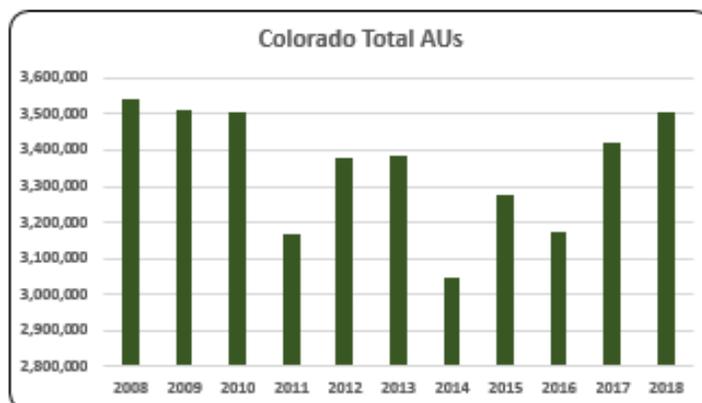
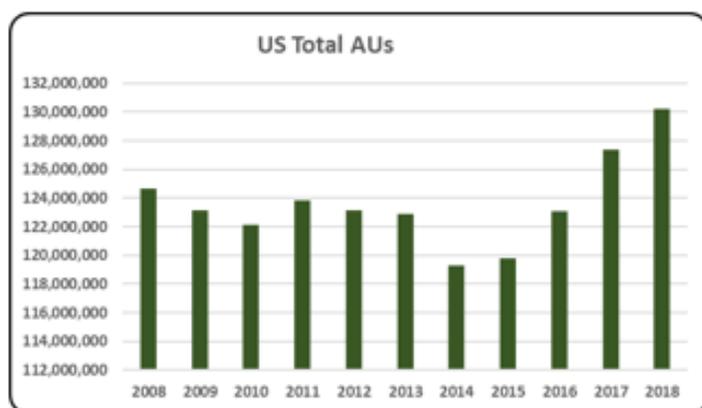


Colorado Animal Unit (AU) Trends

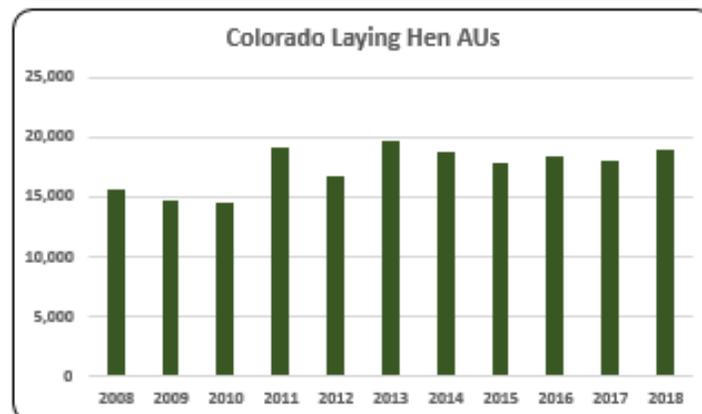
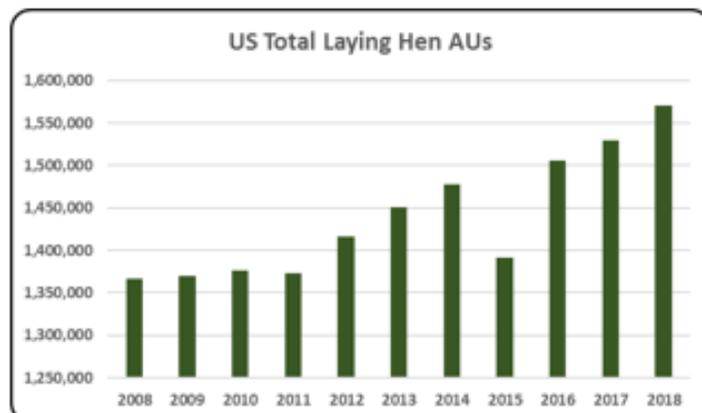
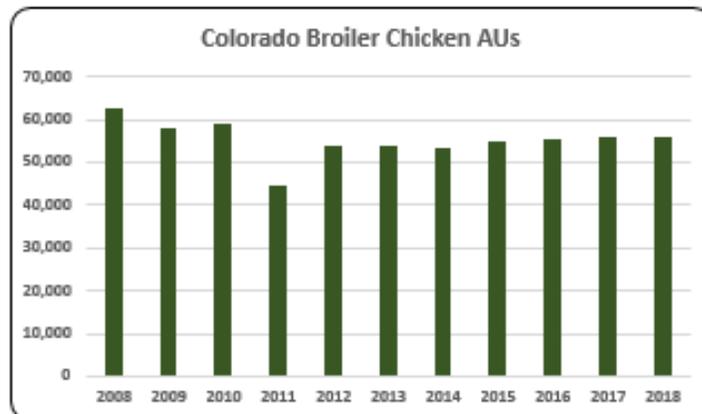
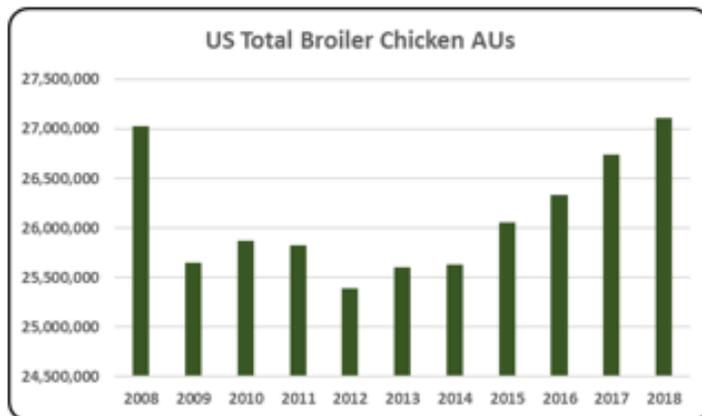
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Colorado. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Colorado and to give perspective on Colorado's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

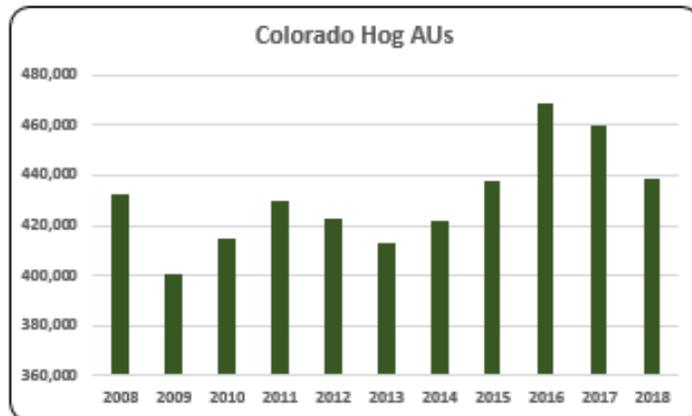
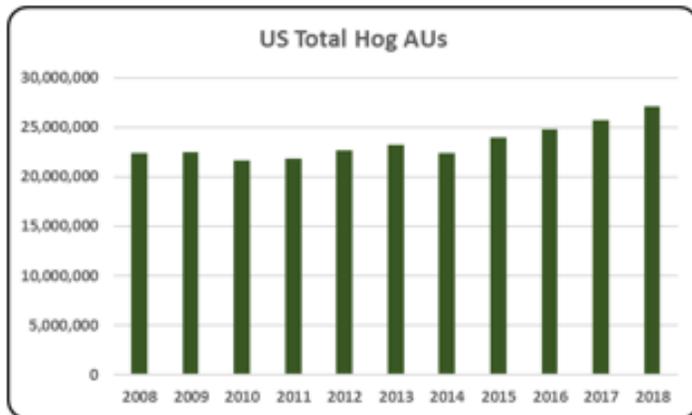
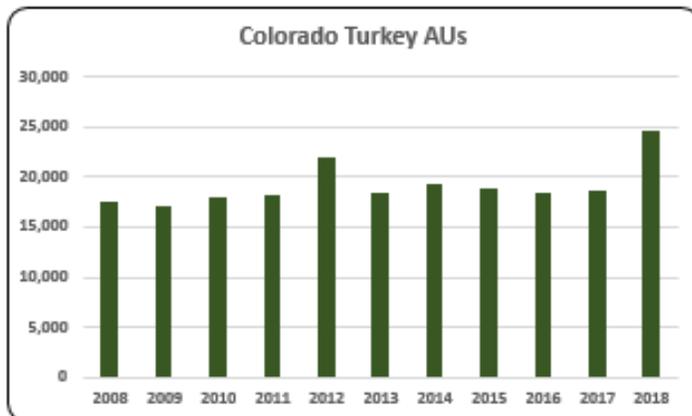
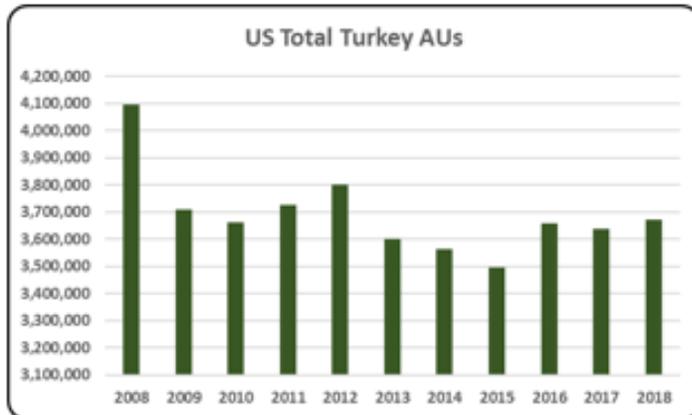
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Colorado, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (2.7 million AUs), Hogs (438,750 AUs), and Dairy Cows (235,200 AUs). Total animal units in Colorado during 2018 were 3.5 million AUs.



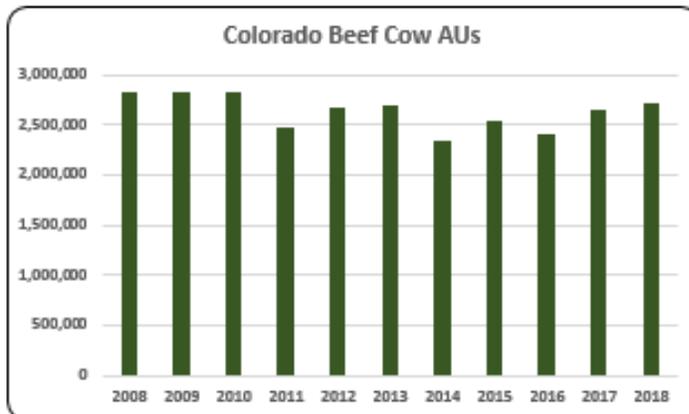
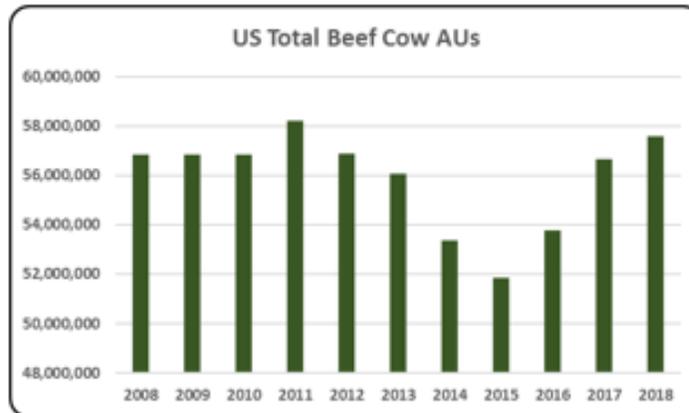
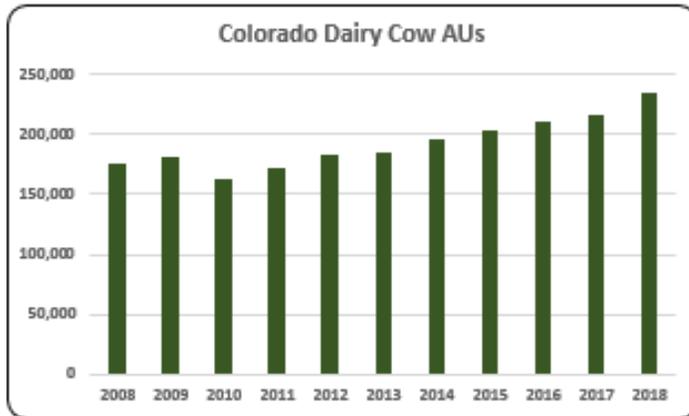
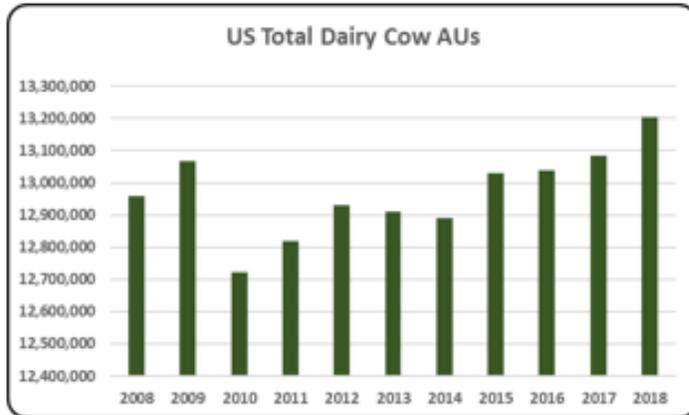
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- The average number of AUs in Colorado from 2008 to 2018 was 3.5 million AUs (2.7% of total U.S. AUs).



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Colorado broiler AUs in 2018 were 56,124. Broiler AUs have decreased from 2008 when they Colorado 62,600. 2018 continued the levels seen since the low of 2011 when Colorado had 44,447 AUs.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Colorado layer AUs in 2018 were 1.18% (19,038 AUs) of all layer AUs in the U.S. Colorado layer AUs in 2018 have risen by 21.7% since 2008.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- In 2018 Colorado turkey animal units were 24,698 which was a 33.0% increase from 2008. The average number of turkey AUs in Colorado from 2008 to 2018 was 19,218.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- The number of hog AUs (438750) in 2018 represents 1.62% of all hog AUs in the country in 2018r. From 2008 to 2018, there have been 431,066 hog AUs in Colorado, on average.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- The third largest animal sector in terms of animal units in Colorado is dairy with 235,200 AUs in 2018. On average, there was 192,945 dairy cow AUs in Colorado from 2008 to 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- In 2018 there were 2.7 million beef cow AUs in Colorado with an average for 2008-2018 of 2.6 million beef cow AUs.

Colorado Additional Information and Methodology

Animal agriculture is an important part of Colorado's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Colorado, of interest is the degree to which the industry impacts the Colorado economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Colorado animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Colorado's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Colorado which have occurred. As shown in this state report, Colorado has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Colorado. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Colorado Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Colorado’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Colorado, \$1.73 to \$2.41 million in total economic activity, \$0.41 to \$0.53 in household wages and 12 to 15 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.411	\$ 0.507	13.9
	Hogs, Pigs, and Other	\$ 1.731	\$ 0.411	12.1
	Poultry and Eggs	\$ 2.304	\$ 0.517	13.2
	Dairy	\$ 2.222	\$ 0.528	14.6

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	2,838,600	2,838,600	2,838,600	2,482,875	2,681,250	2,692,500	2,339,550	2,541,900	2,404,275	2,654,025	2,730,225
	Hog and Pig AUs	432,450	400,950	414,450	430,125	422,700	413,100	421,650	438,150	469,200	460,200	438,750
	Broiler AUs	62,600	58,203	58,986	44,447	53,998	53,809	53,504	54,885	55,295	56,087	56,124
	Turkey AUs	17,576	17,181	17,901	18,220	22,019	18,455	19,370	18,934	18,478	18,567	24,698
	Egg Layer AUs	15,647	14,804	14,512	19,112	16,804	19,748	18,703	17,946	18,505	18,071	19,038
	Dairy AUs	176,400	182,000	162,400	172,200	183,400	184,800	196,000	203,000	210,000	217,000	235,200
	Total Animal Units	3,543,272	3,511,739	3,506,849	3,166,979	3,380,171	3,382,412	3,048,776	3,274,815	3,175,753	3,423,950	3,504,035
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,734,151	\$ 1,597,426	\$ 1,766,700	\$ 1,927,383	\$ 2,140,163	\$ 2,162,134	\$ 2,398,256	\$ 2,473,508	\$ 1,899,569	\$ 2,042,279	\$ 1,973,960
	Hogs and Pigs (\$1,000)	\$ 159,404	\$ 126,971	\$ 189,680	\$ 227,019	\$ 206,066	\$ 206,725	\$ 236,205	\$ 195,371	\$ 183,485	\$ 166,435	\$ 136,198
	Broilers (\$1,000)	\$ 50,139	\$ 43,259	\$ 45,207	\$ 39,578	\$ 53,804	\$ 65,559	\$ 68,777	\$ 60,001	\$ 53,349	\$ 62,644	\$ 70,716
	Turkeys (\$1,000)	\$ 29,385	\$ 27,849	\$ 35,171	\$ 27,655	\$ 29,736	\$ 21,554	\$ 14,259	\$ 17,553	\$ 19,849	\$ 13,439	\$ 16,487
	Eggs (\$1,000)	\$ 96,842	\$ 70,308	\$ 77,131	\$ 85,801	\$ 96,215	\$ 103,782	\$ 130,350	\$ 177,115	\$ 67,929	\$ 76,212	\$ 113,657
	Milk (\$1,000)	\$ 540,040	\$ 363,136	\$ 461,824	\$ 599,800	\$ 597,618	\$ 672,256	\$ 862,320	\$ 668,746	\$ 655,475	\$ 758,209	\$ 761,019
	Other	\$ 63,235	\$ 64,315	\$ 67,168	\$ 82,611	\$ 131,476	\$ 88,878	\$ 92,114	\$ 109,838	\$ 114,174	\$ 111,383	\$ 117,492
	Sheep and Lambs (\$1,000)	\$ 55,118	\$ 54,608	\$ 55,872	\$ 69,725	\$ 117,001	\$ 74,027	\$ 76,887	\$ 94,235	\$ 98,195	\$ 95,028	\$ 100,761
	Aquaculture (\$1,000)	\$ 8,117	\$ 9,707	\$ 11,296	\$ 12,886	\$ 14,475	\$ 14,851	\$ 15,227	\$ 15,603	\$ 15,979	\$ 16,355	\$ 16,731
	Total (\$1,000)	\$ 2,673,196	\$ 2,293,263	\$ 2,642,881	\$ 2,989,847	\$ 3,255,078	\$ 3,320,888	\$ 3,802,281	\$ 3,702,133	\$ 2,993,830	\$ 3,230,602	\$ 3,189,529

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	9,819	9,598	10,528	12,298
	Cattle feedlots (112112)	1,081	615	268	291
	Dairy cattle and milk production (11212)	232	267	183	228
	Hog and pig farming (1122)	445	453	343	387
	Poultry and egg production (1123)	237	742	611	500
	Sheep and goat farming (1124)	902	1,010	1,212	1,741
	Animal aquaculture and other animal production (1125,1129)	6,111	7,941	7,153	7,438
Value of Sales (\$1,000)	Cattle and Calves	2,632,740	3,156,348	4,321,308	3,989,383
	Hogs and Pigs	179,415	159,808	208,763	234,752
	Poultry and Eggs	113,256	161,320	102,175	117,682
	Milk*			559,422	703,562
	Aquaculture	28,805	11,258	14,475	16,355
	Other (calculated)	107,667	134,925	108,550	191,106
	Total	3,061,883	3,623,659	5,314,693	5,252,840
Input Purchases	Livestock and poultry purchased	(Farms) 8,174	8,517	9,728	11,167
		\$1,000 1,662,797	1,778,706	1,885,482	1,804,260
	Breeding livestock purchased	(Farms) 4,686	4,866	5,372	6,267
		\$1,000 46,389	86,507	98,374	116,442
	Other livestock and poultry purchased	(Farms) 4,650	4,944	5,838	6,772
		\$1,000 1,616,409	1,692,199	1,787,108	1,687,819
Feed purchased	(Farms) 18,525	18,817	21,744	24,605	
	\$1,000 866,170	1,221,367	1,972,993	1,857,442	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 4,758,823	\$ 1,001,390	27,471	\$ 248,645
	Hogs, Pigs, and Other	\$ 439,111	\$ 104,292	3,059	\$ 25,896
	Poultry and Eggs	\$ 462,741	\$ 103,845	2,654	\$ 25,785
	Dairy	\$ 1,691,136	\$ 401,438	11,076	\$ 99,677
	Total	\$ 7,351,812	\$ 1,610,964	44,261	\$ 400,002
Change from 2008 to 2018	Cattle and Calves	\$ (237,313)	\$ (49,937)	(1,370)	\$ (12,399)
	Hogs, Pigs, and Other	\$ (21,421)	\$ (5,088)	(149)	\$ (1,263)
	Poultry and Eggs	\$ (22,821)	\$ (5,121)	(131)	\$ (1,272)
	Dairy	\$ 256,984	\$ 61,002	1,683	\$ 15,147
	Total	\$ (24,570)	\$ 856	33	\$ 213
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.411	\$ 0.507	13.9	
	Hogs, Pigs, and Other	\$ 1.731	\$ 0.411	12.1	
	Poultry and Eggs	\$ 2.304	\$ 0.517	13.2	
	Dairy	\$ 2.222	\$ 0.528	14.6	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.6%	
	Total			24.8%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: CONNECTICUT

Connecticut Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Connecticut animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Connecticut. The success of Connecticut animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Connecticut during 2018 animal agriculture contributed:

- \$262.9 million in economic output
- 1,747 jobs
- \$55.9 million in earnings
- \$14.1 million in income taxes paid at local, state, and federal levels
- \$34.5 million in the form of property taxes

Connecticut's animal agriculture consumed about 35,700 tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (14,700 tons)
- Dairy Cows (7,200 tons)
- Turkeys (5,100 tons)

This report examines animal agriculture in Connecticut over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Connecticut, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Connecticut and beyond.

Connecticut Economic Impact of Animal Agriculture

Animal agriculture is a small part of Connecticut's economy. In 2018, Connecticut's animal agriculture contributed the following to the economy:

- About \$262.9 million in economic output
- \$55.9 million in household earnings
- 1,747 jobs
- \$14.1 million in income taxes

During the last decade, contractions in Connecticut's animal agriculture has:

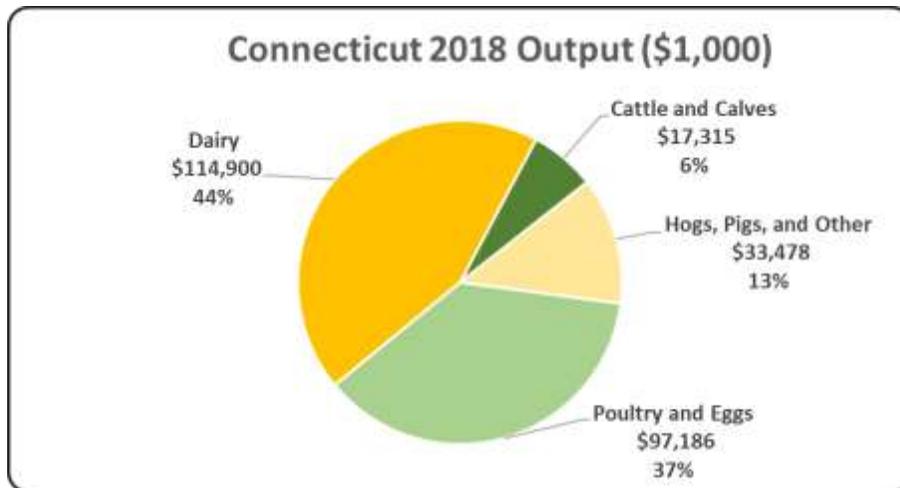
- Decreased economic output by \$69.9 million
- Reduced household earnings by \$14.7 million
- Shrunk by 432 jobs
- Paid \$3.7 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 262,878	\$ (69,919)	-21.01%
Earnings (\$1,000)	\$ 55,882	\$ (14,694)	-20.82%
Employment (Jobs)	1,747	(432)	-19.83%
Income Taxes Paid (\$1,000)	\$ 14,079	\$ (3,702)	-20.82%
Property Taxes Paid in 2017 (\$1,000)	\$ 34,531		

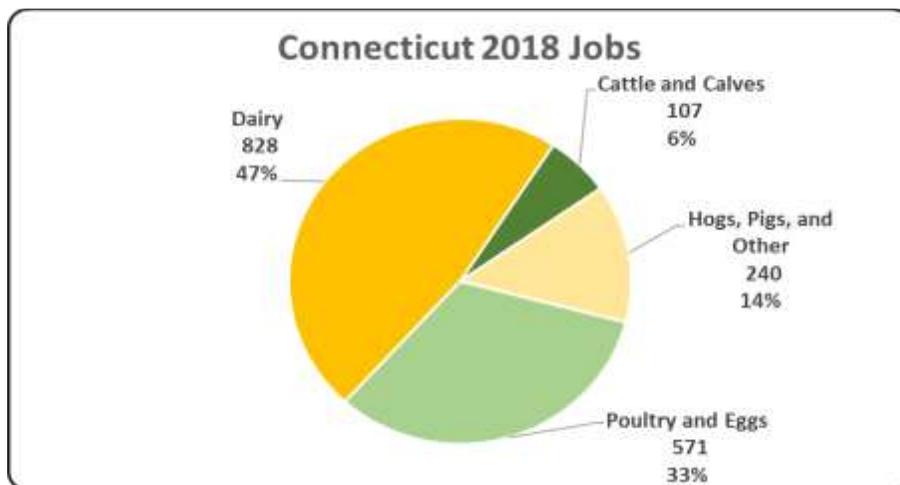
Connecticut Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Connecticut economy. Animal agriculture’s impact on Connecticut total economic output is about \$262.9 million.



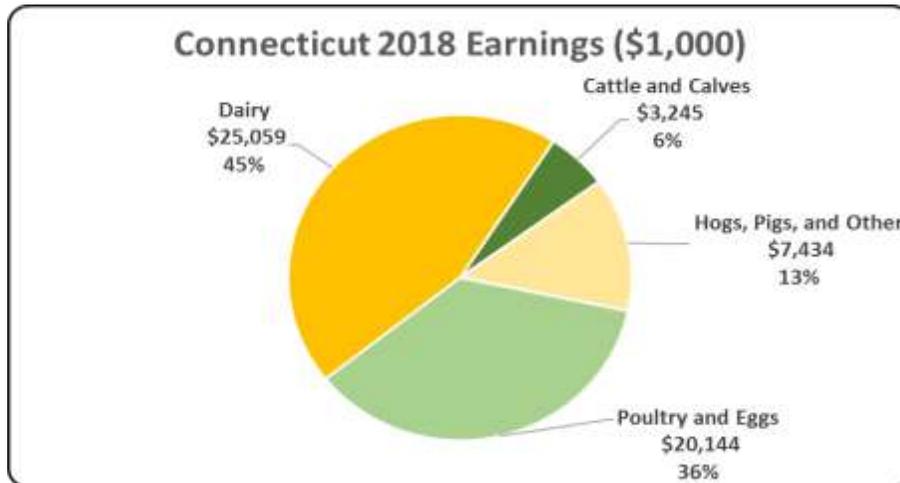
Connecticut Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Connecticut in terms of animal agriculture jobs. As shown, animal agriculture contributes 1,747 jobs within and outside of animal agriculture.



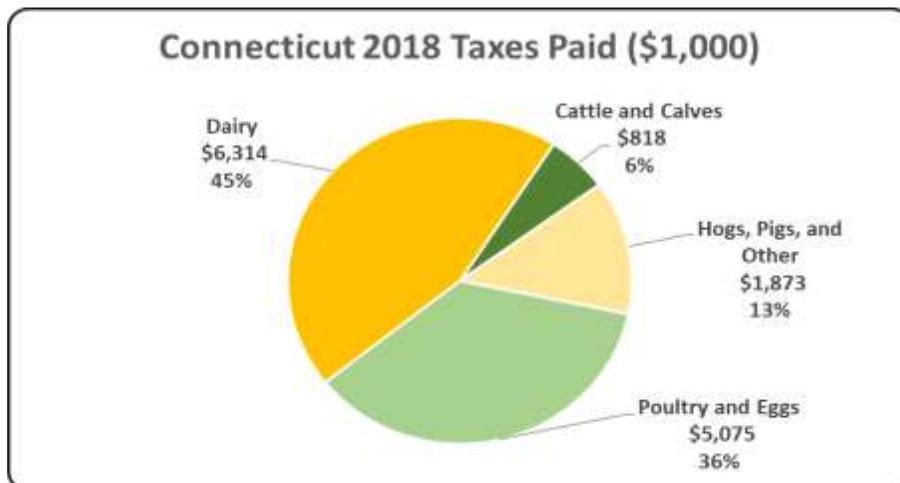
Connecticut Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Connecticut economy in terms of earnings. Connecticut’s animal agriculture contributed about \$55.9 million to household earnings in 2018.



Connecticut Taxes Paid by Animal Agriculture

Connecticut’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$14.1 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$34.5 million in property taxes paid by all of Connecticut agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



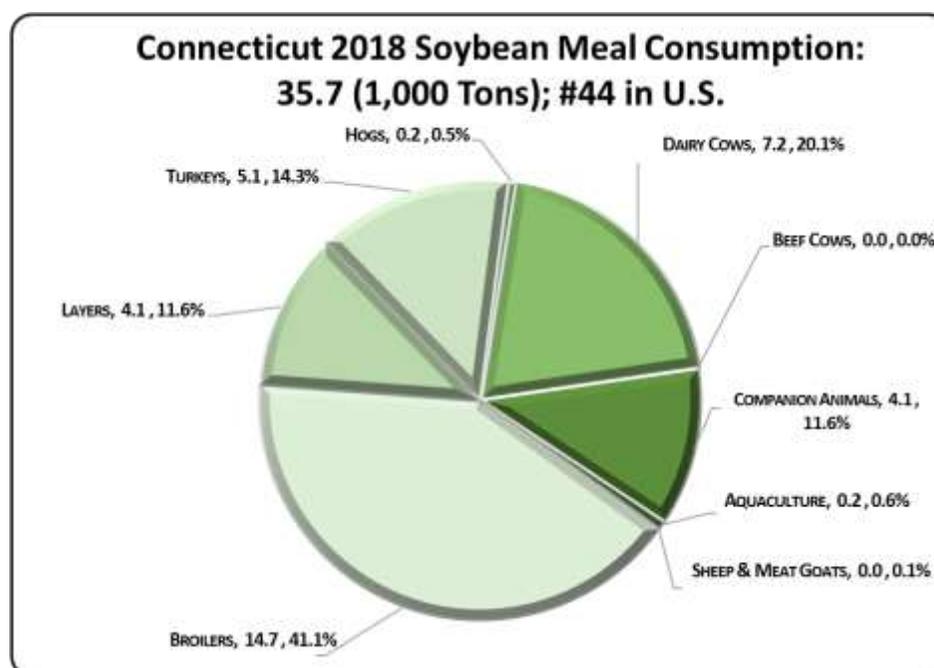
Connecticut Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Connecticut's animal agriculture consumed almost 35.7 thousand tons of soybean meal in 2018, placing the state as #44 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Connecticut consumed about 100 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (14.7 thousand tons)
2. Dairy Cows (7.2 thousand tons)
3. Turkeys (5.1 thousand tons)

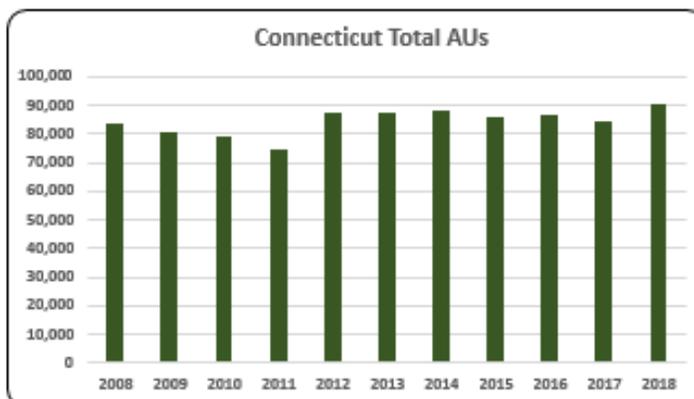
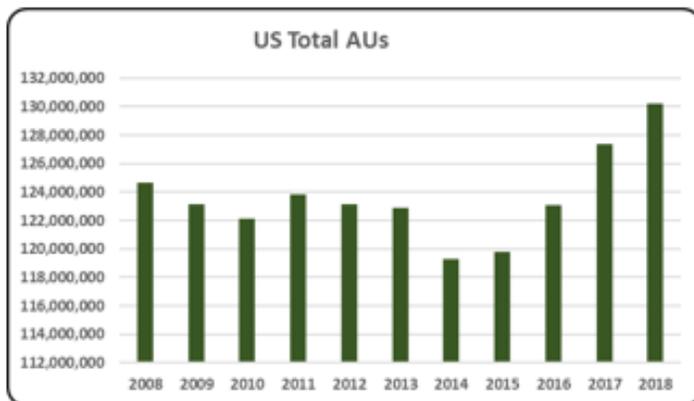


Connecticut Animal Unit (AU) Trends

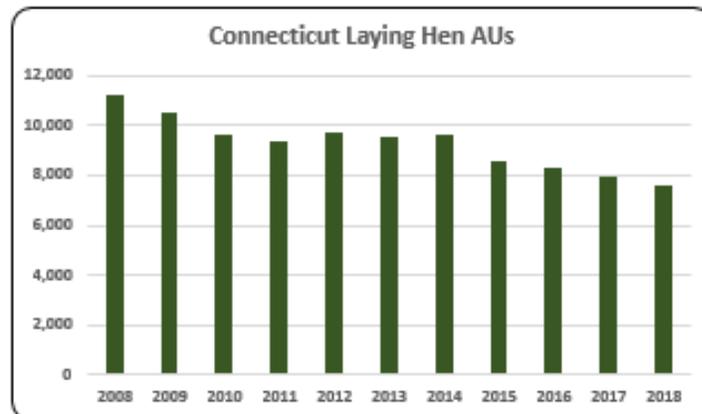
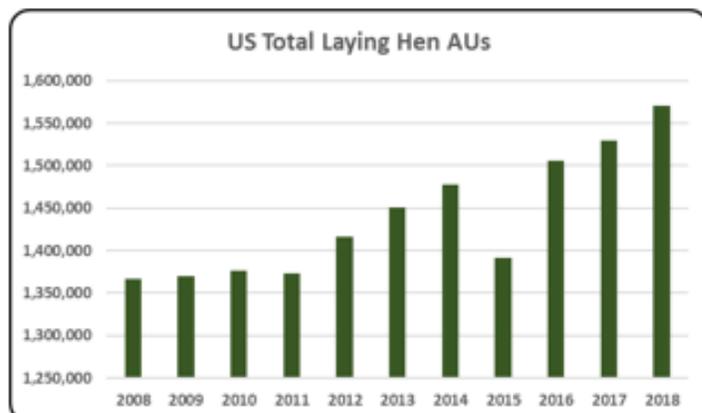
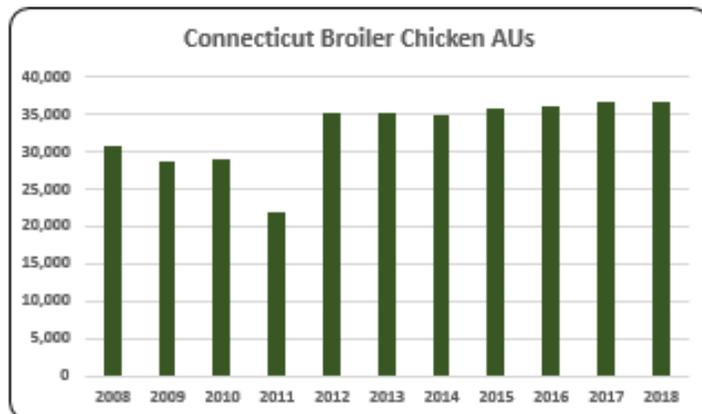
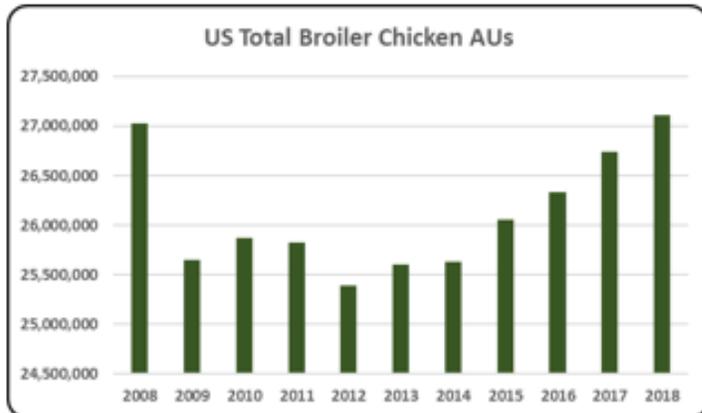
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Connecticut. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Connecticut and to give perspective on Connecticut’s contribution to the nation’s animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

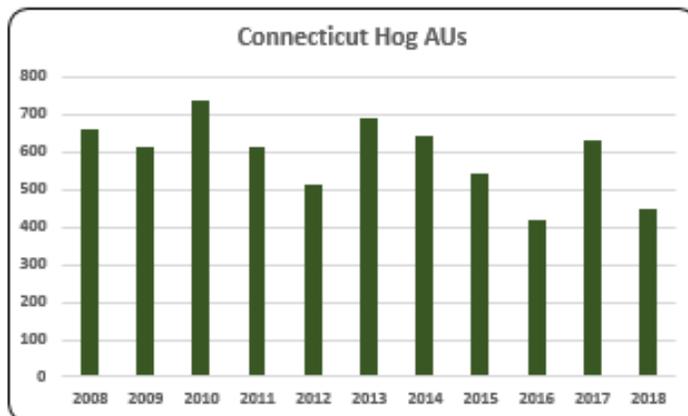
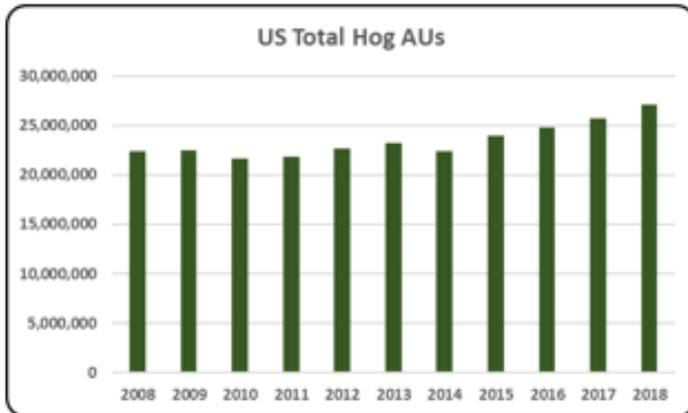
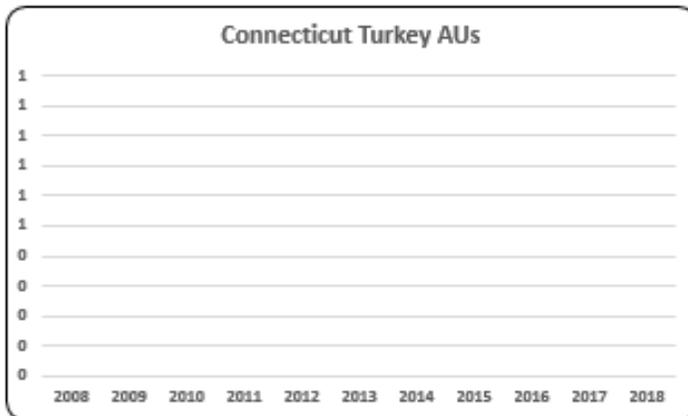
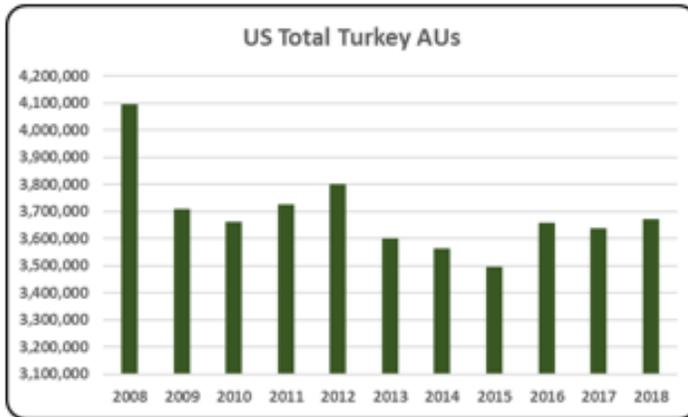
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Connecticut, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (36,594 AUs), Dairy Cows (28,000 AUs), and Beef Cows (17,670 AUs). Total animal units in Connecticut during 2018 were 90,326 AUs.



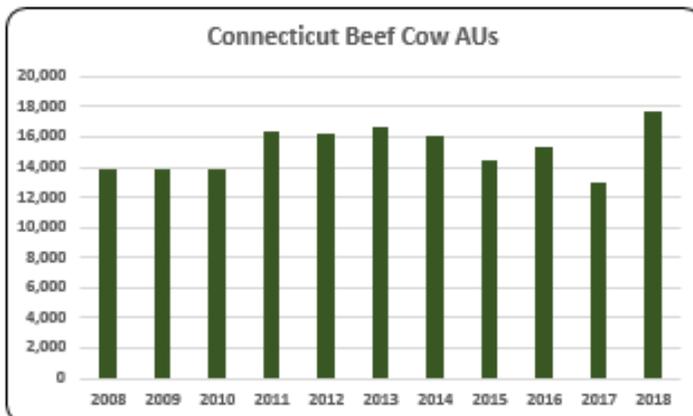
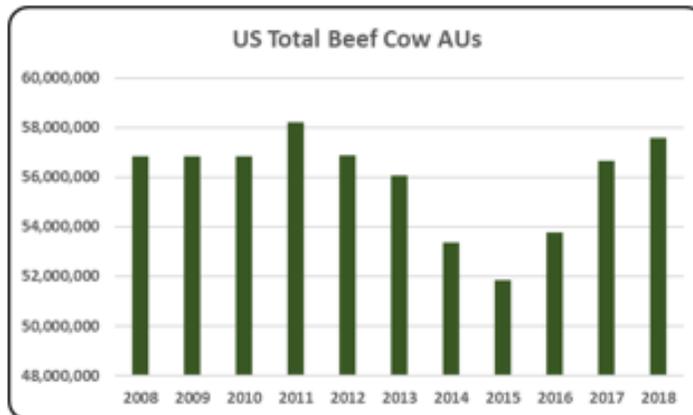
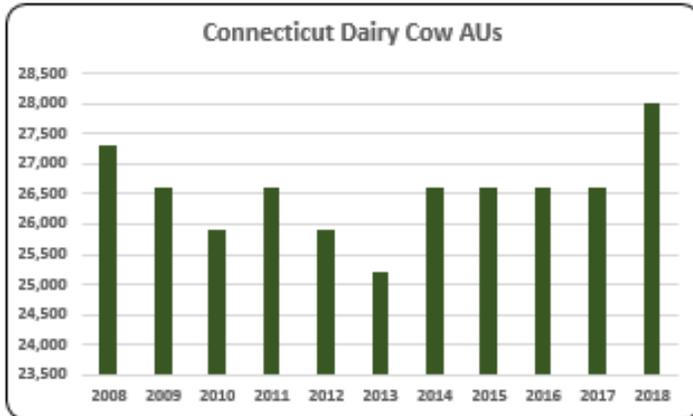
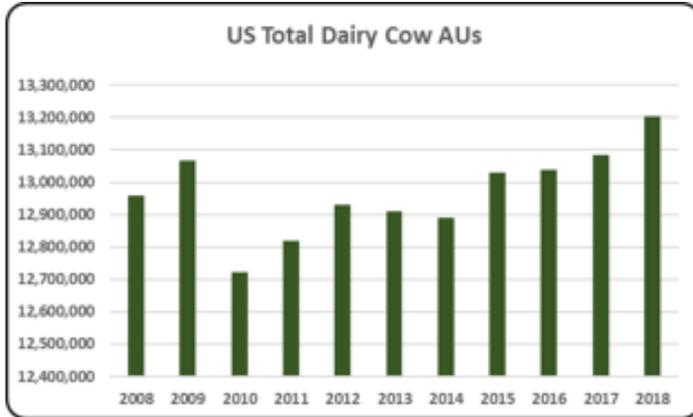
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 90,326 total AUs in Connecticut in 2018. On average, there was 84,430 AUs in the state from 2008 to 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler chickens are the largest animal sector in Connecticut with 36,594 broiler AUs in 2018. The number of broiler AUs in the state increased 18.5% from 2008 (30,871).
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- On average (2008 to 2018), 7,611 AUs in the Connecticut were layer AUs, with 7,611 layer AUs in 2017. Connecticut layer AUs have been declining over the past decade.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey production is nearly nonexistent in Connecticut.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs represented 0.50% (450) of all AUs in Connecticut in 2018. This is a 31.8% decrease from 2008.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- The average number of dairy cow AUs in Connecticut during last decade was 26,536. In 2018 Connecticut had 28,000 dairy cow animal units or 31.0% of the states total AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- On average, there was 15,225 beef cow AUs from 2008 to 2018. Beef cow AU numbers have increased by 19.6% since 2008 to a total of 17,670 AUs in 2018.

Connecticut Additional Information and Methodology

Animal agriculture is a small part of Connecticut's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Connecticut, of interest is the degree to which the industry impacts the Connecticut economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Connecticut animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Connecticut's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Connecticut which have occurred. As shown in this state report, Connecticut has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Connecticut. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Connecticut Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Connecticut’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Connecticut, \$1.37 to \$1.57 million in total economic activity, \$0.26 to \$0.34 in household wages and 9 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.391	\$ 0.261	8.6
	Hogs, Pigs, and Other	\$ 1.368	\$ 0.304	9.8
	Poultry and Eggs	\$ 1.512	\$ 0.313	8.9
	Dairy	\$ 1.574	\$ 0.343	11.3

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	13,890	13,890	13,890	16,305	16,230	16,650	16,125	14,445	15,405	12,975	17,670
	Hog and Pig AUs	660	615	735	615	510	690	645	540	420	630	450
	Broiler AUs	30,871	28,703	29,089	21,919	35,208	35,085	34,886	35,786	36,054	36,570	36,594
	Turkey AUs	-	-	-	-	-	-	-	-	-	-	-
	Egg Layer AUs	11,216	10,528	9,620	9,368	9,709	9,531	9,682	8,597	8,276	7,946	7,611
	Dairy AUs	27,300	26,600	25,900	26,600	25,900	25,200	26,600	26,600	26,600	26,600	28,000
	Total Animal Units	83,937	80,336	79,234	74,807	87,557	87,156	87,938	85,969	86,755	84,721	90,326
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 8,858	\$ 8,552	\$ 8,626	\$ 14,205	\$ 14,451	\$ 13,008	\$ 21,129	\$ 24,175	\$ 15,655	\$ 15,034	\$ 12,447
	Hogs and Pigs (\$1,000)	\$ 280	\$ 324	\$ 565	\$ 450	\$ 453	\$ 864	\$ 736	\$ 520	\$ 366	\$ 619	\$ 389
	Broilers (\$1,000)	\$ 24,726	\$ 21,333	\$ 22,294	\$ 19,518	\$ 35,082	\$ 42,746	\$ 44,844	\$ 39,123	\$ 34,785	\$ 40,846	\$ 30,598
	Turkeys (\$1,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 5,848
	Eggs (\$1,000)	\$ 60,116	\$ 41,686	\$ 39,566	\$ 41,948	\$ 46,588	\$ 52,024	\$ 20,232	\$ 33,728	\$ 13,264	\$ 17,934	\$ 27,830
	Milk (\$1,000)	\$ 73,528	\$ 50,479	\$ 65,520	\$ 79,059	\$ 70,526	\$ 79,920	\$ 99,963	\$ 72,864	\$ 69,530	\$ 78,540	\$ 73,017
	Other	\$ 15,926	\$ 16,904	\$ 17,932	\$ 18,873	\$ 19,863	\$ 20,612	\$ 21,312	\$ 22,043	\$ 22,743	\$ 23,378	\$ 24,080
	Sheep and Lambs (\$1,000)	\$ 125	\$ 137	\$ 199	\$ 174	\$ 198	\$ 244	\$ 241	\$ 269	\$ 266	\$ 198	\$ 197
	Aquaculture (\$1,000)	\$ 15,800	\$ 16,767	\$ 17,733	\$ 18,699	\$ 19,665	\$ 20,368	\$ 21,071	\$ 21,774	\$ 22,477	\$ 23,180	\$ 23,883
	Total (\$1,000)	\$ 183,434	\$ 139,278	\$ 154,503	\$ 174,053	\$ 186,963	\$ 209,175	\$ 208,216	\$ 192,453	\$ 156,343	\$ 176,351	\$ 174,209

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	342	490	693	627
	Cattle feedlots (112112)	90	32	6	1
	Dairy cattle and milk production (11212)	231	212	146	124
	Hog and pig farming (1122)	47	69	160	110
	Poultry and egg production (1123)	128	273	175	218
	Sheep and goat farming (1124)	120	198	246	328
	Animal aquaculture and other animal production (1125,1129)	792	820	1,507	1,121
Value of Sales (\$1,000)	Cattle and Calves	7,025	9,405	9,751	11,701
	Hogs and Pigs	-	616	1,259	withheld
	Poultry and Eggs	62,411	45,274	48,859	withheld
	Milk*			69,843	81,038
	Aquaculture	12,848	15,142	19,665	23,180
	Other (calculated)	4,303	7,406	4,018	44,152
	Total	86,587	77,843	153,395	160,071
Input Purchases	Livestock and poultry purchased	(Farms) 948	1,077	1,487	1,470
		\$1,000 8,644	7,164	6,536	15,961
	Breeding livestock purchased	(Farms) 361	392	527	447
		\$1,000 686	2,058	1,583	3,126
	Other livestock and poultry purchased	(Farms) 701	846	1,190	1,189
		\$1,000 7,957	5,106	4,953	12,836
	Feed purchased	(Farms) 2,372	2,458	3,617	3,128
	\$1,000 42,832	55,295	66,754	51,988	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 17,315	\$ 3,245	107	\$ 818
	Hogs, Pigs, and Other	\$ 33,478	\$ 7,434	240	\$ 1,873
	Poultry and Eggs	\$ 97,186	\$ 20,144	571	\$ 5,075
	Dairy	\$ 114,900	\$ 25,059	828	\$ 6,314
	Total	\$ 262,878	\$ 55,882	1,747	\$ 14,079
Change from 2008 to 2018	Cattle and Calves	\$ 2,589	\$ 485	16	\$ 122
	Hogs, Pigs, and Other	\$ 6,980	\$ 1,550	50	\$ 391
	Poultry and Eggs	\$ (56,116)	\$ (11,632)	(330)	\$ (2,931)
	Dairy	\$ (23,372)	\$ (5,097)	(168)	\$ (1,284)
	Total	\$ (69,919)	\$ (14,694)	(432)	\$ (3,702)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.391	\$ 0.261	8.6	
	Hogs, Pigs, and Other	\$ 1.368	\$ 0.304	9.8	
	Poultry and Eggs	\$ 1.512	\$ 0.313	8.9	
	Dairy	\$ 1.574	\$ 0.343	11.3	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				5.0%
	Total				25.2%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: DELAWARE

Delaware Executive Summary

The use of soybean meal as a key feed ingredient is a moderate part of Delaware's animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture success in the State of Delaware. The success of Delaware animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Delaware during 2018 animal agriculture contributed:

- \$2.3 billion in economic output
- 7,420 jobs
- \$397.4 million in earnings
- \$97.8 million in income taxes paid at local, state, and federal levels
- \$7.1 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Delaware has increased economic output by over \$411.8 million, boosted household earnings by \$72.5 million, contributed 1,348 additional jobs and paid \$17.8 million in additional tax revenues.

Delaware's animal agriculture consumed almost 452.8 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (433.6 thousand tons)
- Companion Animals (11,000 tons)
- Horses (10,500 tons)

This report examines animal agriculture in Delaware over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Delaware, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Delaware and beyond.

Delaware Economic Impact of Animal Agriculture

Animal agriculture is an important part of Delaware's economy. In 2018, Delaware's animal agriculture contributed the following to the economy:

- About \$2.3 billion in economic output
- \$397.4 million in household earnings
- 7,420 jobs
- \$97.8 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Delaware's animal agriculture has:

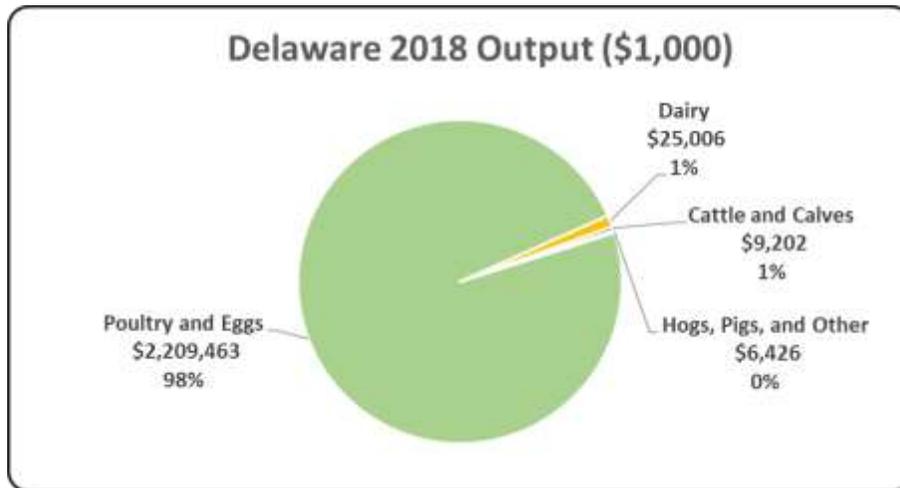
- Increased economic output by \$411.8 million
- Boosted household earnings by \$72.5 million
- Added 1,348 jobs
- Paid an additional \$17.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,250,097	\$ 411,773	22.40%
Earnings (\$1,000)	\$ 397,431	\$ 72,487	22.31%
Employment (Jobs)	7,420	1,348	22.21%
Income Taxes Paid (\$1,000)	\$ 97,768	\$ 17,832	22.31%
Property Taxes Paid in 2017 (\$1,000)	\$ 7,117		

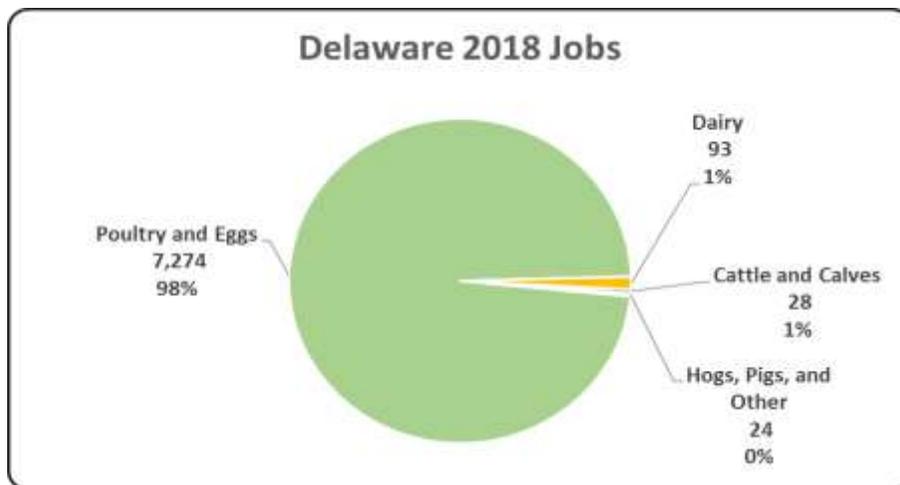
Delaware Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Delaware economy. Animal agriculture’s impact on Delaware total economic output is about \$2.3 billion.



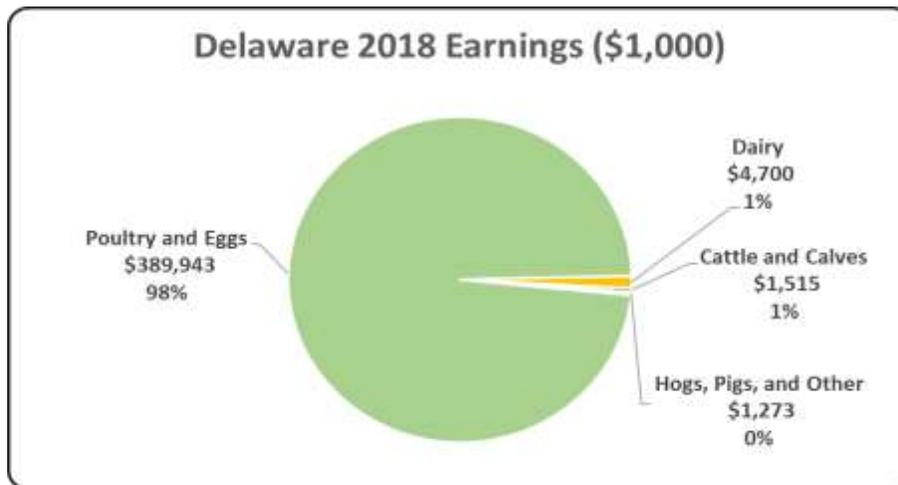
Delaware Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Delaware in terms of animal agriculture jobs. As shown, animal agriculture contributes 7,420 jobs within and outside of animal agriculture.



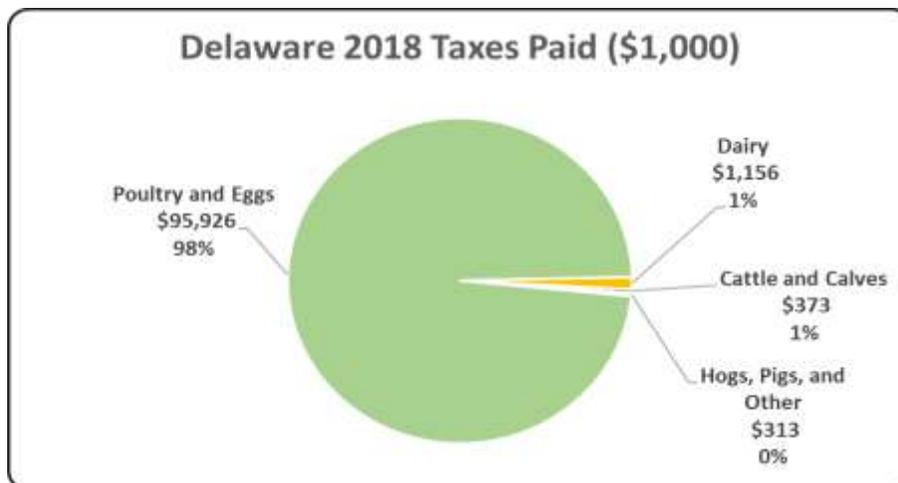
Delaware Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Delaware economy in terms of earnings. Delaware’s animal agriculture contributed about \$397.4 million to household earnings in 2018.



Delaware Taxes Paid by Animal Agriculture

Delaware’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$97.8 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$7.1 million in property taxes paid by all of Delaware agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



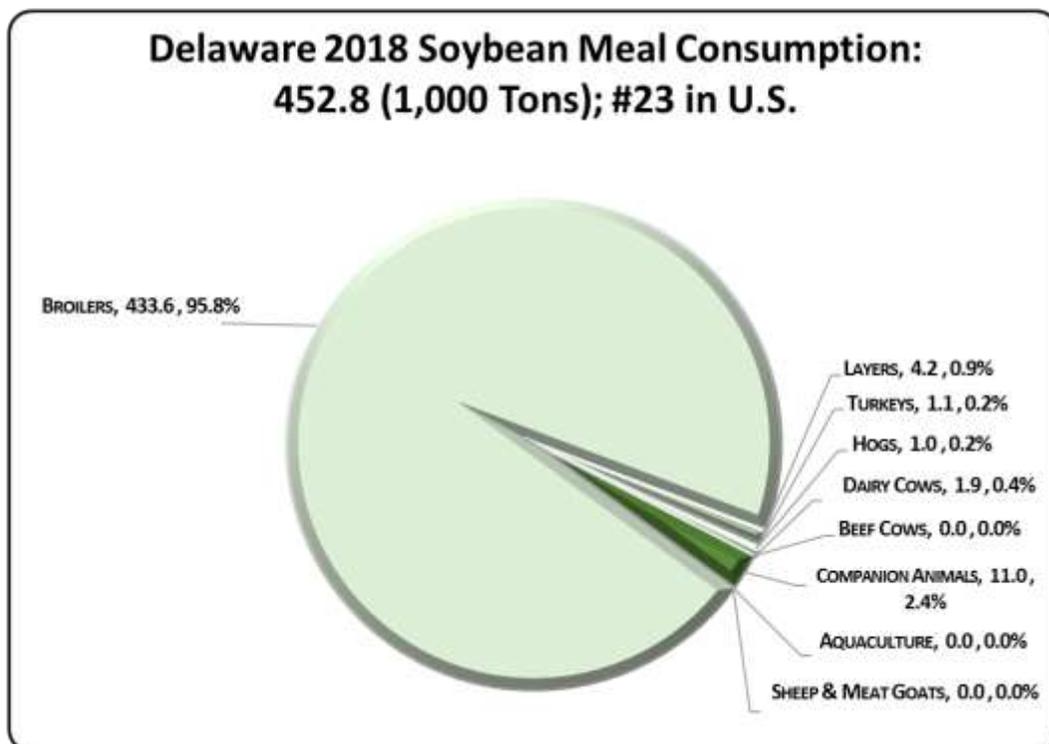
Delaware Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Delaware's animal agriculture consumed almost 452.8 thousand tons of soybean meal in 2018, placing the state as #23 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Delaware consumed about 100 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (433.6 thousand tons)
2. Companion Animals (11,000 tons)
3. Horses (10,500 tons)

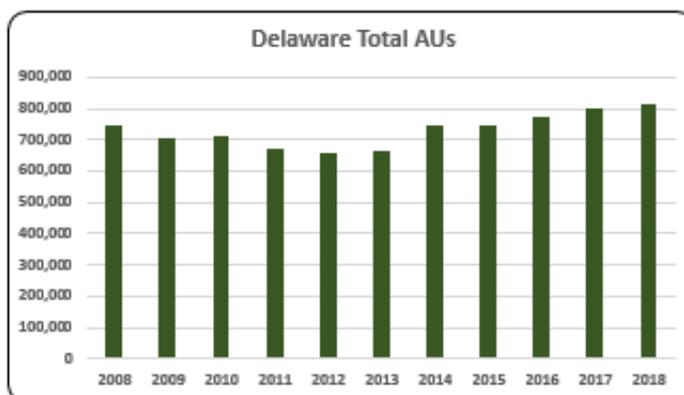
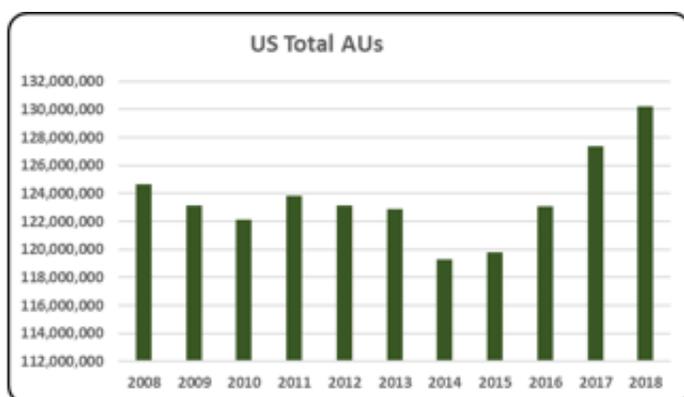


Delaware Animal Unit (AU) Trends

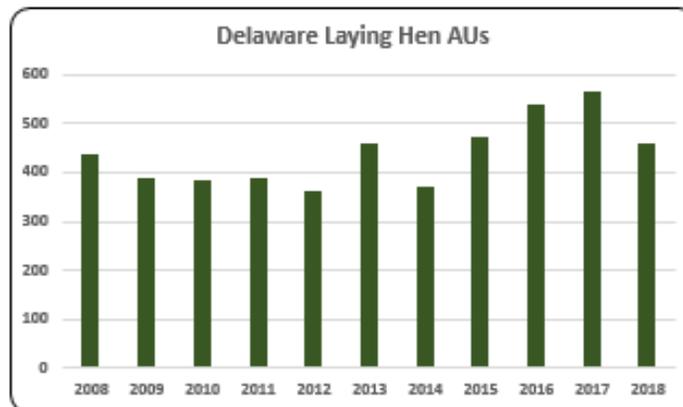
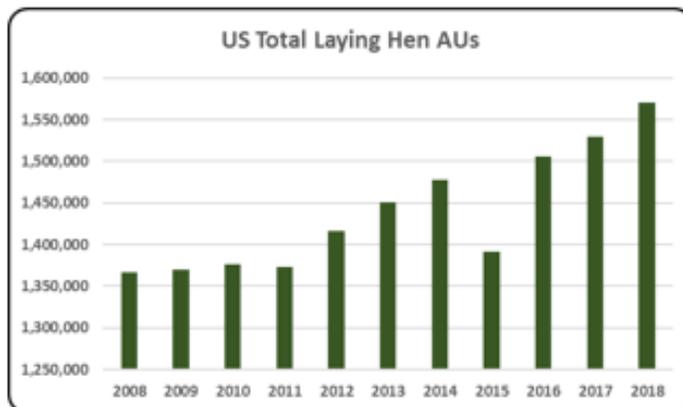
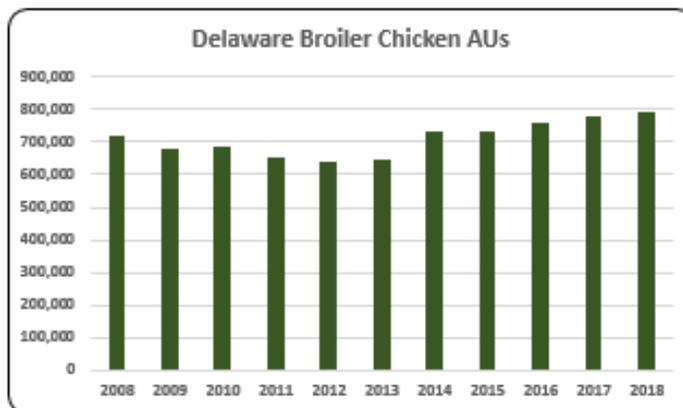
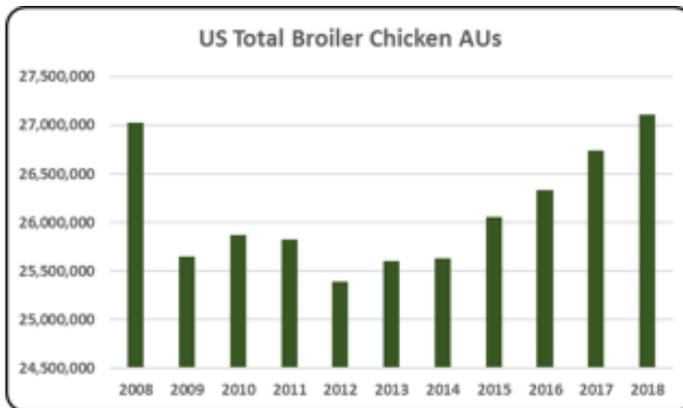
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Delaware. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Delaware and to give perspective on Delaware's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

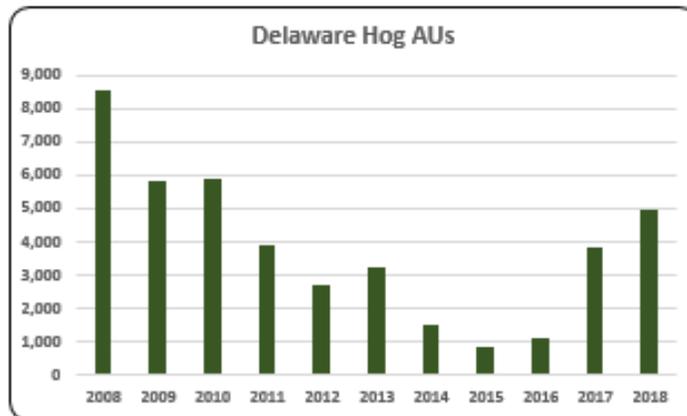
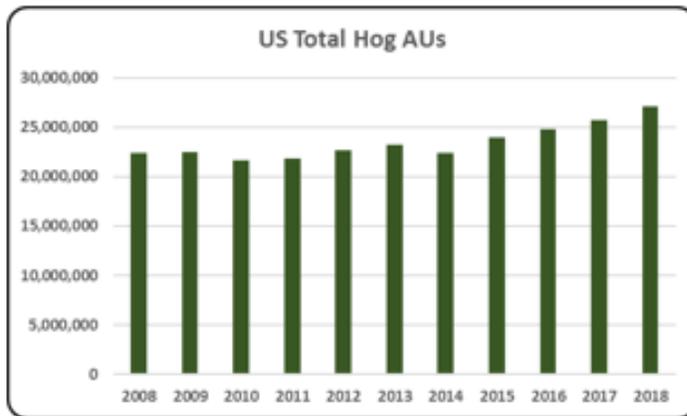
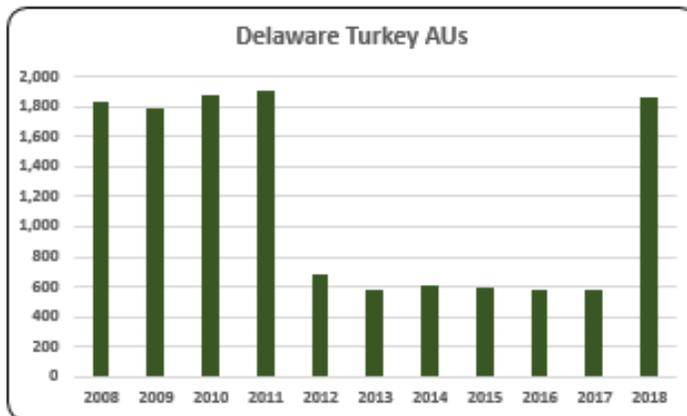
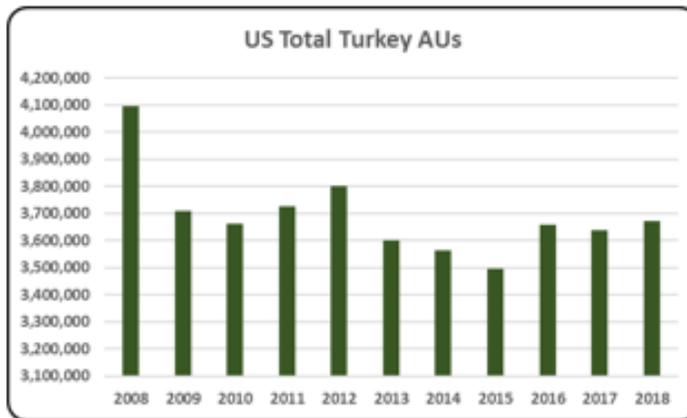
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Delaware, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (792,211 AUs), Beef Cows (7,935 AUs), and Dairy Cows (7,000 AUs). Total animal units in Delaware during 2018 were 814,421 AUs.



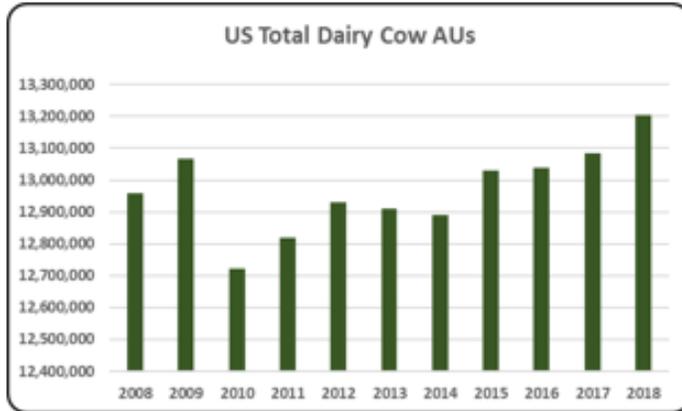
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Delaware in 2018 had a total of 814,421 AUs. The state housed 2.92% of all broiler AUs in the U.S. in 2018.



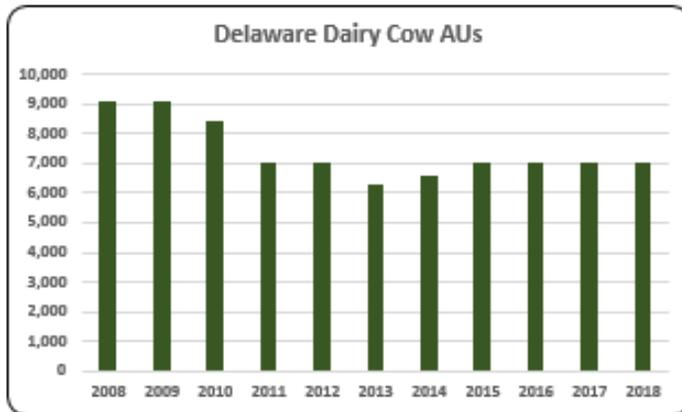
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- The largest animal sector in Delaware in terms of animal units is broiler chickens with 97.3% of all AUs in the state in 2018. Broiler AUs declined steadily from 2008-2012, but have recently rebounded to a record level of 792,211 AUs in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens are the smallest animal sector in the state of Delaware with only 440 layer AUs, on average, from 2008 to 2018.



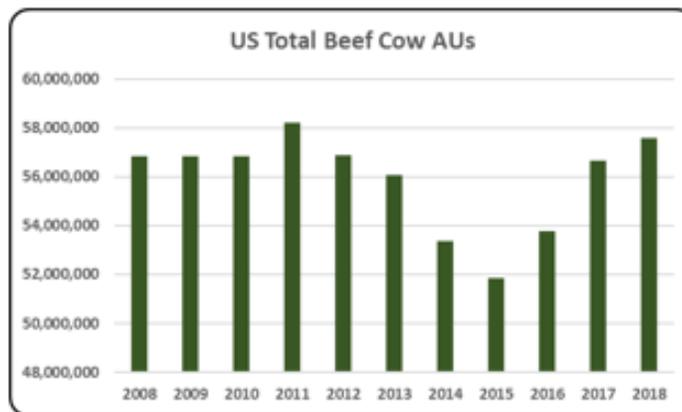
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Delaware turkey AUs in 2018 were 1,864 AUs. Turkey AUs in Delaware rebounded back to levels seen in the higher period before 2012 with an entry of more farms into turkey production.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- The hog industry in Delaware declined from 2008 to 2016. In 2018 Hog AUs in Delaware increased from 2015's 870 AUs to 4,950 hog AUs in 2018. 2018 hog AUs in Delaware were a 27.9% increase from 2017.



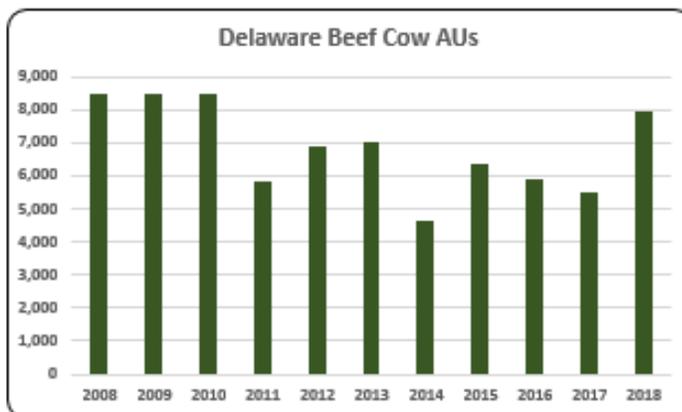
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Delaware's dairy cow AUs in were 7,000 AUs in the state in 2018. This is a 23.0% decrease from 2008.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- On average, there were 6,860 beef cow AUs from 2008 to 2018. Delaware beef cow AUs were 7,935 in 2018. Beef cow AUs shrank 6.4% in 2018 compared to the beef cow AUs in 2008.

Delaware Additional Information and Methodology

Animal agriculture is a moderate part of Delaware's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Delaware, of interest is the degree to which the industry impacts the Delaware economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Delaware animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Delaware's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Delaware which have occurred. As shown in this state report, Delaware has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Delaware. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Delaware Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Delaware's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Delaware, \$1.42 to \$2.04 million in total economic activity, \$0.25 to \$0.36 in household wages and 5 to 7 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.516	\$ 0.250	4.7
	Hogs, Pigs, and Other	\$ 1.422	\$ 0.282	5.2
	Poultry and Eggs	\$ 2.042	\$ 0.360	6.7
	Dairy	\$ 1.697	\$ 0.319	6.3

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	8,475	8,475	8,475	5,805	6,900	7,020	4,635	6,375	5,895	5,475	7,935
	Hog and Pig AUs	8,550	5,835	5,910	3,885	2,700	3,225	1,515	870	1,095	3,870	4,950
	Broiler AUs	716,213	681,756	689,206	654,386	637,227	648,018	733,651	734,263	758,893	780,824	792,211
	Turkey AUs	1,836	1,795	1,870	1,904	688	577	605	592	577	580	1,864
	Egg Layer AUs	439	388	385	388	362	461	373	471	538	568	461
	Dairy AUs	9,100	9,100	8,400	7,000	7,000	6,300	6,580	7,000	7,000	7,000	7,000
	Total Animal Units	744,613	707,349	714,246	673,367	654,877	665,601	747,359	749,571	773,998	798,317	814,421
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 5,929	\$ 5,114	\$ 4,233	\$ 5,472	\$ 5,664	\$ 5,014	\$ 6,435	\$ 5,825	\$ 5,676	\$ 5,318	\$ 6,069
	Hogs and Pigs (\$1,000)	\$ 2,879	\$ 1,793	\$ 2,260	\$ 1,645	\$ 1,524	\$ 2,586	\$ 1,362	\$ 972	\$ 1,047	\$ 3,662	\$ 3,819
	Broilers (\$1,000)	\$ 726,294	\$ 730,606	\$ 783,395	\$ 699,791	\$ 752,600	\$ 929,196	\$ 1,103,985	\$ 946,342	\$ 881,097	\$ 1,017,606	\$ 1,075,684
	Turkeys (\$1,000)	\$ 588	\$ 557	\$ 3,675	\$ 2,889	\$ 3,107	\$ 2,252	\$ 1,490	\$ 549	\$ 620	\$ 420	\$ 1,244
	Eggs (\$1,000)	\$ 2,237	\$ 1,592	\$ 1,748	\$ 1,916	\$ 2,149	\$ 2,428	\$ 3,886	\$ 6,479	\$ 2,548	\$ 3,445	\$ 5,346
	Milk (\$1,000)	\$ 20,570	\$ 14,484	\$ 16,560	\$ 19,215	\$ 17,822	\$ 19,209	\$ 23,257	\$ 17,041	\$ 15,376	\$ 16,333	\$ 14,732
	Other	\$ 1,256	\$ 1,047	\$ 846	\$ 630	\$ 422	\$ 473	\$ 514	\$ 562	\$ 604	\$ 658	\$ 700
	Sheep and Lambs (\$1,000)	\$ 21	\$ 23	\$ 34	\$ 29	\$ 33	\$ 41	\$ 41	\$ 45	\$ 45	\$ 57	\$ 57
	Aquaculture (\$1,000)	\$ 1,235	\$ 1,024	\$ 812	\$ 600	\$ 389	\$ 431	\$ 474	\$ 516	\$ 559	\$ 601	\$ 643
	Total (\$1,000)	\$ 759,753	\$ 755,193	\$ 812,716	\$ 731,559	\$ 783,288	\$ 961,157	\$ 1,140,930	\$ 977,769	\$ 906,968	\$ 1,047,442	\$ 1,107,594

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	92	155	137	157	
	Cattle feedlots (112112)	25	21	2	4	
	Dairy cattle and milk production (11212)	78	63	32	18	
	Hog and pig farming (1122)	14	13	16	14	
	Poultry and egg production (1123)	809	777	645	610	
	Sheep and goat farming (1124)	38	77	31	74	
	Animal aquaculture and other animal production (1125,1129)	250	211	520	363	
Value of Sales (\$1,000)	Cattle and Calves	3,254	7,567	9,489	5,799	
	Hogs and Pigs	2,853	2,754	1,427	2,712	
	Poultry and Eggs	440,774	837,378	811,301	1,112,087	
	Milk*			16,593	16,754	
	Aquaculture	240	withheld	withheld	601	
	Other (calculated)	677	2,986	289	2,364	
	Total	447,798	850,685	839,099	1,140,317	
Input Purchases	Livestock and poultry purchased	(Farms)	1,039	981	947	893
		\$1,000	55,182	102,328	94,265	116,039
	Breeding livestock purchased	(Farms)	158	131	151	157
		\$1,000	444	1,043	1,871	1,290
	Other livestock and poultry purchased	(Farms)	928	899	842	803
		\$1,000	54,738	101,284	92,394	114,749
	Feed purchased	(Farms)	1,540	1,426	1,602	1,364
		\$1,000	207,528	416,368	503,159	368,837

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 9,202	\$ 1,515	28	\$ 373
	Hogs, Pigs, and Other	\$ 6,426	\$ 1,273	24	\$ 313
	Poultry and Eggs	\$ 2,209,463	\$ 389,943	7,274	\$ 95,926
	Dairy	\$ 25,006	\$ 4,700	93	\$ 1,156
	Total	\$ 2,250,097	\$ 397,431	7,420	\$ 97,768
Change from 2008 to 2018	Cattle and Calves	\$ (1,541)	\$ (254)	(5)	\$ (62)
	Hogs, Pigs, and Other	\$ (602)	\$ (119)	(2)	\$ (29)
	Poultry and Eggs	\$ 430,636	\$ 76,002	1,418	\$ 18,696
	Dairy	\$ (16,720)	\$ (3,142)	(62)	\$ (773)
	Total	\$ 411,773	\$ 72,487	1,348	\$ 17,832
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.516	\$ 0.250	4.7	
	Hogs, Pigs, and Other	\$ 1.422	\$ 0.282	5.2	
	Poultry and Eggs	\$ 2.042	\$ 0.360	6.7	
	Dairy	\$ 1.697	\$ 0.319	6.3	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.4%
	Total				24.6%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: FLORIDA

Florida Executive Summary

The use of soybean meal as a key feed ingredient is a modest part of Florida animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture success in the State of Florida. The success of Florida animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Florida during 2018 animal agriculture contributed:

- \$2.5 billion in economic output
- 15,005 jobs
- \$561.9 million in earnings
- \$113.5 million in income taxes paid at local, state, and federal levels
- \$211.5 million in the form of property taxes

Florida's animal agriculture consumed almost 242.7 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (108.7 thousand tons)
- Egg-Laying Hens (59.2 thousand tons)
- Dairy Cows (34.1 thousand tons)

This report examines animal agriculture in Florida over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Florida, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Florida and beyond.

Florida Economic Impact of Animal Agriculture

Animal agriculture is a small part of Florida's economy. In 2018, Florida's animal agriculture contributed the following to the economy:

- About \$2.5 billion in economic output
- \$561.9 million in household earnings
- 15,005 jobs
- \$113.5 million in income taxes

During the last decade, contractions in Florida's animal agriculture has:

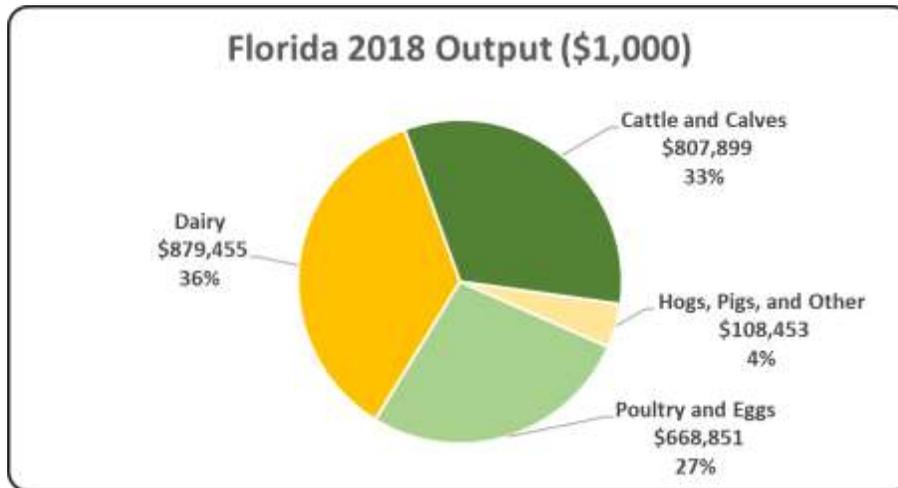
- Decreased economic output by \$236.4 million
- Reduced household earnings by \$59.1 million
- Shrunk by 1,547 jobs
- Paid \$11.9 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,464,658	\$ (236,413)	-8.75%
Earnings (\$1,000)	\$ 561,897	\$ (59,065)	-9.51%
Employment (Jobs)	15,005	(1,547)	-9.35%
Income Taxes Paid (\$1,000)	\$ 113,503	\$ (11,931)	-9.51%
Property Taxes Paid in 2017 (\$1,000)	\$ 211,527		

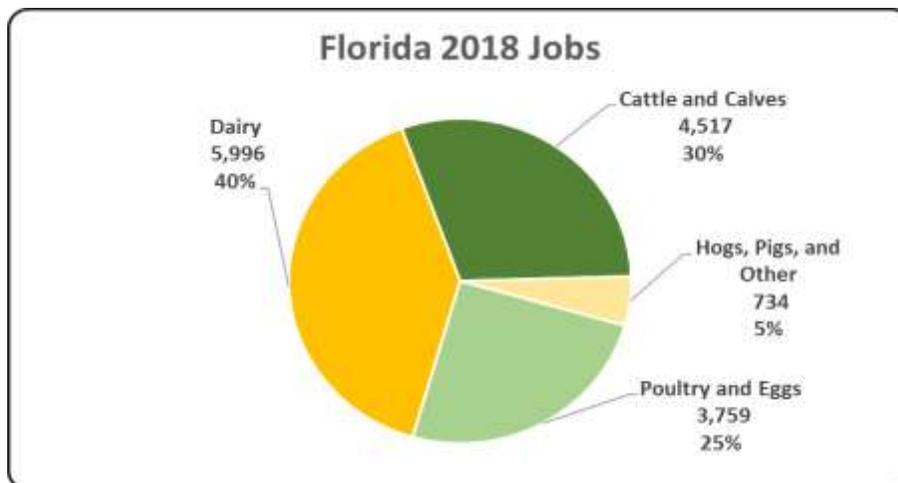
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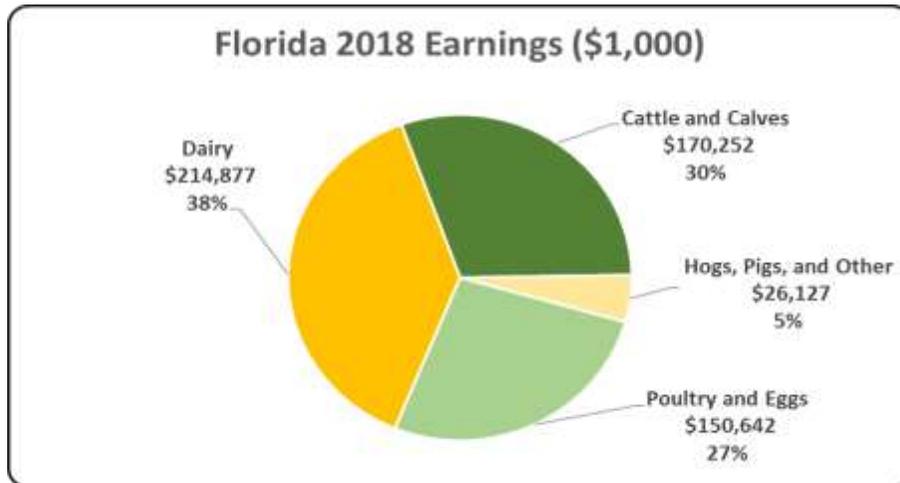
Florida Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Florida in terms of animal agriculture jobs. As shown, animal agriculture contributes 15,005 jobs within and outside of animal agriculture.



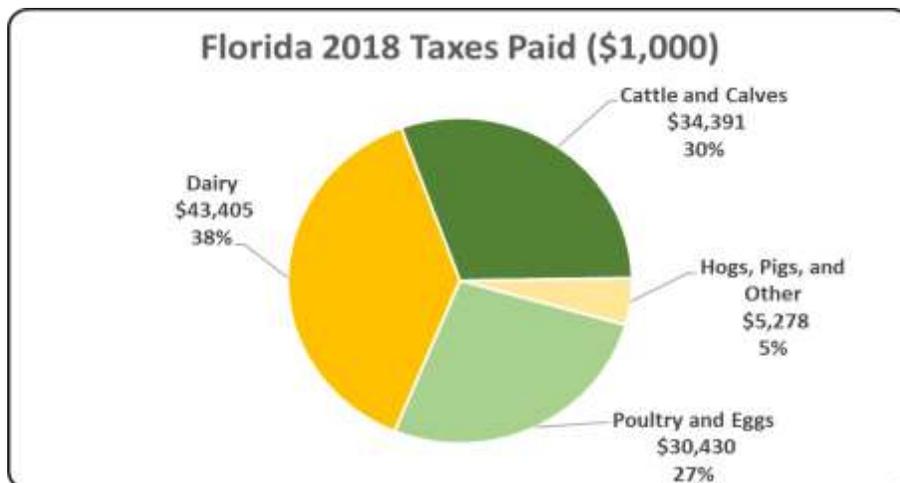
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Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Florida economy in terms of earnings. Florida’s animal agriculture contributed about \$561.9 million to household earnings in 2018.



Florida Taxes Paid by Animal Agriculture

Florida’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$113.5 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$211.5 million in property taxes paid by all of Florida agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



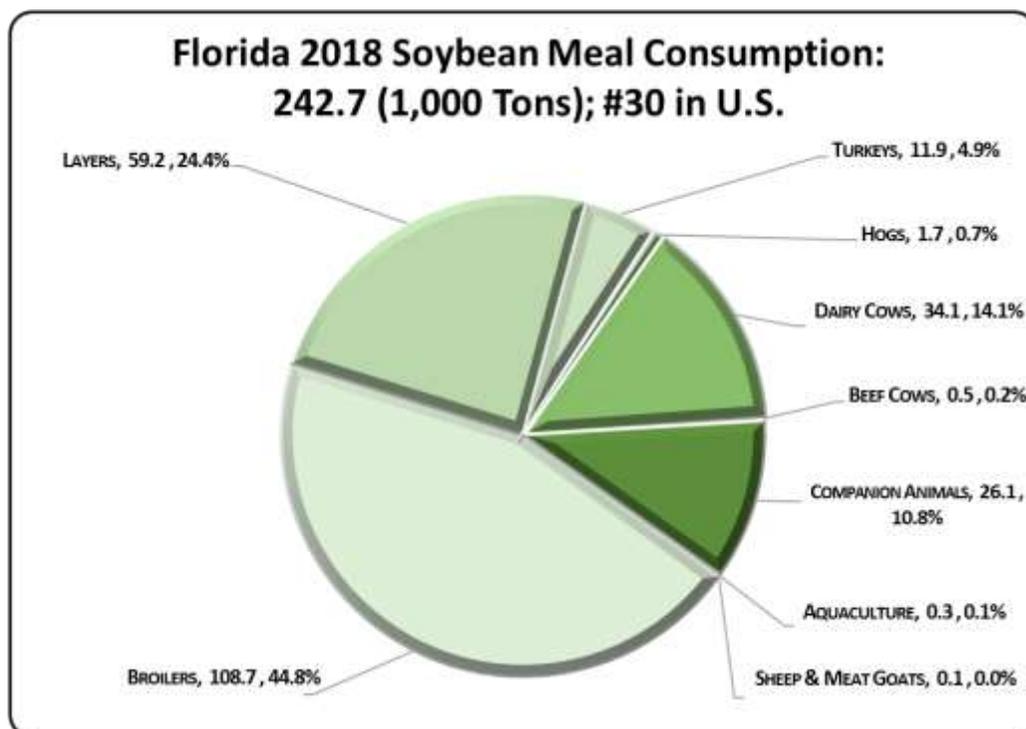
Florida Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Florida's animal agriculture consumed almost 242.7 thousand tons of soybean meal in 2018, placing the state as #30 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Florida consumed 18,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (108.7 thousand tons)
2. Egg-Laying Hens (59.2 thousand tons)
3. Dairy Cows (34.1 thousand tons)

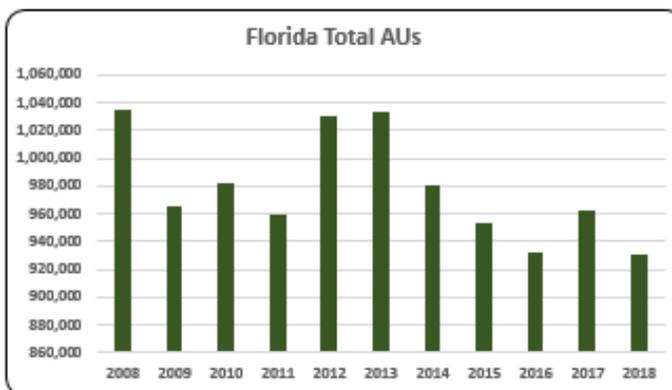
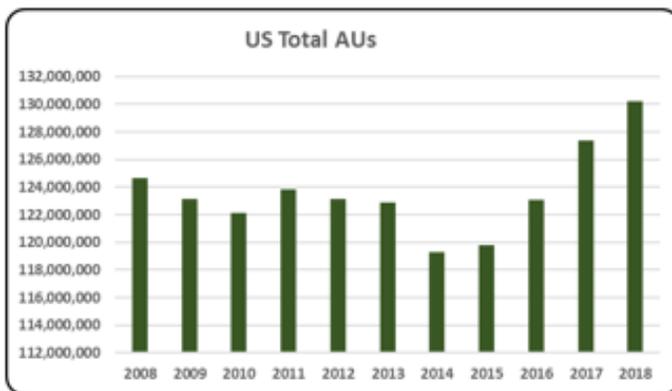


Florida Animal Unit (AU) Trends

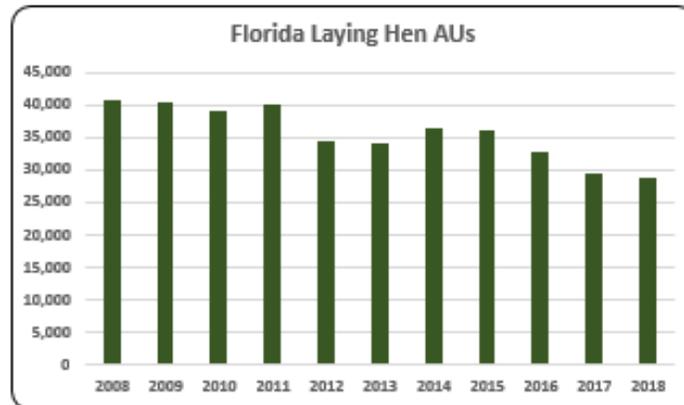
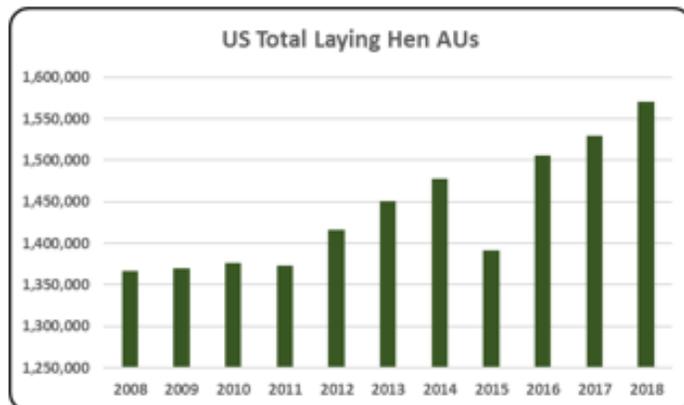
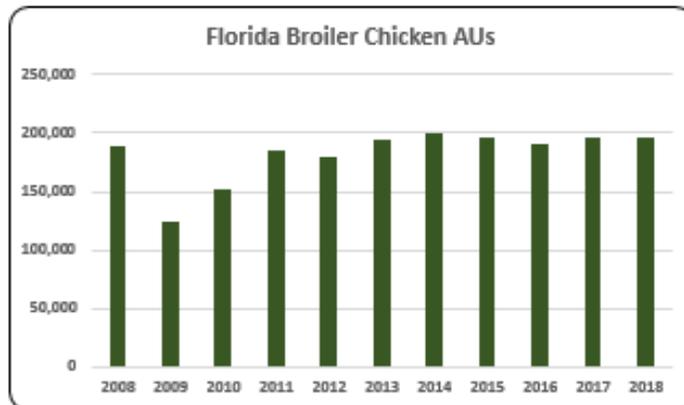
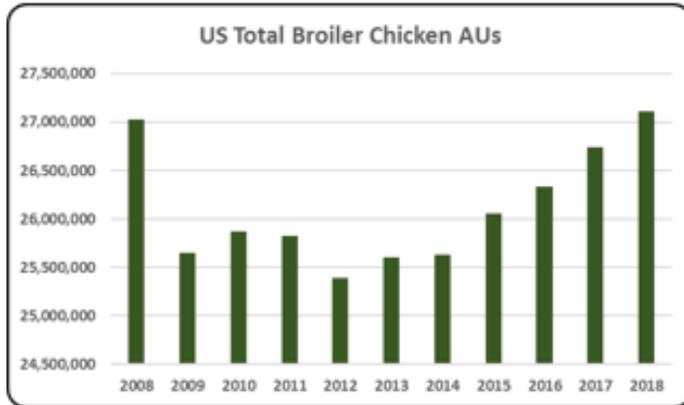
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Florida. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Florida and to give perspective on Florida’s contribution to the nation’s animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

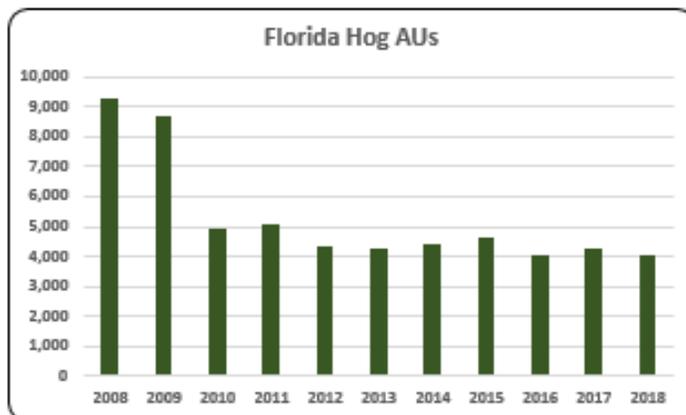
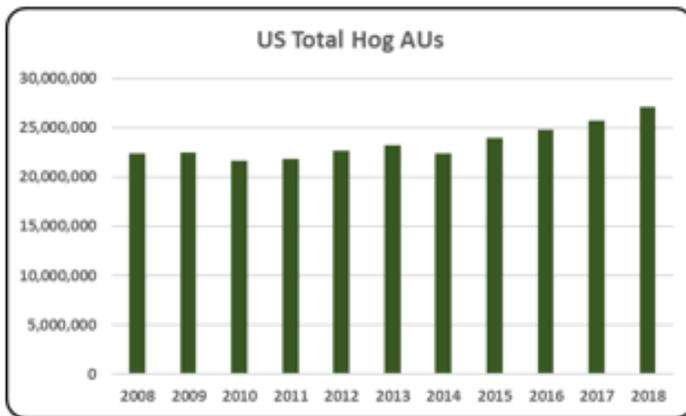
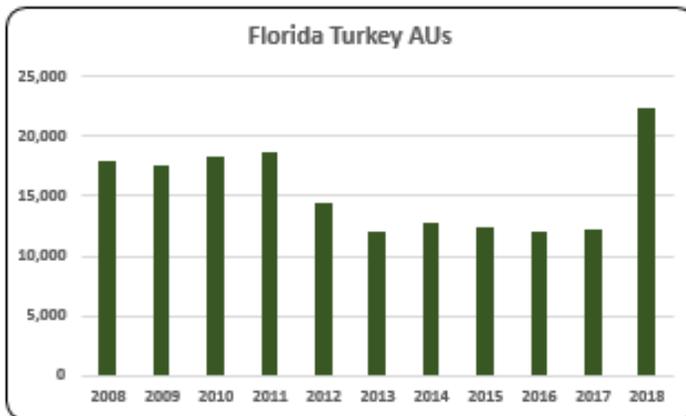
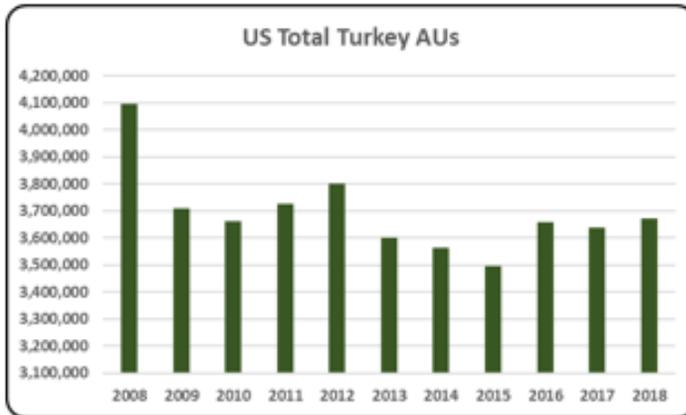
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Florida, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (505,575 AUs), Broilers (196,550 AUs), and Dairy Cows (173,600 AUs). Total animal units in Florida during 2018 were 930,996 AUs.



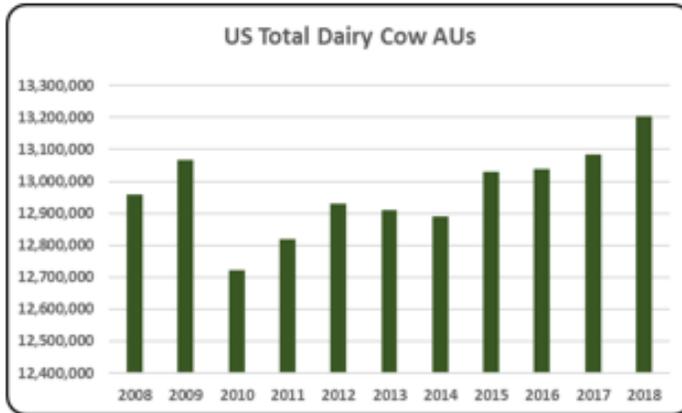
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- In 2018 there were 930,996 AUs in Florida. 54.3% (505,575) of which were beef cow AUs.



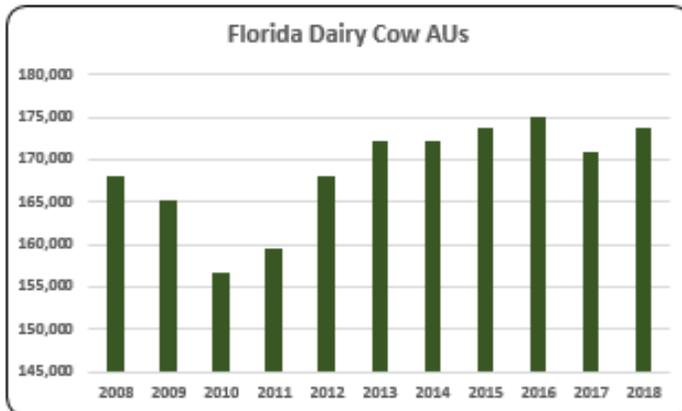
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- In 2018 there were 196,550 broiler AUs in the state. Florida’s broiler sector makes up 21.1% of Florida’s total AUs.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- The average layer AUs in Florida during the 2008-2018 decade was 35,687 but layer AUs fell from the 2008 high of 40,907 layer AUs in the state compared to 28,931 AUs in 2018.



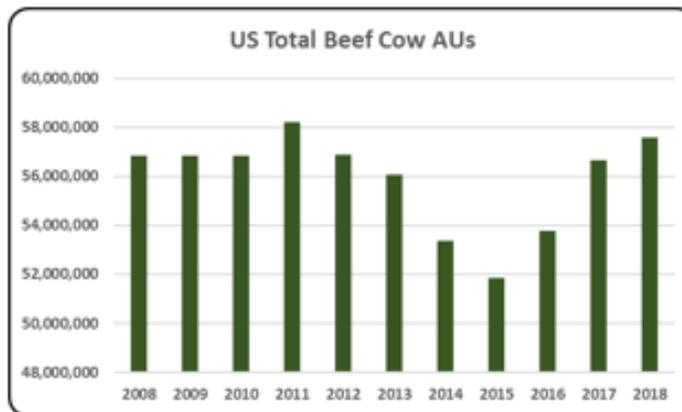
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- In 2018 turkey AUs increased by 83% relative to 2017. Turkey AUs for Florida in 2018 reached 22,275, which was the highest level over the past decade.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- In 2018, hogs in Florida were the smallest (4,065 AUs) animal sector in the state in terms of animal units. Overall hog numbers have been declining. Since 2008, hog AUs have averaged 5,279 AUs.



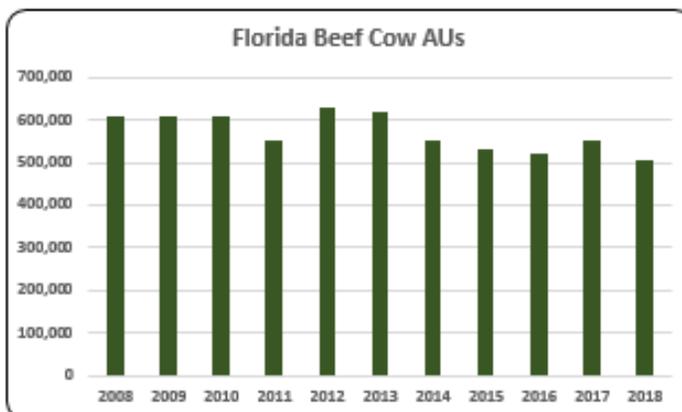
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Dairy cow animal inventory makes up 18.7% (173,600) of all AUs in the state. Dairy cow AUs have increased 3.3% since 2008.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Beef cow AUs are the largest animal sector in the state with 505,575 AUs in 2018. On average, from 2008 to 2018 there were 571,623 beef cow AUs in the state.

Florida Additional Information and Methodology

Animal agriculture is a modest part of Florida's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Florida, of interest is the degree to which the industry impacts the Florida economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Florida animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Florida's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Florida which have occurred. As shown in this state report, Florida has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Florida. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Florida Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Florida's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Florida, \$1.52 to \$1.86 million in total economic activity, \$0.34 to \$0.45 in household wages and 9 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.597	\$ 0.337	8.9
	Hogs, Pigs, and Other	\$ 1.520	\$ 0.366	10.3
	Poultry and Eggs	\$ 1.736	\$ 0.391	9.8
	Dairy	\$ 1.856	\$ 0.454	12.7

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	610,650	610,650	610,650	550,350	629,700	617,550	553,650	530,925	518,625	549,525	505,575
	Hog and Pig AUs	9,300	8,700	4,950	5,100	4,350	4,260	4,410	4,635	4,020	4,275	4,065
	Broiler AUs	188,120	123,581	152,143	185,680	178,844	193,564	200,469	195,663	189,949	195,957	196,550
	Turkey AUs	17,969	17,566	18,302	18,628	14,450	12,111	12,711	12,425	12,126	12,185	22,275
	Egg Layer AUs	40,907	40,508	39,176	40,012	34,425	34,005	36,470	36,081	32,700	29,345	28,931
	Dairy AUs	168,000	165,200	156,800	159,600	168,000	172,200	172,200	173,600	175,000	170,800	173,600
	Total Animal Units	1,034,946	966,205	982,021	959,369	1,029,770	1,033,690	979,910	953,329	932,420	962,086	930,996
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 333,654	\$ 311,595	\$ 395,161	\$ 451,169	\$ 532,525	\$ 533,592	\$ 798,434	\$ 786,325	\$ 510,629	\$ 501,798	\$ 505,949
	Hogs and Pigs (\$1,000)	\$ 2,813	\$ 3,274	\$ 2,297	\$ 2,759	\$ 2,318	\$ 2,293	\$ 3,114	\$ 2,574	\$ 1,842	\$ 2,088	\$ 1,737
	Broilers (\$1,000)	\$ 173,144	\$ 115,164	\$ 151,493	\$ 175,889	\$ 178,500	\$ 238,430	\$ 246,455	\$ 203,149	\$ 175,235	\$ 202,150	\$ 215,718
	Turkeys (\$1,000)	\$ 24,879	\$ 23,579	\$ 35,958	\$ 28,275	\$ 30,401	\$ 22,037	\$ 14,579	\$ 11,519	\$ 13,026	\$ 8,820	\$ 14,869
	Eggs (\$1,000)	\$ 234,515	\$ 152,616	\$ 150,746	\$ 177,861	\$ 183,258	\$ 167,335	\$ 219,087	\$ 315,651	\$ 110,028	\$ 112,171	\$ 154,784
	Milk (\$1,000)	\$ 465,786	\$ 351,520	\$ 441,531	\$ 549,098	\$ 521,820	\$ 569,537	\$ 707,256	\$ 549,966	\$ 489,020	\$ 536,640	\$ 473,819
	Other	\$ 71,003	\$ 75,466	\$ 80,046	\$ 84,426	\$ 88,916	\$ 85,767	\$ 82,504	\$ 79,313	\$ 76,050	\$ 72,888	\$ 69,628
	Sheep and Lambs (\$1,000)	\$ 287	\$ 314	\$ 456	\$ 400	\$ 453	\$ 560	\$ 552	\$ 617	\$ 610	\$ 703	\$ 698
	Aquaculture (\$1,000)	\$ 70,716	\$ 75,153	\$ 79,590	\$ 84,026	\$ 88,463	\$ 85,207	\$ 81,952	\$ 78,696	\$ 75,441	\$ 72,185	\$ 68,929
	Total (\$1,000)	\$ 1,305,794	\$ 1,033,214	\$ 1,257,232	\$ 1,469,476	\$ 1,537,739	\$ 1,618,991	\$ 2,071,428	\$ 1,948,497	\$ 1,375,831	\$ 1,436,555	\$ 1,436,504

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	15,304	16,819	17,351	18,534	
	Cattle feedlots (112112)	-	240	-	-	
	Dairy cattle and milk production (11212)	517	210	187	261	
	Hog and pig farming (1122)	601	594	581	455	
	Poultry and egg production (1123)	739	1,185	1,106	807	
	Sheep and goat farming (1124)	608	1,260	1,796	2,465	
	Animal aquaculture and other animal production (1125,1129)	8,281	8,531	7,904	8,384	
Value of Sales (\$1,000)	Cattle and Calves	328,820	436,193	531,869	521,847	
	Hogs and Pigs	3,154	2,220	2,158	3,989	
	Poultry and Eggs	336,295	410,148	378,453	406,742	
	Milk*			508,847	478,124	
	Aquaculture	56,949	61,340	88,463	72,185	
	Other (calculated)	103,930	206,888	60,021	169,923	
	Total	829,148	1,116,789	1,569,811	1,652,810	
Input Purchases	Livestock and poultry purchased	(Farms)	8,931	8,322	9,474	10,724
		\$1,000	147,080	175,186	163,843	184,126
	Breeding livestock purchased	(Farms)	5,337	5,111	5,623	6,336
		\$1,000	49,880	59,350	61,772	74,053
	Other livestock and poultry purchased	(Farms)	4,919	4,460	5,138	6,131
		\$1,000	97,200	115,836	102,071	110,074
Feed purchased	(Farms)	26,515	27,297	30,765	32,941	
	\$1,000	410,603	547,947	750,800	612,589	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 807,899	\$ 170,252	4,517	\$ 34,391
	Hogs, Pigs, and Other	\$ 108,453	\$ 26,127	734	\$ 5,278
	Poultry and Eggs	\$ 668,851	\$ 150,642	3,759	\$ 30,430
	Dairy	\$ 879,455	\$ 214,877	5,996	\$ 43,405
	Total	\$ 2,464,658	\$ 561,897	15,005	\$ 113,503

Change from 2008 to 2018	Cattle and Calves	\$ 171,202	\$ 36,078	957	\$ 7,288
	Hogs, Pigs, and Other	\$ (25,606)	\$ (6,168)	(173)	\$ (1,246)
	Poultry and Eggs	\$ (228,289)	\$ (51,416)	(1,283)	\$ (10,386)
	Dairy	\$ (153,720)	\$ (37,558)	(1,048)	\$ (7,587)
	Total	\$ (236,413)	\$ (59,065)	(1,547)	\$ (11,931)

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.597	\$ 0.337	8.9
	Hogs, Pigs, and Other	\$ 1.520	\$ 0.366	10.3
	Poultry and Eggs	\$ 1.736	\$ 0.391	9.8
	Dairy	\$ 1.856	\$ 0.454	12.7

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	0.0%
	Total	20.2%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: GEORGIA

Georgia Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Georgia animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Georgia. The success of Georgia animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Georgia during 2018 animal agriculture contributed:

- \$15.8 billion in economic output
- 71,154 jobs
- \$3.5 billion in earnings
- \$830.4 million in income taxes paid at local, state, and federal levels
- \$162.6 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Georgia has increased economic output by over \$1.2 billion, boosted household earnings by \$254.0 million, contributed 5,122 additional jobs and paid \$60.2 million in additional tax revenues.

Georgia's animal agriculture consumed 2.4 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (2.3 million tons)
- Egg-Laying Hens (103.9 thousand tons)
- Hogs (20.3 thousand tons)

This report examines animal agriculture in Georgia over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Georgia, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Georgia and beyond.

Georgia Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Georgia's economy. In 2018, Georgia's animal agriculture contributed the following to the economy:

- About \$15.8 billion in economic output
- \$3.5 billion in household earnings
- 71,154 jobs
- \$830.4 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Georgia's animal agriculture has:

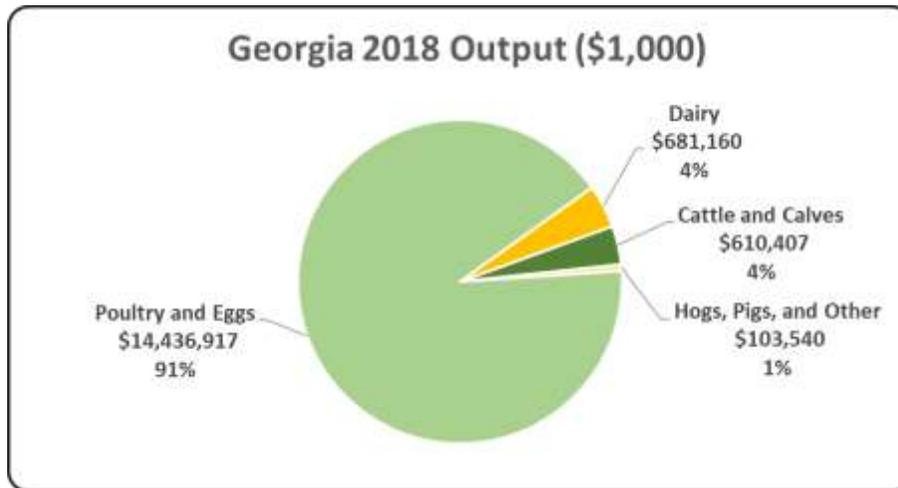
- Increased economic output by \$1.2 billion
- Boosted household earnings by \$254.0 million
- Added 5,122 jobs
- Paid an additional \$60.2 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 15,832,024	\$ 1,159,708	7.90%
Earnings (\$1,000)	\$ 3,503,859	\$ 253,967	7.81%
Employment (Jobs)	71,154	5,122	7.76%
Income Taxes Paid (\$1,000)	\$ 830,415	\$ 60,190	7.81%
Property Taxes Paid in 2017 (\$1,000)	\$ 162,645		

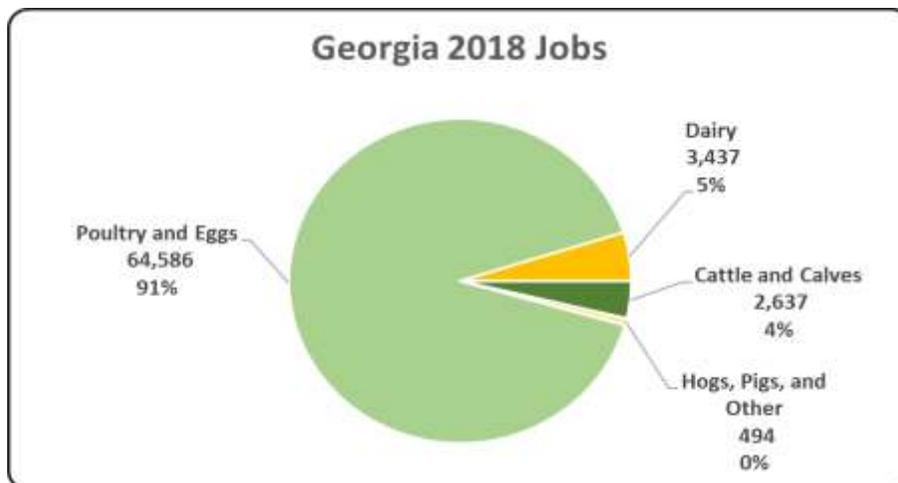
Georgia Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Georgia economy. Animal agriculture’s impact on Georgia total economic output is about \$15.8 billion.



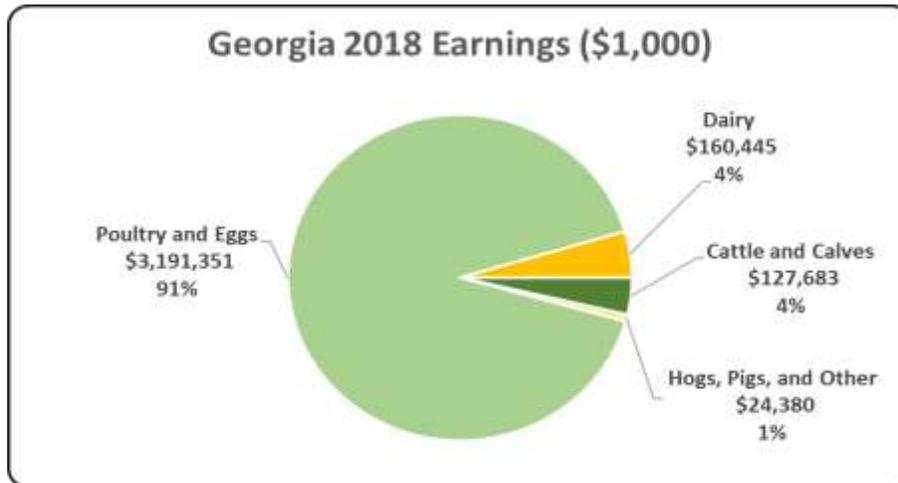
Georgia Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Georgia in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Georgia total jobs, contributing 71,154 jobs within and outside of animal agriculture.



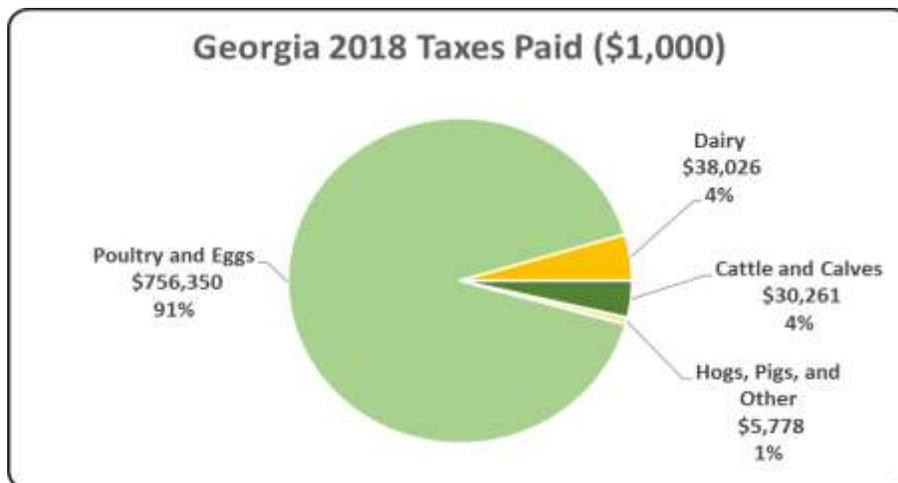
Georgia Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Georgia economy in terms of earnings. Georgia’s animal agriculture contributed about \$3.5 billion to household earnings in 2018.



Georgia Taxes Paid by Animal Agriculture

Georgia’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$830.4 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$162.6 million in property taxes paid by all of Georgia agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



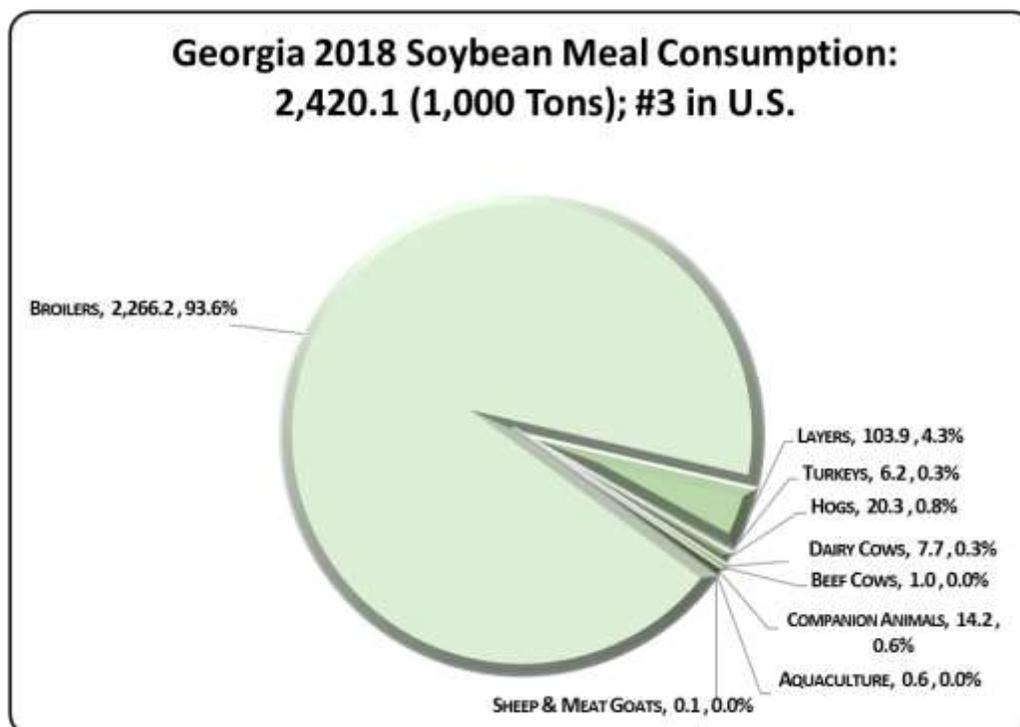
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Georgia's animal agriculture consumed almost 2.4 million tons of soybean meal in 2018, placing the state as #3 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Georgia consumed 7,600 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

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2. Egg-Laying Hens (103.9 thousand tons)
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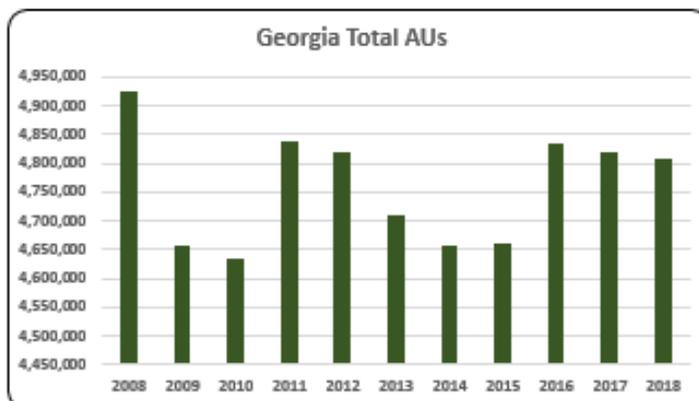
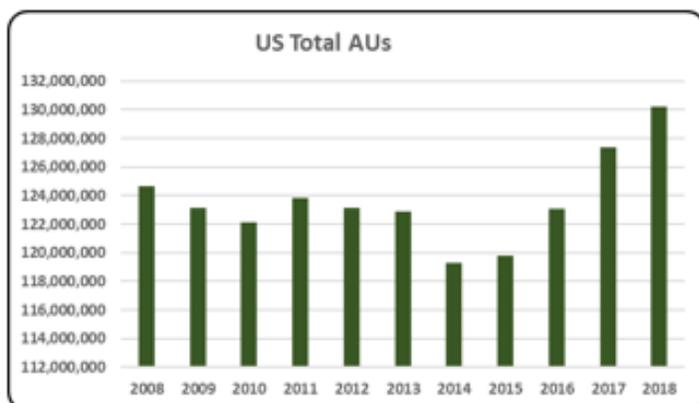


Georgia Animal Unit (AU) Trends

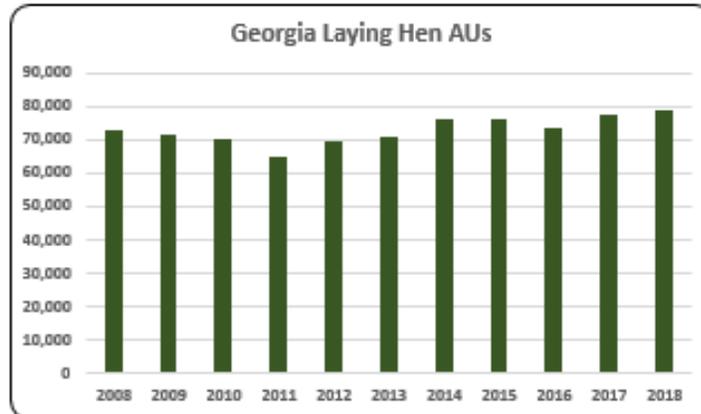
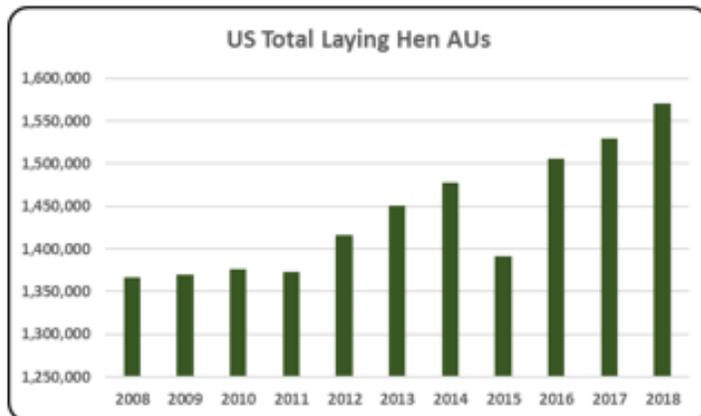
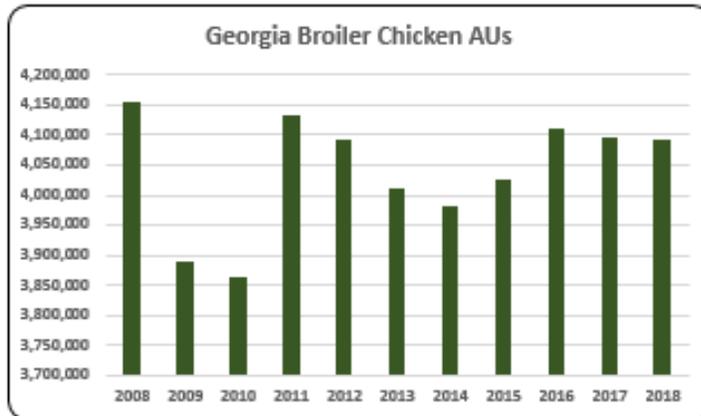
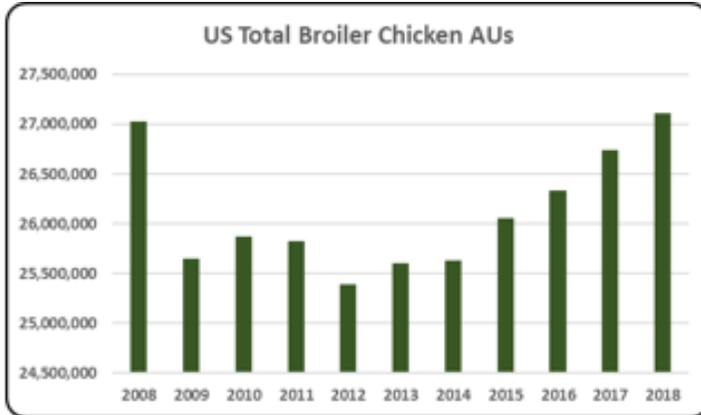
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Georgia. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Georgia and to give perspective on Georgia's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

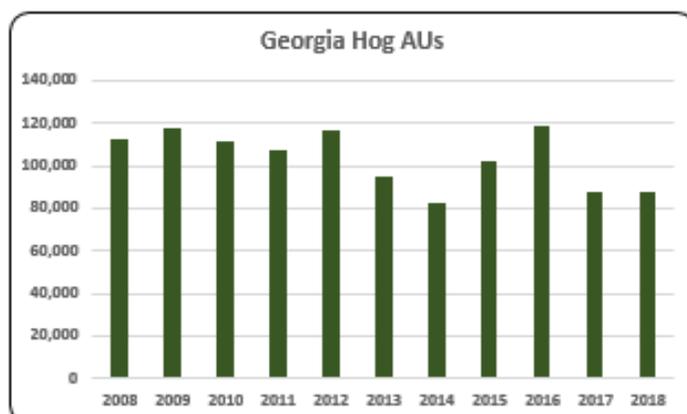
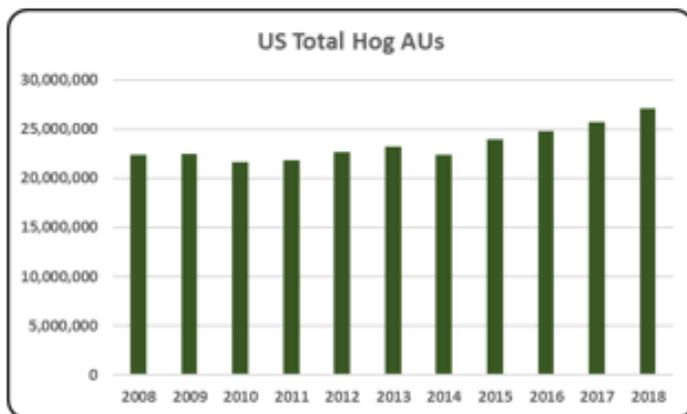
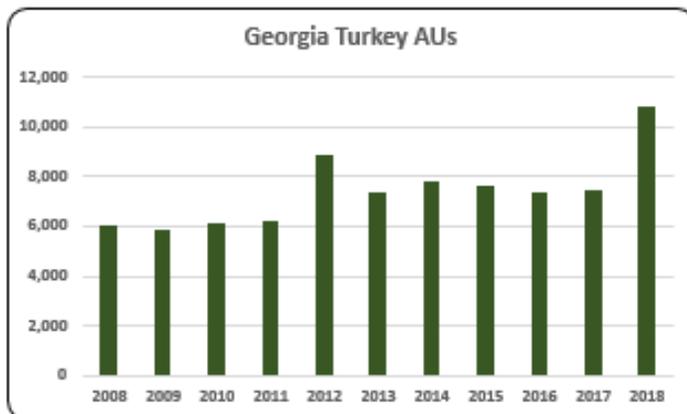
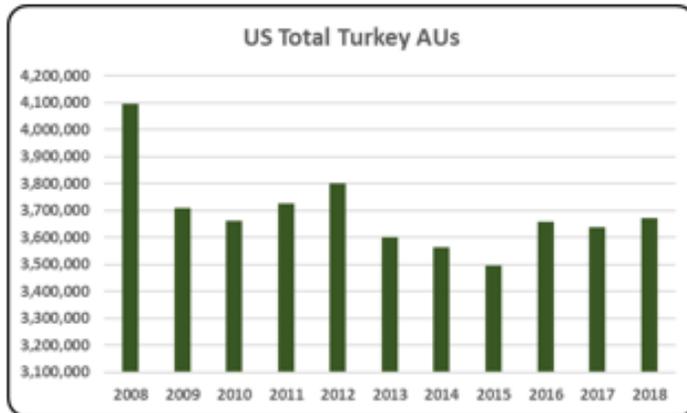
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Georgia, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (4.1 million AUs), Beef Cows (421,500 AUs), and Dairy Cows (119,000 AUs). Total animal units in Georgia during 2018 were 4.8 million AUs.



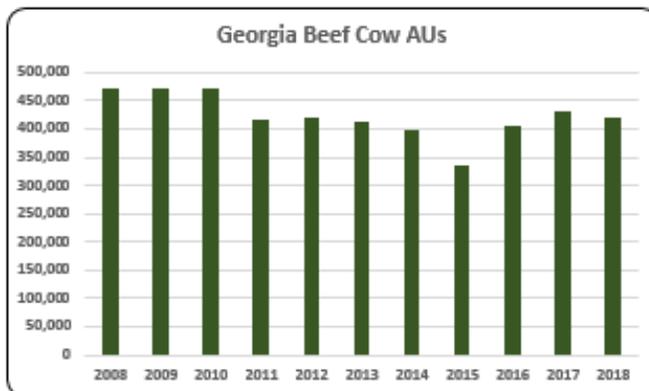
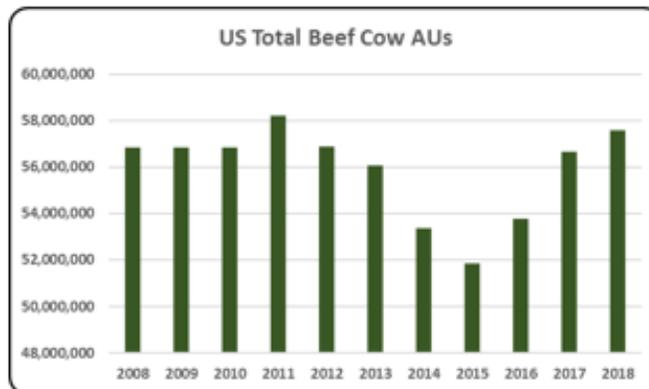
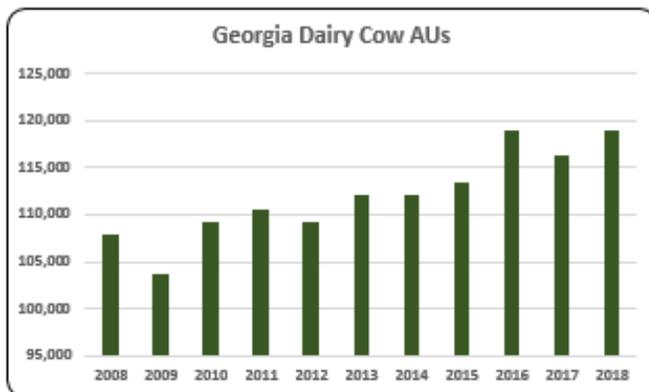
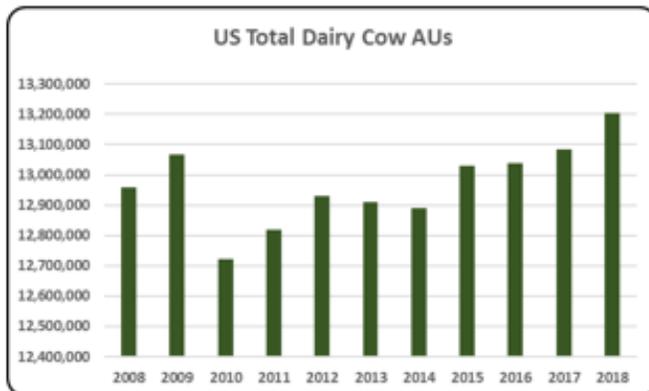
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 2018 total AUs in Georgia were 4.8 million, comprising about 3.7% of all AUs in the U.S. As the number one broiler producer, Georgia's 2018 broiler AUs represented 15.1% of the U.S. broilers.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- In 2018, broiler AUs accounted for 85.1% (4.1 million) of all AUs in Georgia. Broiler AUs have seen large fluctuations in the last decade.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layer AUs have climbed since 2011, and in 2018 laying hen AUs increased to 79,117.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Georgia’s turkey industry is the smallest of all animal sectors reporting in at 10,881 of all AUs in the state in 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs have varied over the years, numbers declined in 2014 (82,500) but increased in 2016 (118,425). However, in 2018 they dropped to 87,615.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cow AUs in Georgia have grown 10.4% since 2008 to a total of 119,000 AUs in 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Even though beef is the second largest animal unit sector in the state, there has been a downward trend with a 10.5% reduction in the number beef cow AUs from 2008 to 2018 (421,500 AUs in 2018).

Georgia Additional Information and Methodology

Animal agriculture is an important part of Georgia's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Georgia, of interest is the degree to which the industry impacts the Georgia economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Georgia animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Georgia's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Georgia which have occurred. As shown in this state report, Georgia has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Georgia. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Georgia Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Georgia's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Georgia, \$1.69 to \$2.76 million in total economic activity, \$0.38 to \$0.61 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.824	\$ 0.382	7.9
	Hogs, Pigs, and Other	\$ 1.692	\$ 0.398	8.1
	Poultry and Eggs	\$ 2.760	\$ 0.610	12.3
	Dairy	\$ 2.256	\$ 0.531	11.4

Appendix

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	470,700	470,700	470,700	417,000	420,300	411,600	398,100	336,600	406,650	432,300	421,500
	Hog and Pig AUs	112,545	117,300	111,900	107,700	116,700	95,175	82,500	102,450	118,425	87,645	87,615
	Broiler AUs	4,155,154	3,889,866	3,865,378	4,131,825	4,092,980	4,011,338	3,979,927	4,026,271	4,108,841	4,097,673	4,091,485
	Turkey AUs	6,033	5,898	6,145	6,255	8,831	7,401	7,768	7,593	7,411	7,446	10,811
	Egg Layer AUs	72,698	71,520	70,012	65,080	69,683	71,271	76,105	76,421	73,764	77,262	79,117
	Dairy AUs	107,800	103,600	109,200	110,600	109,200	112,000	112,000	113,400	119,000	116,200	119,000
	Total Animal Units	4,924,931	4,658,884	4,633,335	4,838,459	4,817,693	4,708,786	4,656,401	4,662,736	4,834,091	4,818,526	4,809,528
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 253,379	\$ 249,687	\$ 272,727	\$ 336,853	\$ 382,348	\$ 382,907	\$ 521,993	\$ 519,004	\$ 336,222	\$ 331,378	\$ 334,598
	Hogs and Pigs (\$1,000)	\$ 52,730	\$ 45,534	\$ 43,517	\$ 58,427	\$ 64,807	\$ 55,922	\$ 55,943	\$ 60,590	\$ 65,659	\$ 40,707	\$ 34,017
	Broilers (\$1,000)	\$ 3,435,648	\$ 3,141,601	\$ 3,317,461	\$ 3,408,580	\$ 3,812,750	\$ 4,617,570	\$ 4,808,012	\$ 4,252,137	\$ 3,855,500	\$ 4,375,990	\$ 4,566,136
	Turkeys (\$1,000)	\$ 6,856	\$ 6,498	\$ 12,074	\$ 9,494	\$ 10,208	\$ 7,399	\$ 4,895	\$ 7,039	\$ 7,960	\$ 5,390	\$ 7,217
	Eggs (\$1,000)	\$ 564,244	\$ 468,599	\$ 442,065	\$ 488,812	\$ 532,576	\$ 585,797	\$ 666,920	\$ 764,192	\$ 597,102	\$ 578,298	\$ 656,656
	Milk (\$1,000)	\$ 283,195	\$ 204,400	\$ 256,680	\$ 319,000	\$ 304,669	\$ 338,688	\$ 446,424	\$ 359,400	\$ 320,250	\$ 349,600	\$ 301,986
	Other	\$ 16,024	\$ 18,810	\$ 21,687	\$ 24,408	\$ 27,215	\$ 27,257	\$ 27,208	\$ 27,217	\$ 27,168	\$ 27,223	\$ 27,177
	Sheep and Lambs (\$1,000)	\$ 226	\$ 247	\$ 359	\$ 315	\$ 357	\$ 441	\$ 435	\$ 486	\$ 481	\$ 578	\$ 575
	Aquaculture (\$1,000)	\$ 15,797	\$ 18,563	\$ 21,328	\$ 24,093	\$ 26,858	\$ 26,815	\$ 26,773	\$ 26,730	\$ 26,688	\$ 26,645	\$ 26,602
	Total (\$1,000)	\$ 4,612,076	\$ 4,135,129	\$ 4,366,211	\$ 4,645,573	\$ 5,134,573	\$ 6,015,540	\$ 6,531,395	\$ 5,989,579	\$ 5,209,862	\$ 5,708,586	\$ 5,927,787

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	18,799	15,796	12,858	13,209	
	Cattle feedlots (112112)	317	313	-	1	
	Dairy cattle and milk production (11212)	527	487	232	319	
	Hog and pig farming (1122)	493	384	247	230	
	Poultry and egg production (1123)	3,632	3,860	4,158	3,024	
	Sheep and goat farming (1124)	1,010	1,544	1,912	2,198	
	Animal aquaculture and other animal production (1125,1129)	6,197	6,301	4,027	4,547	
Value of Sales (\$1,000)	Cattle and Calves	240,070	342,392	403,172	362,331	
	Hogs and Pigs	65,384	68,369	56,386	53,265	
	Poultry and Eggs	2,780,214	4,246,765	4,773,837	5,482,036	
	Milk*			299,548	331,380	
	Aquaculture	5,310	14,075	26,858	26,645	
	Other (calculated)	28,458	34,572	16,560	45,655	
	Total	3,119,436	4,706,173	5,576,361	6,301,312	
Input Purchases	Livestock and poultry purchased	(Farms)	12,342	10,114	10,995	11,253
		\$1,000	372,108	871,341	927,465	1,004,687
	Breeding livestock purchased	(Farms)	3,460	4,907	5,728	6,240
		\$1,000	27,615	43,265	99,642	159,115
	Other livestock and poultry purchased	(Farms)	7,172	6,399	6,714	6,715
		\$1,000	344,493	828,076	827,823	845,572
	Feed purchased	(Farms)	32,119	26,287	26,118	27,046
		\$1,000	1,365,162	2,121,379	2,913,851	2,264,683

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 610,407	\$ 127,683	2,637	\$ 30,261
	Hogs, Pigs, and Other	\$ 103,540	\$ 24,380	494	\$ 5,778
	Poultry and Eggs	\$ 14,436,917	\$ 3,191,351	64,586	\$ 756,350
	Dairy	\$ 681,160	\$ 160,445	3,437	\$ 38,026
	Total	\$ 15,832,024	\$ 3,503,859	71,154	\$ 830,415
Change from 2008 to 2018	Cattle and Calves	\$ 58,008	\$ 12,134	251	\$ 2,876
	Hogs, Pigs, and Other	\$ (35,481)	\$ (8,355)	(169)	\$ (1,980)
	Poultry and Eggs	\$ 1,219,389	\$ 269,552	5,455	\$ 63,884
	Dairy	\$ (82,208)	\$ (19,364)	(415)	\$ (4,589)
	Total	\$ 1,159,708	\$ 253,967	5,122	\$ 60,190
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.824	\$ 0.382	7.9	
	Hogs, Pigs, and Other	\$ 1.692	\$ 0.398	8.1	
	Poultry and Eggs	\$ 2.760	\$ 0.610	12.3	
	Dairy	\$ 2.256	\$ 0.531	11.4	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.5%	
	Total			23.7%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: HAWAII

Hawaii Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Hawaii animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture success in the State of Hawaii. The success of Hawaii animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Hawaii during 2018 animal agriculture contributed:

- \$227.2 million in economic output
- 1,522 jobs
- \$49.8 million in earnings
- \$12.5 million in income taxes paid at local, state, and federal levels
- \$16.3 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Hawaii has increased economic output by over \$90.3 million, boosted household earnings by \$20.0 million, contributed 610 additional jobs and paid \$5.0 million in additional tax revenues.

Hawaii's animal agriculture consumed almost 9,400 tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (3,900 tons)
- Egg-Laying Hens (2,400 tons)
- Companion Animals (1,300 tons)

This report examines animal agriculture in Hawaii over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Hawaii, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Hawaii and beyond.

Hawaii Economic Impact of Animal Agriculture

Animal agriculture is a small part of Hawaii's economy. In 2018, Hawaii's animal agriculture contributed the following to the economy:

- About \$227.2 million in economic output
- \$49.8 million in household earnings
- 1,522 jobs
- \$12.5 million in income taxes

During the last decade Hawaii's animal agriculture has:

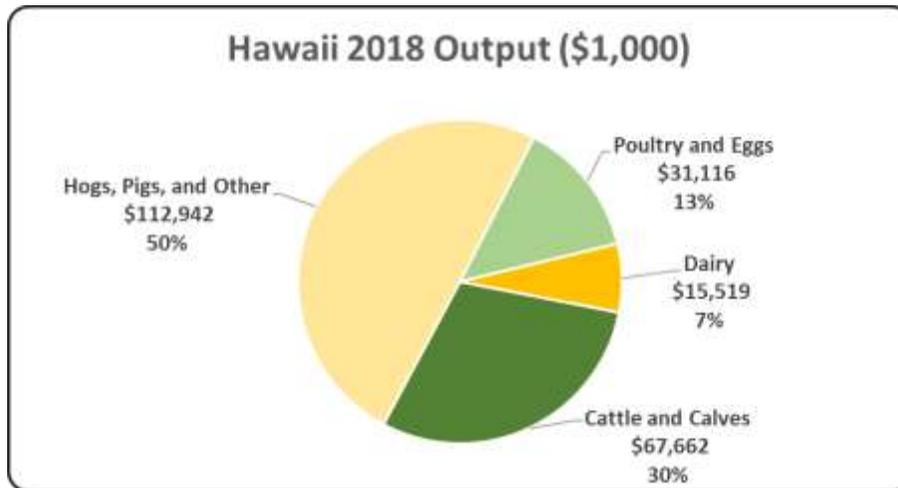
- Increased economic output by \$90.3 million
- Boosted household earnings by \$20.0 million
- Added 610 jobs
- Paid an additional \$5.0 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 227,238	\$ 90,343	65.99%
Earnings (\$1,000)	\$ 49,794	\$ 19,975	66.99%
Employment (Jobs)	1,522	610	66.92%
Income Taxes Paid (\$1,000)	\$ 12,461	\$ 4,999	66.99%
Property Taxes Paid in 2017 (\$1,000)	\$ 16,334		

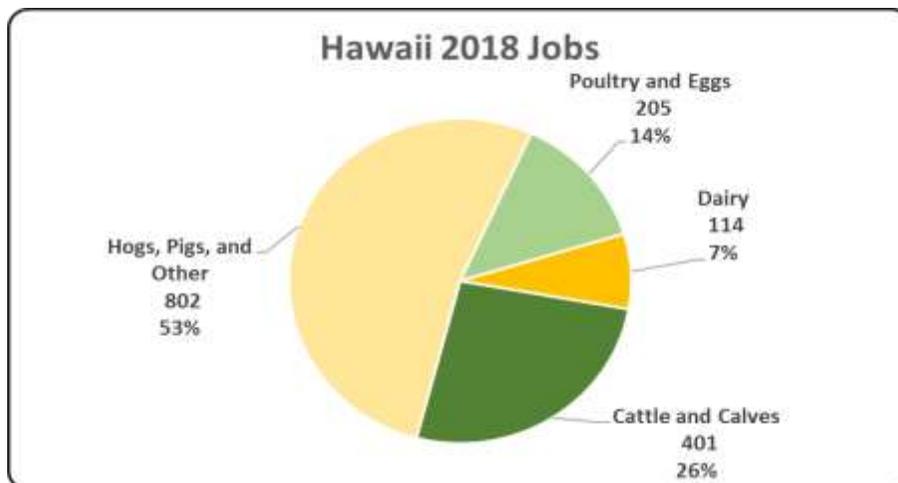
Hawaii Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Hawaii economy. Animal agriculture’s impact on Hawaii total economic output is about \$227.2 million.



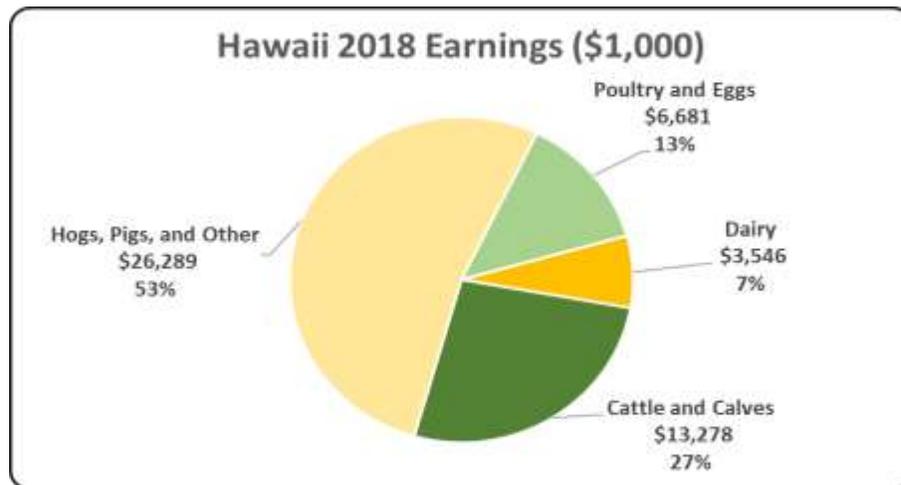
Hawaii Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Hawaii in terms of animal agriculture jobs. As shown, animal agriculture contributes 1,522 jobs within and outside of animal agriculture.



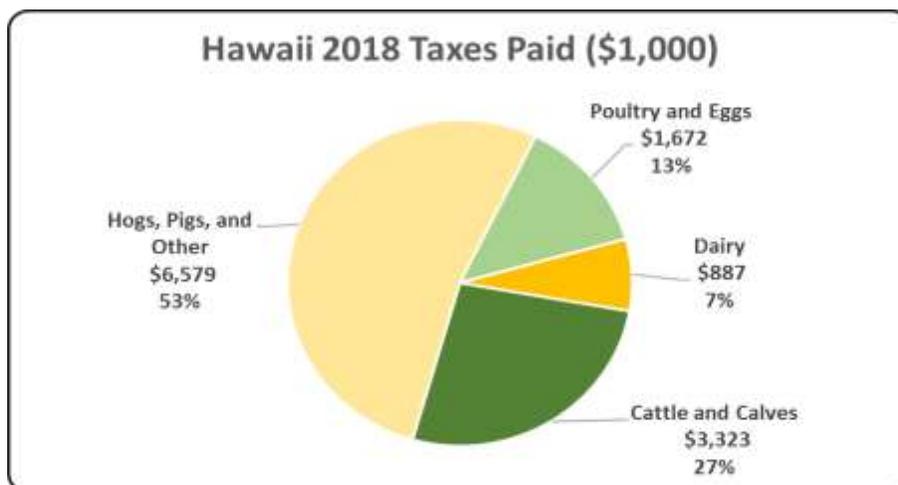
Hawaii Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Hawaii economy in terms of earnings. Hawaii’s animal agriculture contributed about \$49.8 million to household earnings in 2018.



Hawaii Taxes Paid by Animal Agriculture

Hawaii’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$12.5 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$16.3 million in property taxes paid by all of Hawaii agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



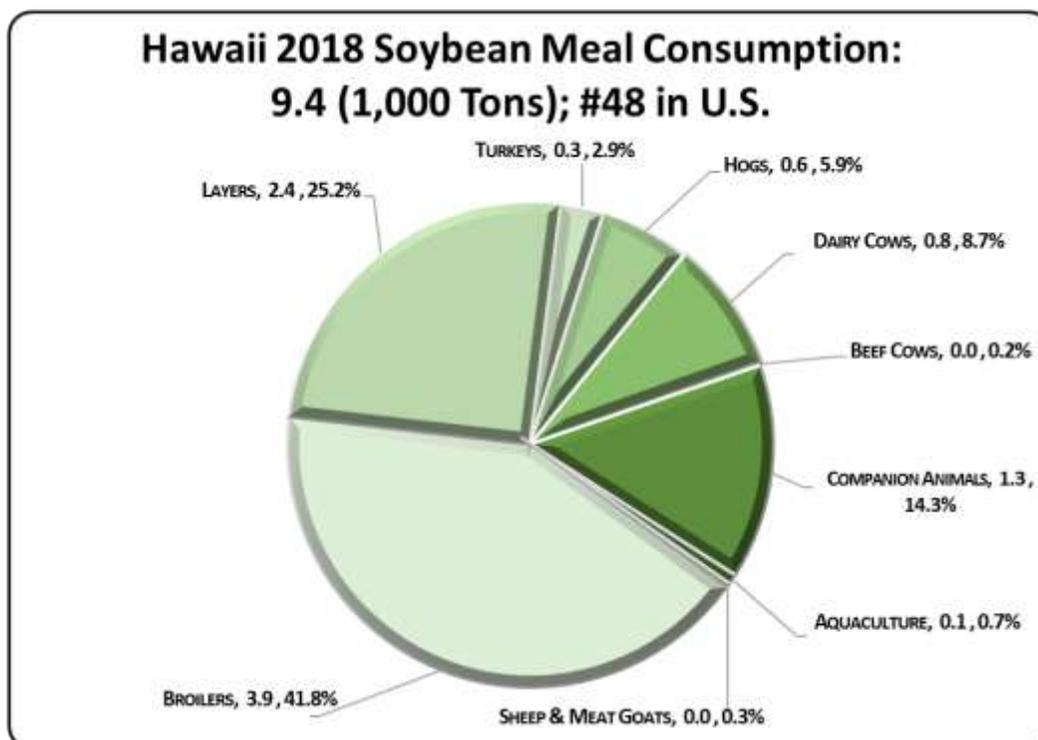
Hawaii Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Hawaii's animal agriculture consumed almost 9,400 tons of soybean meal in 2018, placing the state as #48 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Hawaii consumed 0.1 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (3,900 tons)
2. Egg-Laying Hens (2,400 tons)
3. Companion Animals (1,300 tons)

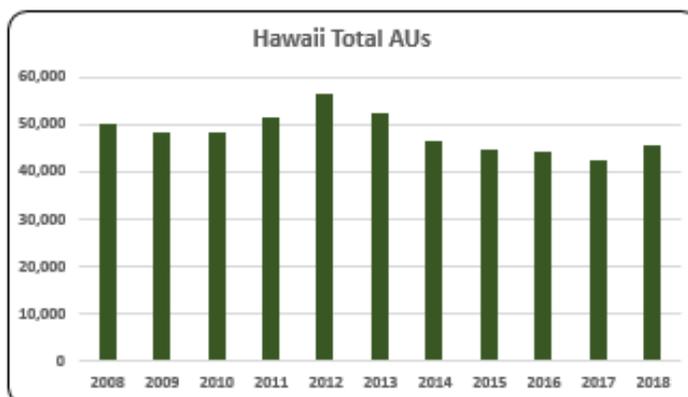
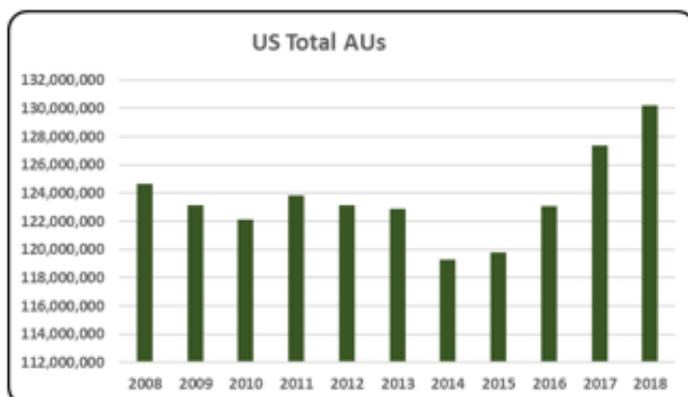


Hawaii Animal Unit (AU) Trends

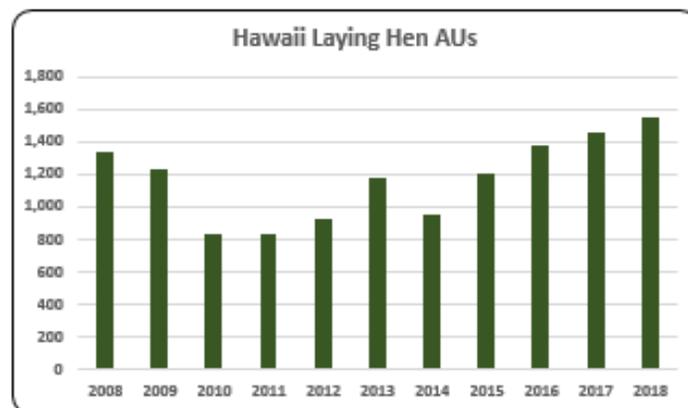
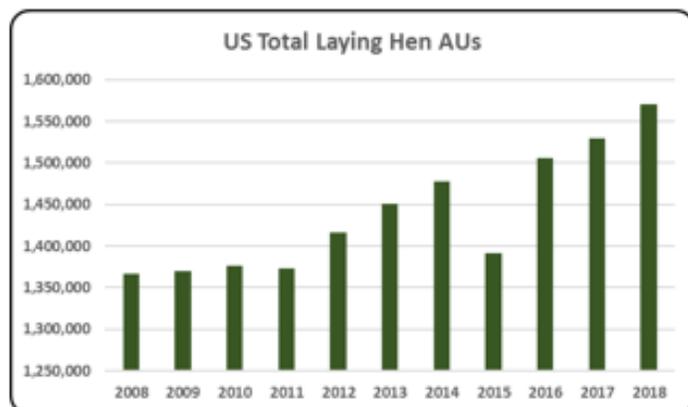
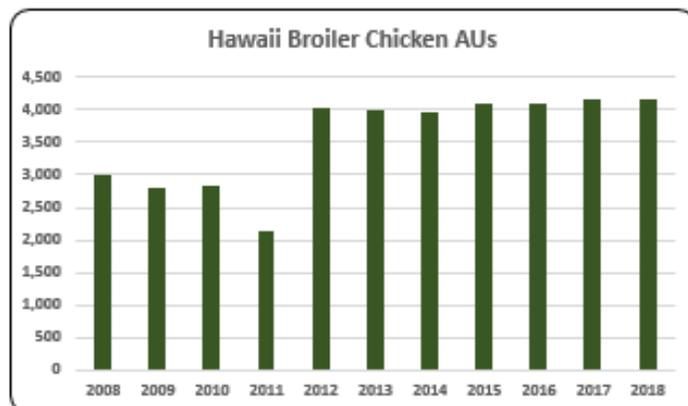
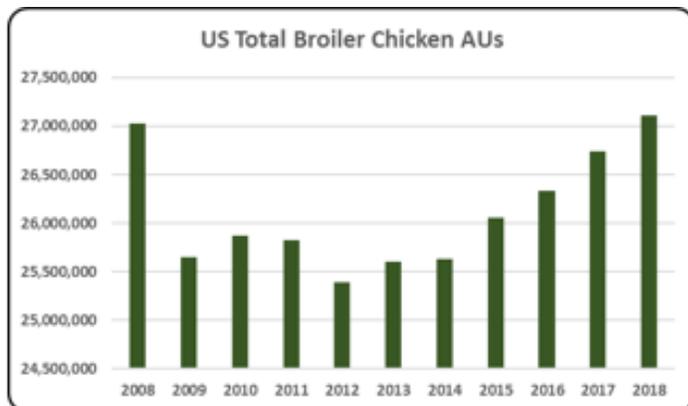
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Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Hawaii, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (36,135 AUs), Broilers (4,171 AUs), and Dairy Cows (2,800 AUs). Total animal units in Hawaii during 2018 were 45,667 AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Overall AUs in Hawaii were small for all species included in this study from 2008 to 2018 and there was a decrease of 9.2% during this period for all AUs. Hawaii AUs in 2018 were 45,667.

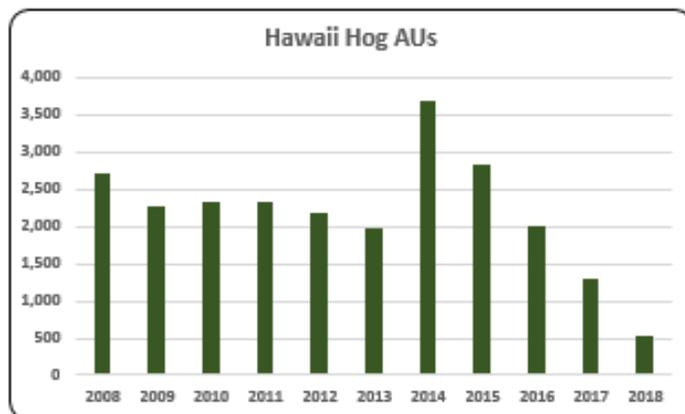
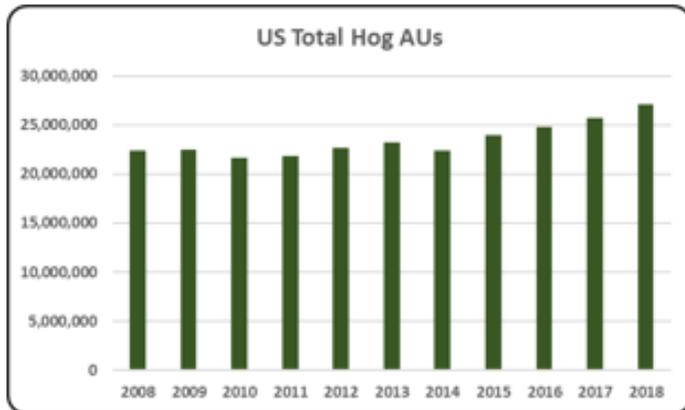
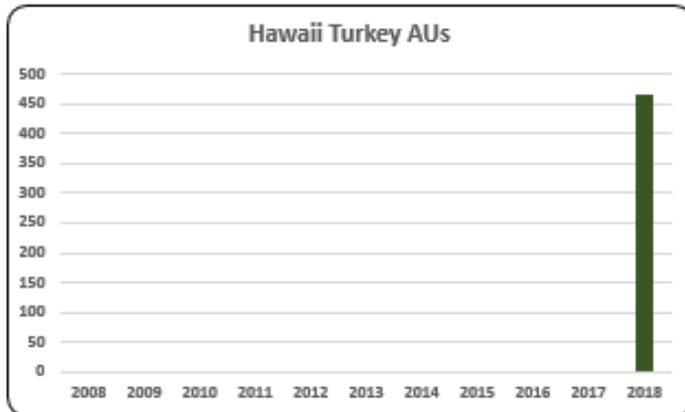
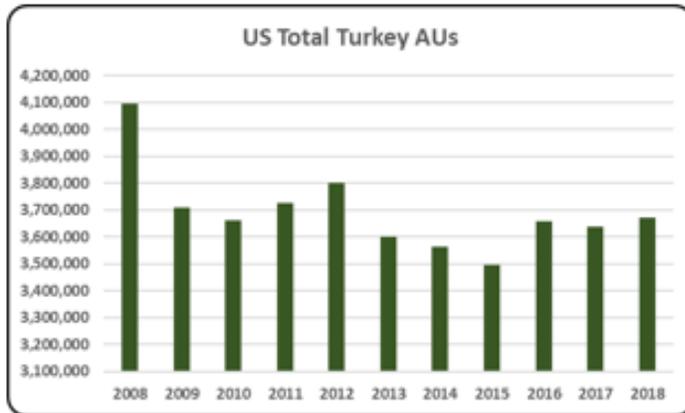


- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).

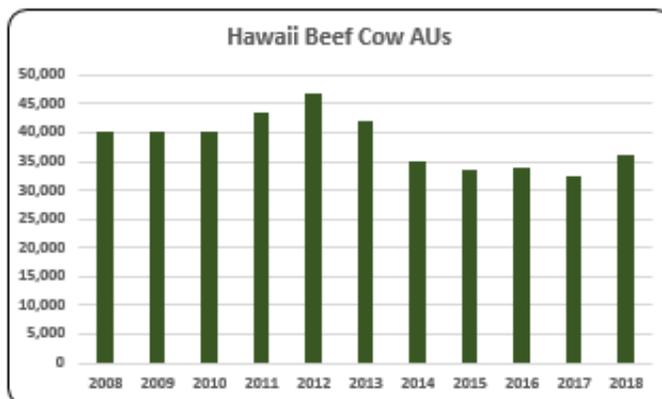
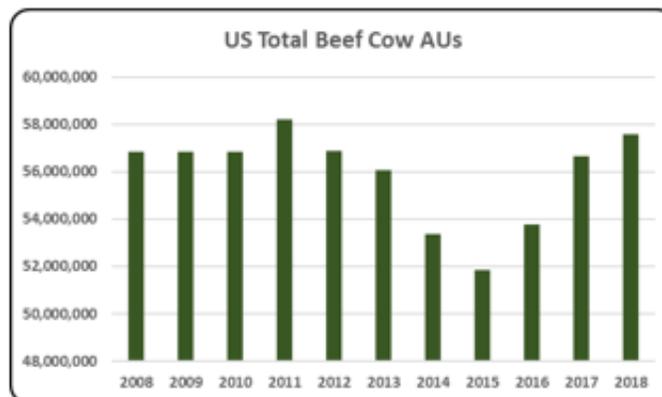
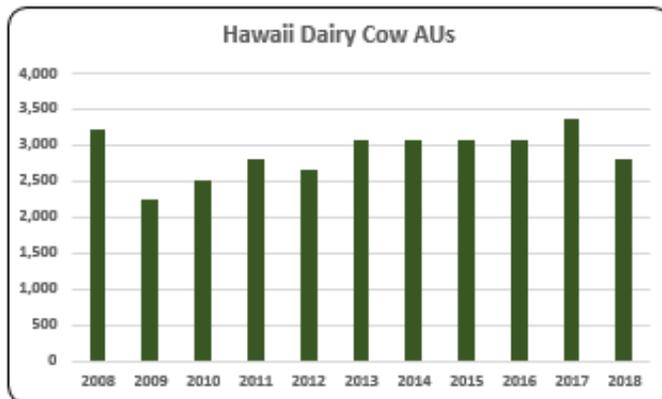
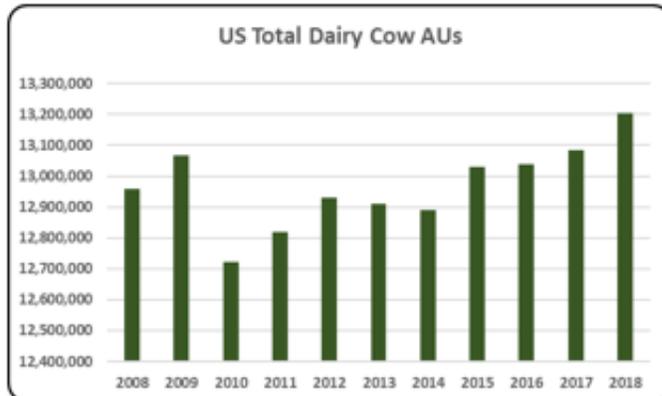
- There were 4,171 broiler AUs in 2018 in Hawaii. Broiler chickens made up 9.1% of total Hawaii AUs in 2018.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- Layer AUs in Hawaii followed a descending trend from the highest numbers in 2008 (1,345) to the lowest numbers in 2010 (832). Layer AUs have risen since the 2010 levels; however, layer AUs in 2018 were only at 1,555 AUs.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey production in Hawaii reported farms for the first time and had a total of 466 AUs in 2018.
- On average from 2006 to 2016, hog AUs were about 22.3 million. Hog AUs increased 16.7% to 24.8 million AUs compared to the decade low in 2006 (20.6 million AUs). Hog AUs have increased 300 thousand units per year since 2006.
- 2018 hog AUs were at 540, overall hog AUs have fallen from a record number in 2005 (3,900) to the lowest number (540) in 2018.



- From 2007 to 2017 dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- Dairy AUs in Hawaii declined from 2008 reaching the lowest number in 2009 (2,240). Numbers have been rebuilding since then but fell below dairy cow AUs in 2008 (3,220). In 2018 dairy AUs were at 2,800.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- There were 36,135 beef cow AUs in Hawaii in 2018. AU numbers have been consistently declining since the 2012 record number of 46,650 beef cow AUs but did see a slight increase in 2018.

Hawaii Additional Information and Methodology

Animal agriculture is a small part of Hawaii's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Hawaii, of interest is the degree to which the industry impacts the Hawaii economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Hawaii animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Hawaii's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again, using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Hawaii which have occurred. As shown in this state report, Hawaii has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Hawaii. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Hawaii Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Hawaii's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Hawaii, \$1.44 to \$1.63 million in total economic activity, \$0.30 to \$0.37 in household wages and 9 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.508	\$ 0.296	8.9
	Hogs, Pigs, and Other	\$ 1.443	\$ 0.336	10.3
	Poultry and Eggs	\$ 1.479	\$ 0.318	9.7
	Dairy	\$ 1.630	\$ 0.373	11.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	40,050	40,050	40,050	43,500	46,650	42,150	34,860	33,510	33,960	32,460	36,135	
	Hog and Pig AUs	2,700	2,265	2,325	2,325	2,190	1,965	3,690	2,820	1,995	1,290	540	
	Broiler AUs	3,001	2,791	2,828	2,131	4,013	3,999	3,977	4,079	4,110	4,169	4,171	
	Turkey AUs	-	-	-	-	-	-	-	-	-	-	-	466
	Egg Layer AUs	1,345	1,228	832	837	928	1,182	957	1,208	1,379	1,456	1,555	
	Dairy AUs	3,220	2,240	2,520	2,800	2,660	3,080	3,080	3,080	3,080	3,360	2,800	
	Total Animal Units	50,316	48,574	48,555	51,593	56,441	52,377	46,564	44,698	44,524	42,735	45,667	
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 24,898	\$ 29,891	\$ 28,499	\$ 46,848	\$ 49,601	\$ 48,877	\$ 63,298	\$ 68,251	\$ 45,209	\$ 43,891	\$ 44,857	
	Hogs and Pigs (\$1,000)	\$ 3,299	\$ 3,216	\$ 3,935	\$ 2,789	\$ 2,941	\$ 2,831	\$ 4,232	\$ 3,315	\$ 2,364	\$ 1,534	\$ 568	
	Broilers (\$1,000)	\$ 2,404	\$ 2,074	\$ 2,167	\$ 1,898	\$ 3,999	\$ 4,873	\$ 5,112	\$ 4,460	\$ 3,965	\$ 4,656	\$ 7,026	
	Turkeys (\$1,000)	\$ 196	\$ 186	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 311	
	Eggs (\$1,000)	\$ 8,678	\$ 8,759	\$ 8,128	\$ 4,913	\$ 5,510	\$ 6,225	\$ 9,964	\$ 16,610	\$ 6,532	\$ 8,832	\$ 13,705	
	Milk (\$1,000)	\$ 5,643	\$ 7,562	\$ 8,855	\$ 9,617	\$ 9,713	\$ 10,148	\$ 10,585	\$ 10,080	\$ 9,214	\$ 11,125	\$ 9,520	
	Other	\$ 32,125	\$ 38,230	\$ 44,363	\$ 50,447	\$ 56,559	\$ 60,095	\$ 63,603	\$ 67,129	\$ 70,637	\$ 74,186	\$ 77,695	
	Sheep and Lambs (\$1,000)	\$ 69	\$ 75	\$ 109	\$ 96	\$ 109	\$ 134	\$ 132	\$ 148	\$ 146	\$ 185	\$ 184	
	Aquaculture (\$1,000)	\$ 32,056	\$ 38,155	\$ 44,253	\$ 50,352	\$ 56,450	\$ 59,960	\$ 63,470	\$ 66,981	\$ 70,491	\$ 74,001	\$ 77,511	
	Total (\$1,000)	\$ 77,243	\$ 89,918	\$ 95,947	\$ 116,512	\$ 128,322	\$ 133,048	\$ 156,793	\$ 169,844	\$ 137,921	\$ 144,224	\$ 153,683	

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	526	860	976	952
	Cattle feedlots (112112)	30	30	-	-
	Dairy cattle and milk production (11212)	13	6	9	11
	Hog and pig farming (1122)	115	116	91	95
	Poultry and egg production (1123)	51	107	97	80
	Sheep and goat farming (1124)	65	190	238	420
	Animal aquaculture and other animal production (1125,1129)	167	359	257	341
Value of Sales (\$1,000)	Cattle and Calves	30,719	44,011	37,825	34,639
	Hogs and Pigs	4,612	withheld	-	withheld
	Poultry and Eggs	12,545	withheld	6,429	7,984
	Milk*			-	withheld
	Aquaculture	14,005	14,057	56,450	74,001
	Other (calculated)	4,441	18,625	8,119	30,109
	Total	66,322	76,693	108,823	146,733
Input Purchases	Livestock and poultry purchased	(Farms) 329	547	741	756
		\$1,000 6,025	3,343	3,880	5,011
	Breeding livestock purchased	(Farms) 179	267	354	340
		\$1,000 873	1,135	1,509	1,815
	Other livestock and poultry purchased	(Farms) 193	345	491	527
		\$1,000 5,152	2,208	2,371	3,196
	Feed purchased	(Farms) 1,267	1,939	2,028	2,371
	\$1,000 27,997	24,678	43,811	36,783	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 67,662	\$ 13,278	401	\$ 3,323
	Hogs, Pigs, and Other	\$ 112,942	\$ 26,289	802	\$ 6,579
	Poultry and Eggs	\$ 31,116	\$ 6,681	205	\$ 1,672
	Dairy	\$ 15,519	\$ 3,546	114	\$ 887
	Total	\$ 227,238	\$ 49,794	1,522	\$ 12,461
Change from 2008 to 2018	Cattle and Calves	\$ 22,781	\$ 4,470	135	\$ 1,119
	Hogs, Pigs, and Other	\$ 51,850	\$ 12,069	368	\$ 3,020
	Poultry and Eggs	\$ 11,186	\$ 2,402	74	\$ 601
	Dairy	\$ 4,526	\$ 1,034	33	\$ 259
	Total	\$ 90,343	\$ 19,975	610	\$ 4,999
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.508	\$ 0.296	8.9	
	Hogs, Pigs, and Other	\$ 1.443	\$ 0.336	10.3	
	Poultry and Eggs	\$ 1.479	\$ 0.318	9.7	
	Dairy	\$ 1.630	\$ 0.373	11.9	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.8%	
	Total			25.0%	
Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.					

2008-2018 Animal Agriculture: IDAHO

Idaho Executive Summary

The use of soybean meal as a key feed ingredient is a moderate part of Idaho animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Idaho. The success of Idaho animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Idaho during 2018 animal agriculture contributed:

- \$9.0 billion in economic output
- 42,948 jobs
- \$2.0 billion in earnings
- \$488.4 million in income taxes paid at local, state, and federal levels
- \$103.0 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Idaho has increased economic output by over \$569.4 million, boosted household earnings by \$111.9 million, contributed 2,294 additional jobs and paid \$27.6 million in additional tax revenues.

Idaho's animal agriculture consumed almost 280.4 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (214.4 thousand tons)
- Broilers (27.1 thousand tons)
- Egg-Laying Hens (12.9 thousand tons)

This report examines animal agriculture in Idaho over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Idaho, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Idaho and beyond.

Idaho Economic Impact of Animal Agriculture

Animal agriculture is an important part of Idaho's economy. In 2018, Idaho's animal agriculture contributed the following to the economy:

- About \$9.0 billion in economic output
- \$2.0 billion in household earnings
- 42,948 jobs
- \$488.4 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Idaho's animal agriculture has:

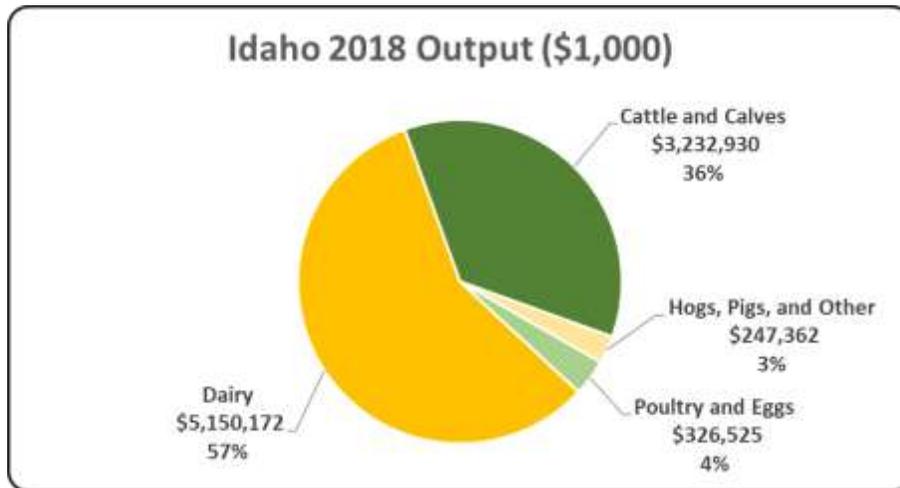
- Increased economic output by \$569.4 million
- Boosted household earnings by \$111.9 million
- Added 2,294 jobs
- Paid an additional \$27.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 8,956,990	\$ 569,414	6.79%
Earnings (\$1,000)	\$ 1,977,327	\$ 111,874	6.00%
Employment (Jobs)	42,948	2,294	5.64%
Income Taxes Paid (\$1,000)	\$ 488,400	\$ 27,633	6.00%
Property Taxes Paid in 2017 (\$1,000)	\$ 102,966		

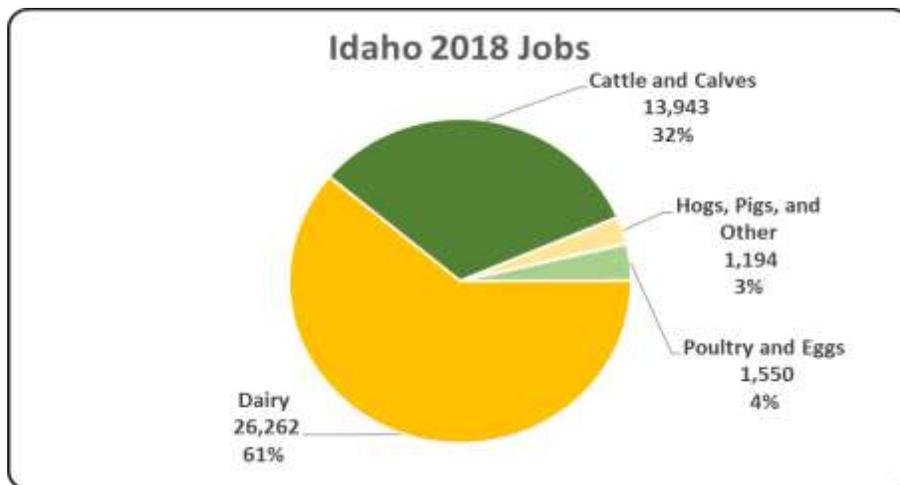
Idaho Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Idaho economy. Animal agriculture’s impact on Idaho total economic output is about \$9.0 billion.



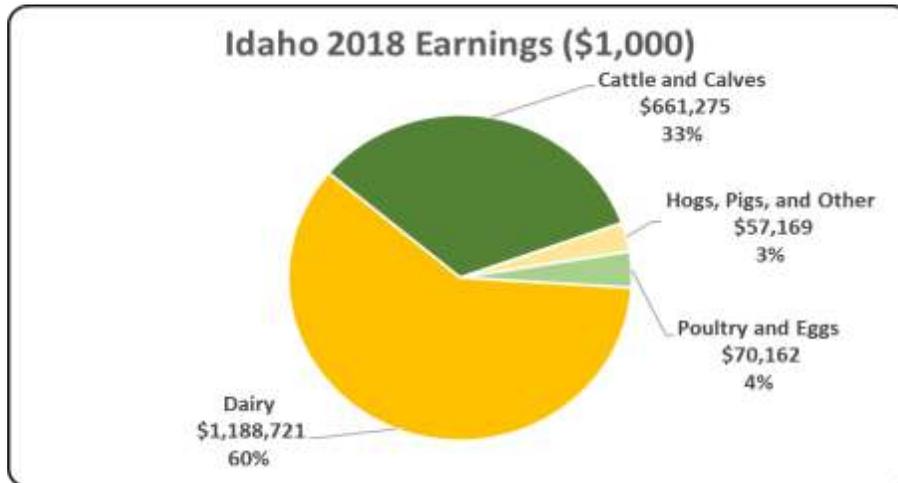
Idaho Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Idaho in terms of animal agriculture jobs. As shown, animal agriculture contributes 42,948 jobs within and outside of animal agriculture.



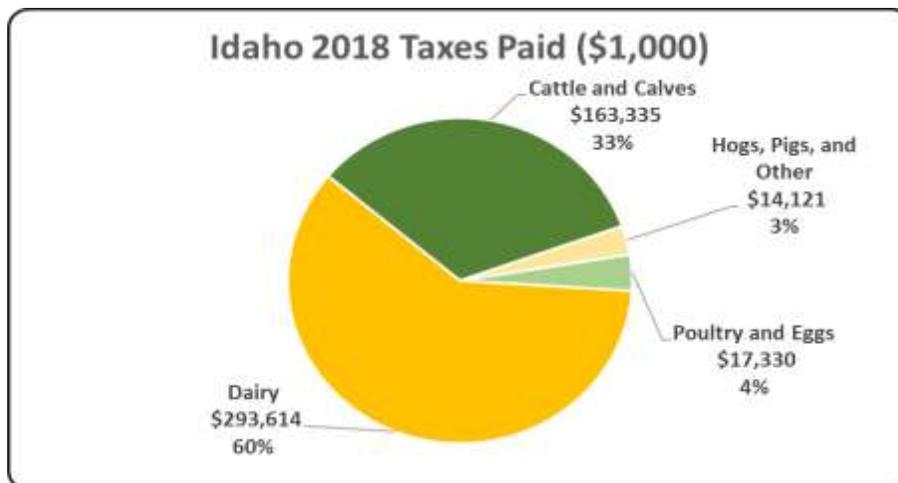
Idaho Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Idaho economy in terms of earnings. Idaho’s animal agriculture contributed about \$2.0 billion to household earnings in 2018.



Idaho Taxes Paid by Animal Agriculture

Idaho’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$488.4 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$103.0 million in property taxes paid by all of Idaho agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



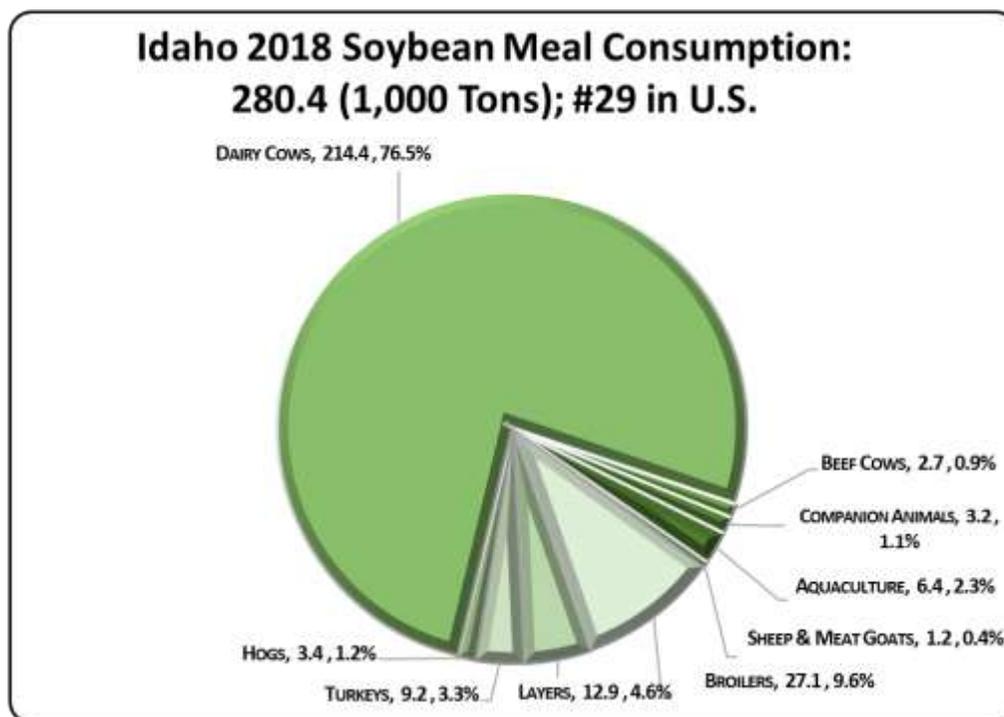
Idaho Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Idaho's animal agriculture consumed almost 280.4 thousand tons of soybean meal in 2018, placing the state as #29 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Idaho consumed 34,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (214.4 thousand tons)
2. Broilers (27.1 thousand tons)
3. Egg-Laying Hens (12.9 thousand tons)

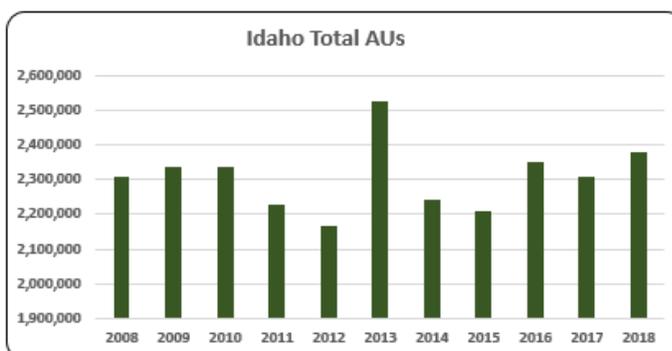
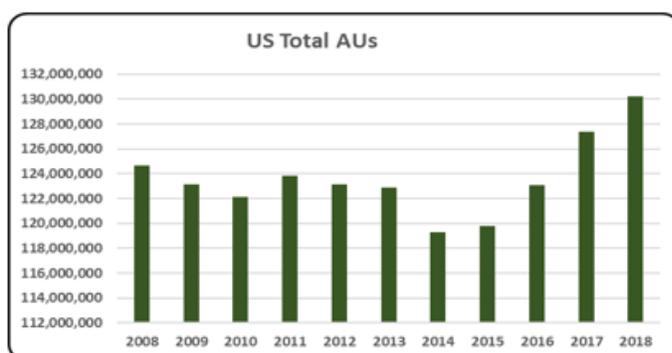


Idaho Animal Unit (AU) Trends

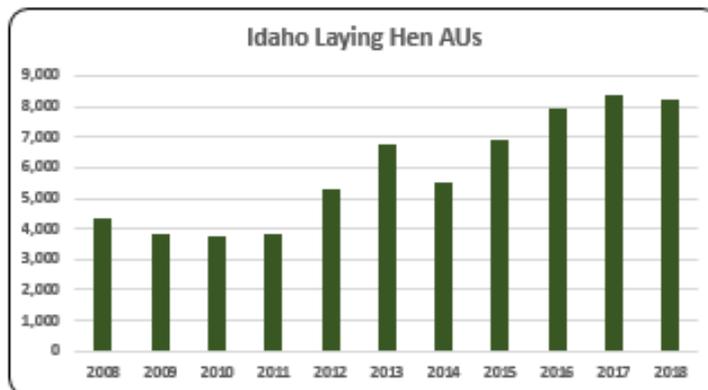
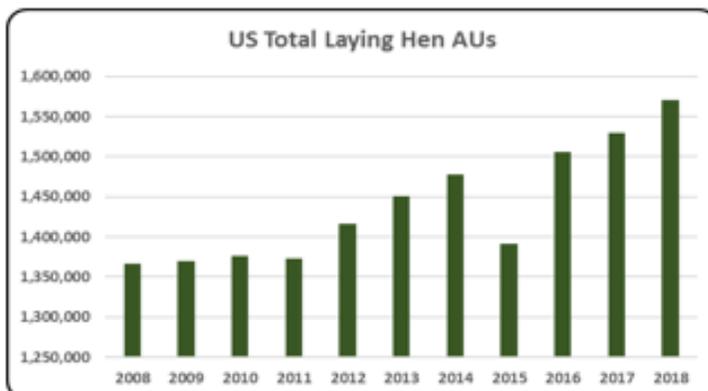
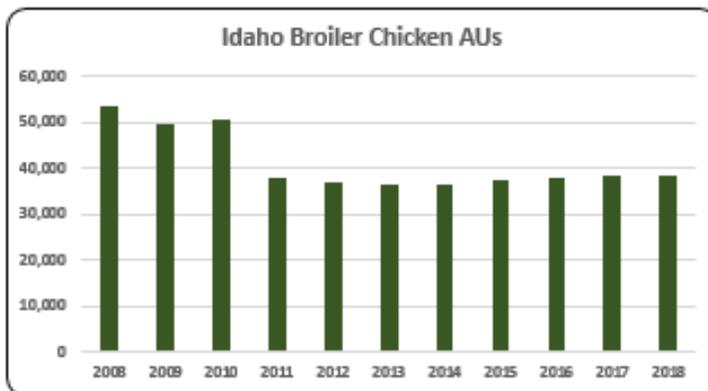
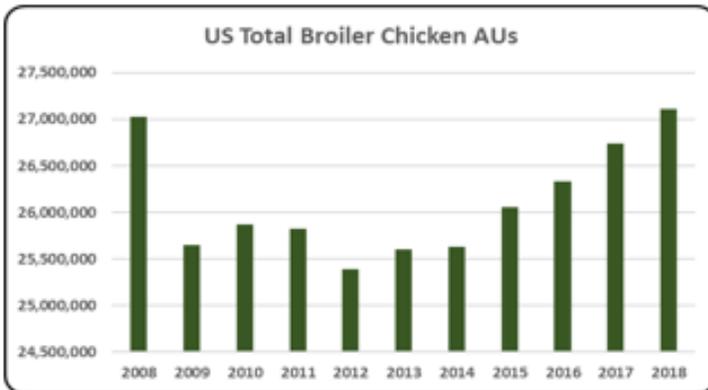
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Idaho. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Idaho and to give perspective on Idaho's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

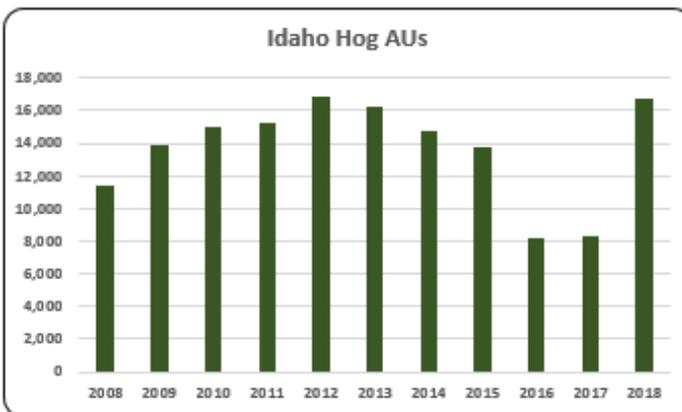
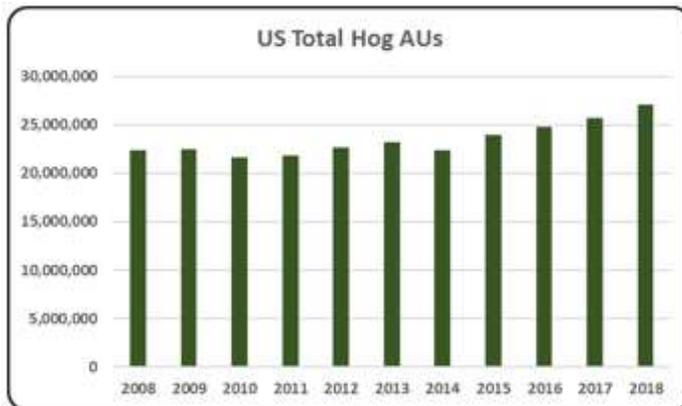
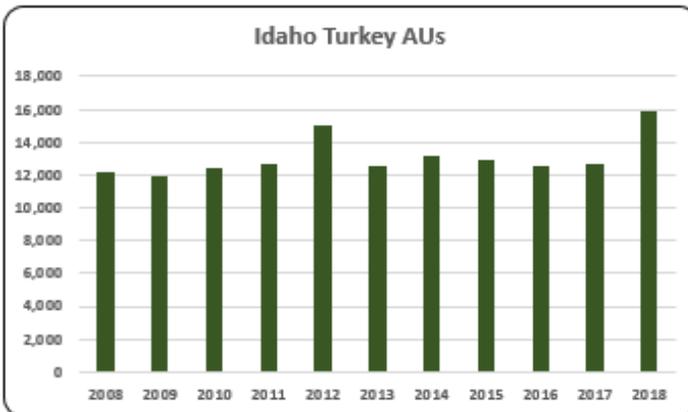
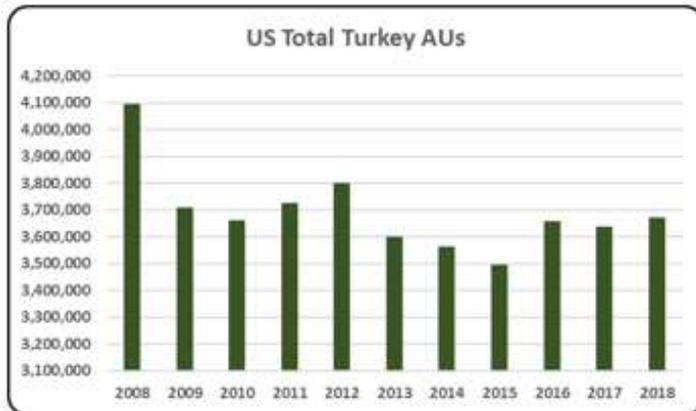
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Idaho, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (1.5 million AUs), Dairy Cows (840,000 AUs), and Broilers (38,301 AUs). Total animal units in Idaho during 2018 were 2.4 million AUs.



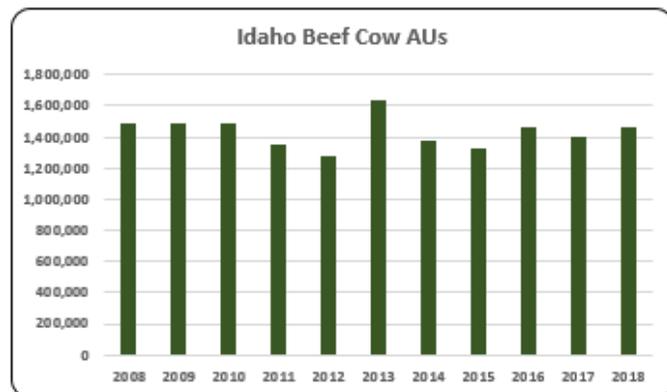
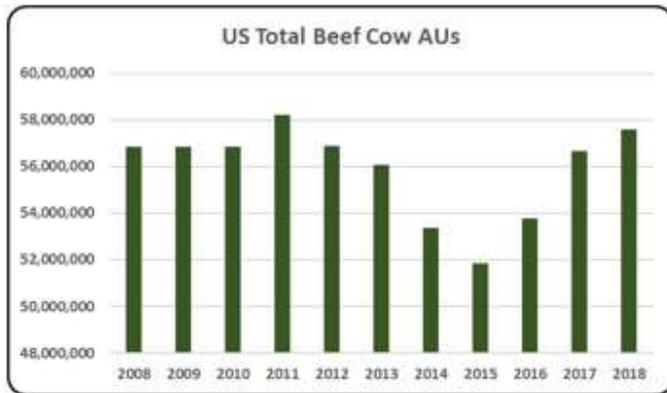
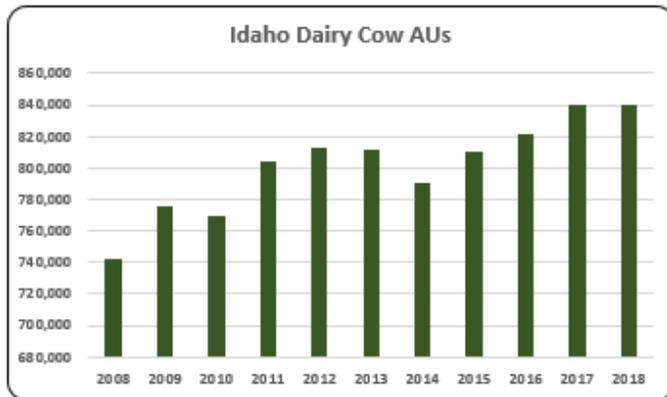
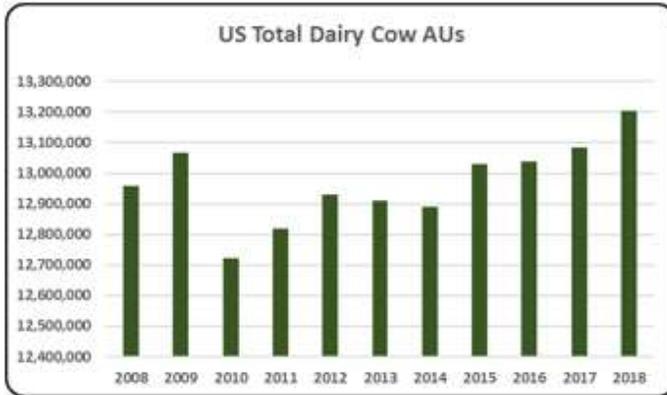
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 2.4 million AUs in Idaho in 2018. Beef is the largest animal sector in Idaho in terms of animal units with 61.4% of all AUs in the state in 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- There were 38,301 AUs in Idaho that were in the broiler industry. Idaho’s broiler AUs have declined 28.5% over the 2008-2018 decade.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Idaho’s laying hens are the smallest of all animal sectors in the state, with 8,255 AUs in 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- In 2018, 15,844 AUs in Idaho came from turkeys. 2018 turkey AUs were 29.9% above the Idaho turkey AUs in 2008.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Idaho hog AUs increased to 16,655 in 2018 an increase of 8,415 AUs from 2017. Hog AUs are up 45.8% compared to 2008.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- In 2018, 35.3% of all AUs in Idaho were dairy cow AUs. In 2018 dairy cow AUs remained the same as 2017. Overall, the trend in the Idaho dairy cow industry has been increasing.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- There were 1.5 million beef cow AUs in Idaho in 2018 representing 61.4% of all AUs in the state. Beef cow AUs in 2018 were 11.2% below the record numbers from 2013 (1.64 million).

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Animal agriculture is an important part of Idaho's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

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Idaho Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Idaho's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Idaho, \$1.67 to \$2.37 million in total economic activity, \$0.38 to \$0.51 in household wages and 8 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.293	\$ 0.469	9.9
	Hogs, Pigs, and Other	\$ 1.665	\$ 0.385	8.0
	Poultry and Eggs	\$ 2.373	\$ 0.510	11.3
	Dairy	\$ 2.165	\$ 0.500	11.0

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	1,483,500	1,483,500	1,483,500	1,355,100	1,279,050	1,642,500	1,382,400	1,328,100	1,464,750	1,399,350	1,459,350
	Hog and Pig AUs	11,430	13,935	14,949	15,245	16,888	16,241	14,697	13,805	8,231	8,250	16,665
	Broiler AUs	53,596	49,832	50,502	38,054	36,850	36,721	36,513	37,455	37,735	38,276	38,301
	Turkey AUs	12,198	11,924	12,424	12,645	15,024	12,592	13,216	12,919	12,607	12,668	15,844
	Egg Layer AUs	4,307	3,809	3,784	3,806	5,330	6,794	5,500	6,943	7,924	8,366	8,255
	Dairy AUs	742,000	775,600	770,000	803,600	813,400	812,000	791,000	810,600	821,800	840,000	840,000
	Total Animal Units	2,307,031	2,338,600	2,335,158	2,228,450	2,166,542	2,526,848	2,243,326	2,209,822	2,353,048	2,306,910	2,378,414
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 917,195	\$ 806,950	\$ 1,020,475	\$ 1,113,672	\$ 1,240,020	\$ 1,384,324	\$ 1,706,207	\$ 1,683,750	\$ 1,384,382	\$ 1,376,883	\$ 1,409,667
	Hogs and Pigs (\$1,000)	\$ 9,513	\$ 10,366	\$ 13,982	\$ 17,589	\$ 19,411	\$ 17,768	\$ 18,486	\$ 13,906	\$ 7,626	\$ 7,763	\$ 14,527
	Broilers (\$1,000)	\$ 42,927	\$ 37,037	\$ 38,705	\$ 33,886	\$ 36,718	\$ 44,740	\$ 46,935	\$ 40,947	\$ 36,407	\$ 42,751	\$ 48,277
	Turkeys (\$1,000)	\$ 23,900	\$ 22,650	\$ 24,410	\$ 19,194	\$ 20,637	\$ 14,959	\$ 9,896	\$ 11,976	\$ 13,543	\$ 9,170	\$ 10,577
	Eggs (\$1,000)	\$ 32,952	\$ 23,453	\$ 25,745	\$ 28,227	\$ 31,656	\$ 35,765	\$ 57,248	\$ 95,437	\$ 37,531	\$ 50,746	\$ 78,746
	Milk (\$1,000)	\$ 2,105,865	\$ 1,433,700	\$ 1,903,177	\$ 2,438,184	\$ 2,426,882	\$ 2,578,752	\$ 3,204,663	\$ 2,357,038	\$ 2,361,065	\$ 2,515,844	\$ 2,378,393
	Other	\$ 61,514	\$ 62,998	\$ 72,239	\$ 75,817	\$ 86,461	\$ 85,974	\$ 99,296	\$ 114,511	\$ 119,793	\$ 126,879	\$ 134,003
	Sheep and Lambs (\$1,000)	\$ 17,445	\$ 16,800	\$ 23,913	\$ 25,364	\$ 33,879	\$ 24,345	\$ 28,620	\$ 34,788	\$ 31,023	\$ 29,062	\$ 27,139
	Aquaculture (\$1,000)	\$ 44,069	\$ 46,198	\$ 48,326	\$ 50,454	\$ 52,582	\$ 61,629	\$ 70,676	\$ 79,723	\$ 88,770	\$ 97,817	\$ 106,864
	Total (\$1,000)	\$ 3,193,865	\$ 2,397,153	\$ 3,098,732	\$ 3,726,569	\$ 3,861,785	\$ 4,162,281	\$ 5,142,733	\$ 4,317,565	\$ 3,960,347	\$ 4,130,036	\$ 4,074,190

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,027	7,712	7,505	8,137	
	Cattle feedlots (112112)	686	517	150	144	
	Dairy cattle and milk production (11212)	748	677	589	501	
	Hog and pig farming (1122)	340	250	217	215	
	Poultry and egg production (1123)	143	267	345	291	
	Sheep and goat farming (1124)	653	835	815	1,190	
	Animal aquaculture and other animal production (1125,1129)	5,345	3,468	3,112	3,386	
Value of Sales (\$1,000)	Cattle and Calves	1,149,407	1,383,742	1,808,929	1,787,255	
	Hogs and Pigs	3,260	6,757	withheld	18,100	
	Poultry and Eggs	12,636	12,673	49,733	29,828	
	Milk*			2,333,364	2,330,865	
	Aquaculture	39,840	56,219	52,582	97,817	
	Other (calculated)	46,421	60,797	75,765	92,741	
	Total	1,251,564	1,520,188	4,320,373	4,356,606	
Input Purchases	Livestock and poultry purchased	(Farms)	7,350	6,598	7,669	7,526
		\$1,000	616,224	584,795	633,046	616,455
	Breeding livestock purchased	(Farms)	3,871	3,473	4,155	4,311
		\$1,000	93,697	128,710	102,481	114,900
	Other livestock and poultry purchased	(Farms)	4,439	4,074	4,718	4,506
		\$1,000	522,527	456,085	530,564	501,555
Feed purchased	(Farms)	14,692	13,075	14,615	15,186	
	\$1,000	646,250	1,137,906	1,921,092	1,794,336	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 3,232,930	\$ 661,275	13,943	\$ 163,335
	Hogs, Pigs, and Other	\$ 247,362	\$ 57,169	1,194	\$ 14,121
	Poultry and Eggs	\$ 326,525	\$ 70,162	1,550	\$ 17,330
	Dairy	\$ 5,150,172	\$ 1,188,721	26,262	\$ 293,614
	Total	\$ 8,956,990	\$ 1,977,327	42,948	\$ 488,400
Change from 2008 to 2018	Cattle and Calves	\$ 719,148	\$ 147,097	3,102	\$ 36,333
	Hogs, Pigs, and Other	\$ 106,000	\$ 24,498	512	\$ 6,051
	Poultry and Eggs	\$ 43,569	\$ 9,362	207	\$ 2,312
	Dairy	\$ (299,304)	\$ (69,083)	(1,526)	\$ (17,063)
	Total	\$ 569,414	\$ 111,874	2,294	\$ 27,633
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.293	\$ 0.469	9.9	
	Hogs, Pigs, and Other	\$ 1.665	\$ 0.385	8.0	
	Poultry and Eggs	\$ 2.373	\$ 0.510	11.3	
	Dairy	\$ 2.165	\$ 0.500	11.0	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.5%	
	Total			24.7%	
Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.					

2008-2018 Animal Agriculture: ILLINOIS

Illinois Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Illinois animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Illinois. The success of Illinois animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Illinois during 2018 animal agriculture contributed:

- \$4.7 billion in economic output
- 20,446 jobs
- \$1.0 billion in earnings
- \$250.3 million in income taxes paid at local, state, and federal levels
- \$431.6 million in the form of property taxes

Illinois's animal agriculture consumed almost 653.3 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (520.6 thousand tons)
- Egg-Laying Hens (47.4 thousand tons)
- Broilers (31.1 thousand tons)

This report examines animal agriculture in Illinois over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Illinois, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Illinois and beyond.

Illinois Economic Impact of Animal Agriculture

Animal agriculture is an important but shrinking part of Illinois's economy. In 2018, Illinois's animal agriculture contributed the following to the economy:

- About \$4.7 billion in economic output
- \$1.0 billion in household earnings
- 20,446 jobs
- \$250.3 million in income taxes

During the last decade Illinois's animal agriculture has:

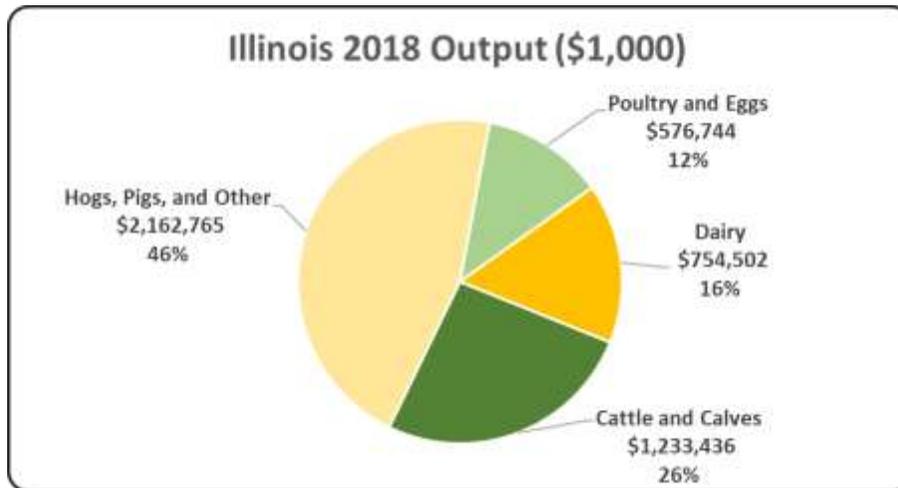
- Decreased in economic output by \$410.7 million
- Reduced household earnings by \$90.3 million
- Shrunk by 1,801 jobs
- Paid \$21.6 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 4,727,448	\$ (410,692)	-7.99%
Earnings (\$1,000)	\$ 1,045,098	\$ (90,305)	-7.95%
Employment (Jobs)	20,446	(1,801)	-8.09%
Income Taxes Paid (\$1,000)	\$ 250,301	\$ (21,628)	-7.95%
Property Taxes Paid in 2017 (\$1,000)	\$ 431,625		

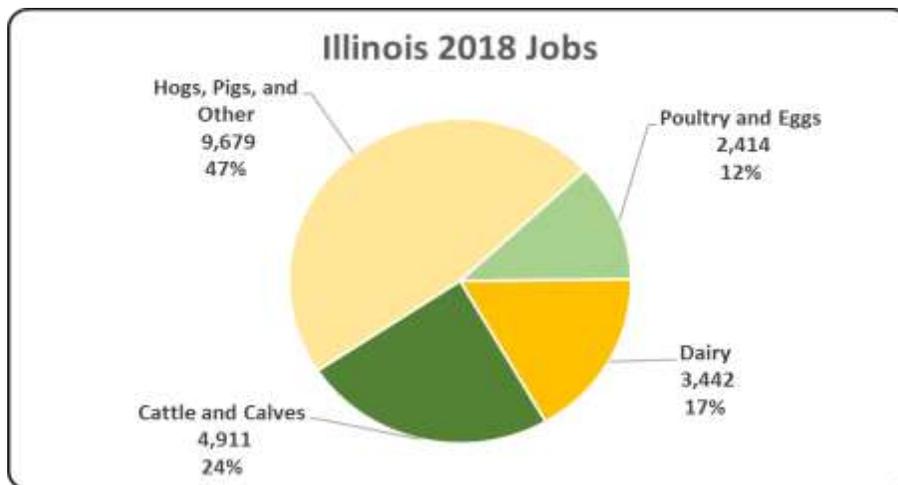
Illinois Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Illinois economy. Animal agriculture’s impact on Illinois total economic output is about \$4.7 billion.



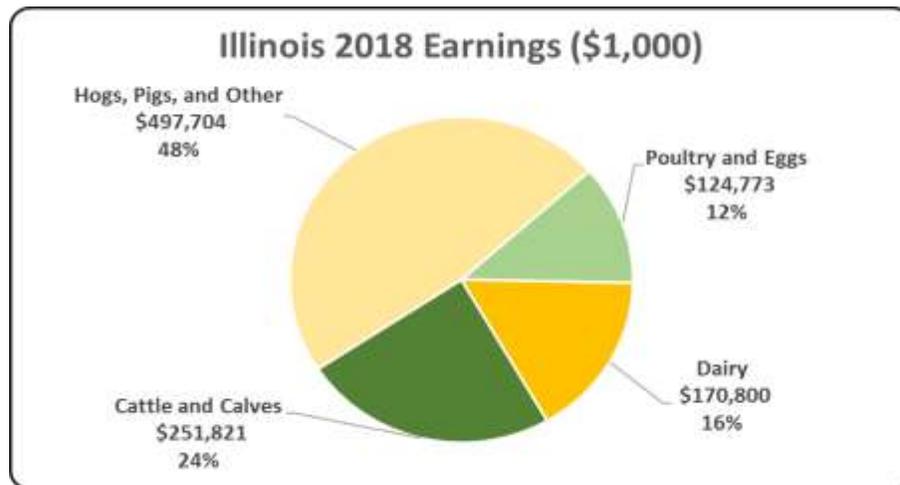
Illinois Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Illinois in terms of animal agriculture jobs. As shown, animal agriculture contributes 20,446 jobs within and outside of animal agriculture.



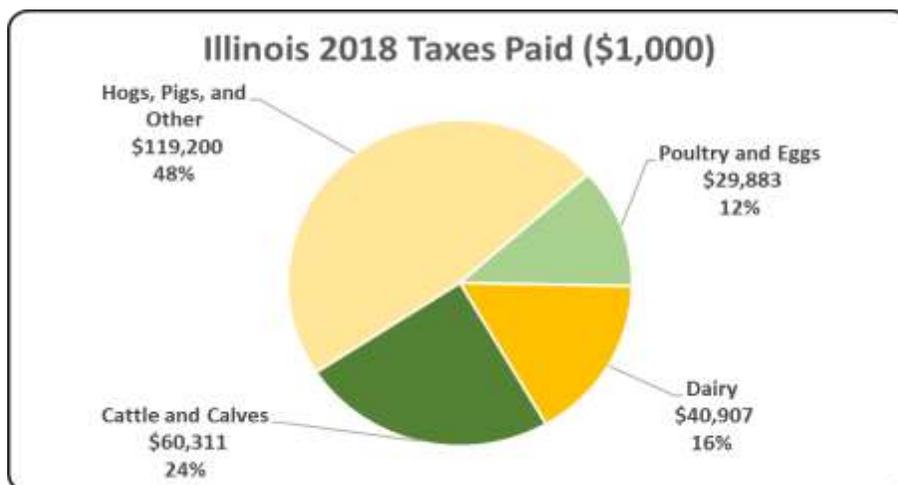
Illinois Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Illinois economy in terms of earnings. Illinois’s animal agriculture contributed about \$1.0 billion to household earnings in 2018.



Illinois Taxes Paid by Animal Agriculture

Illinois’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$250.3 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$431.6 million in property taxes paid by all of Illinois agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



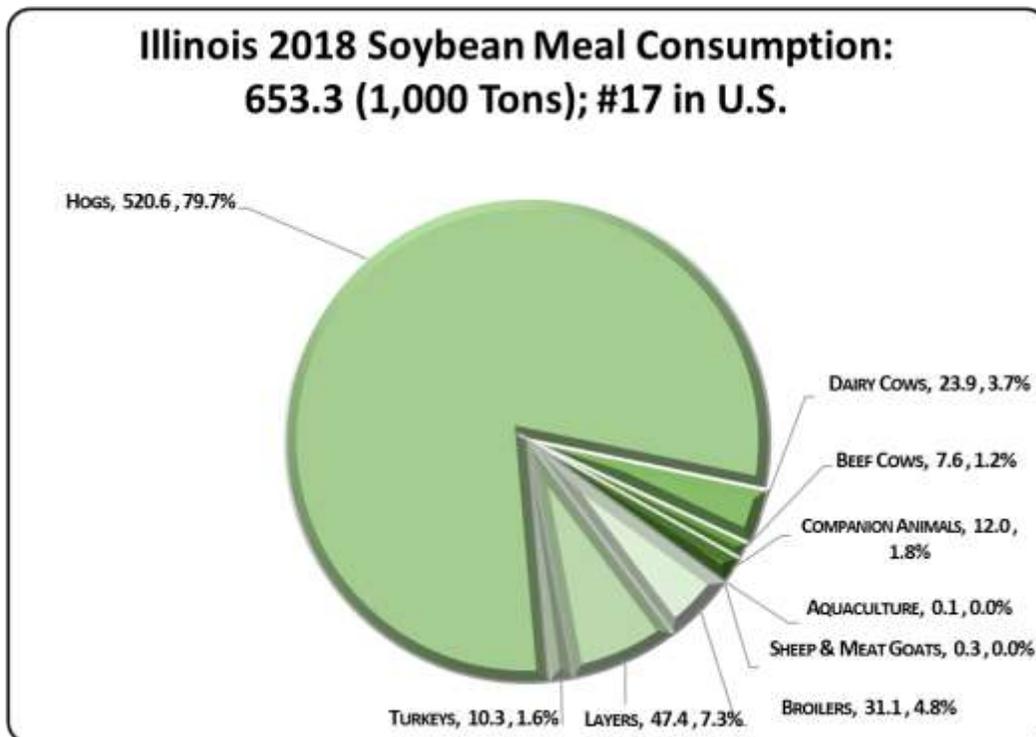
Illinois Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Illinois's animal agriculture consumed almost 653.3 thousand tons of soybean meal in 2018, placing the state as #17 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Illinois consumed 71,500 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (520.6 thousand tons)
2. Egg-Laying Hens (47.4 thousand tons)
3. Broilers (31.1 thousand tons)

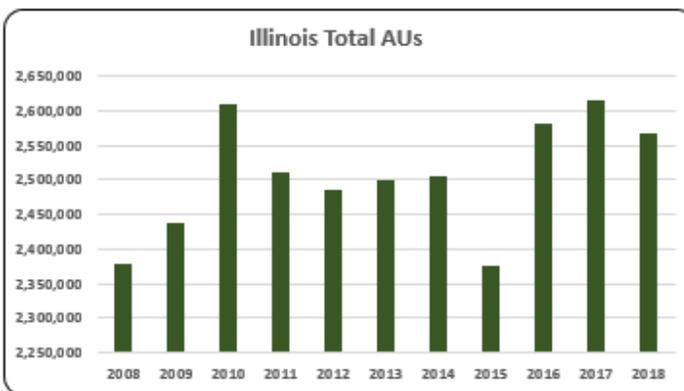
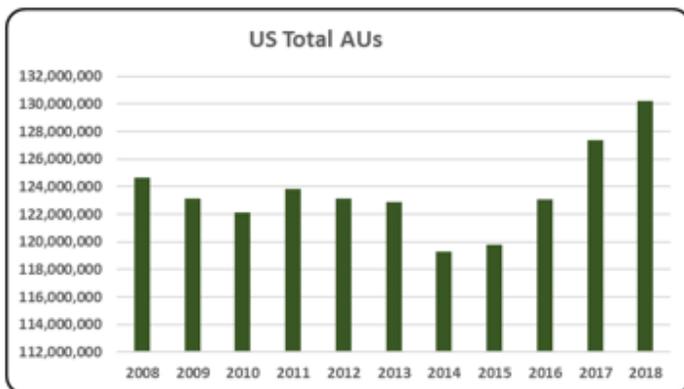


Illinois Animal Unit (AU) Trends

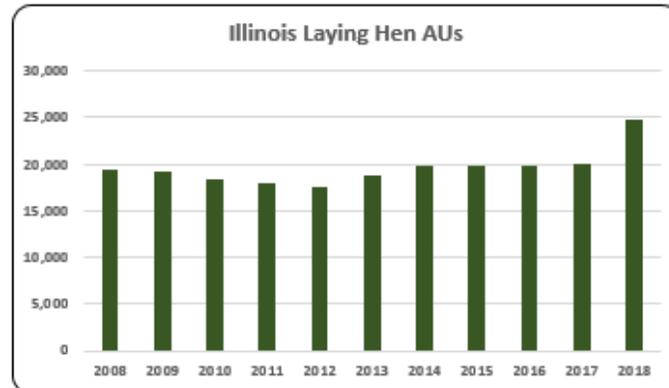
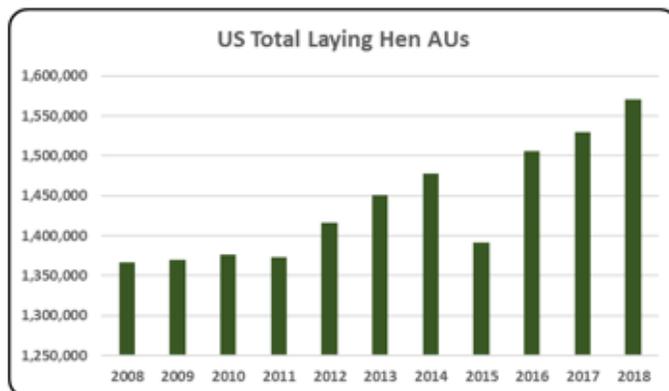
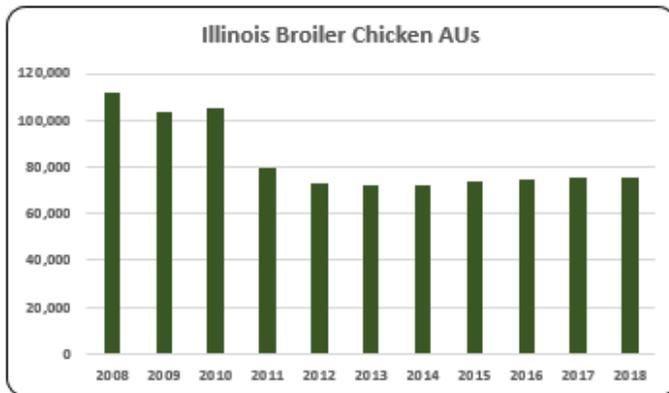
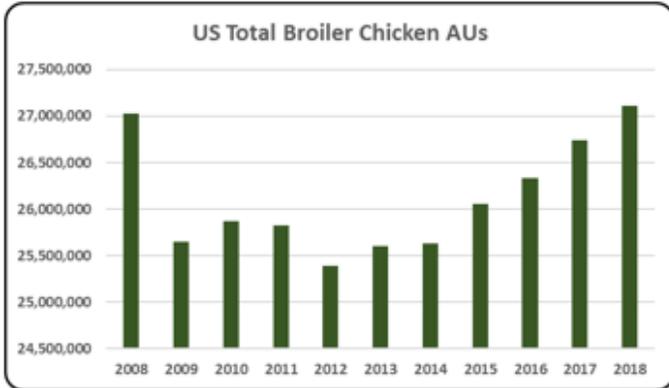
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Illinois. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Illinois and to give perspective on Illinois’s contribution to the nation’s animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Illinois, the largest three segments of animal agriculture in terms of AUs during 2018 were: Hogs (1.9 million AUs), Beef Cows (456,600 AUs), and Dairy Cows (130,200 AUs). Total animal units in Illinois during 2018 were 2.6 million AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- The number of AUs in Illinois in 2018 reached 2.6 million comprising 2.0% of all AUs in the U.S. On average, there were 2.5 million between 2008 and 2018.

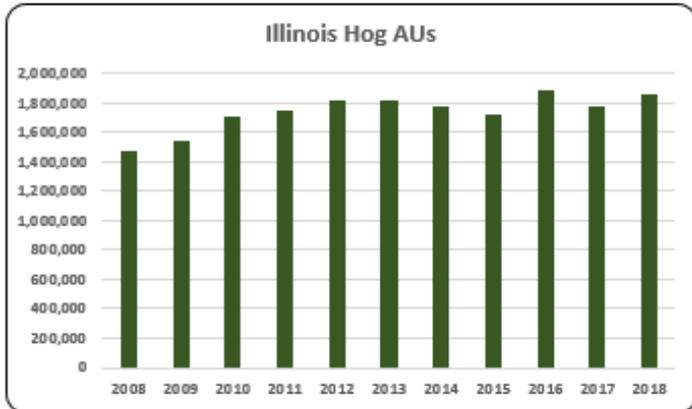
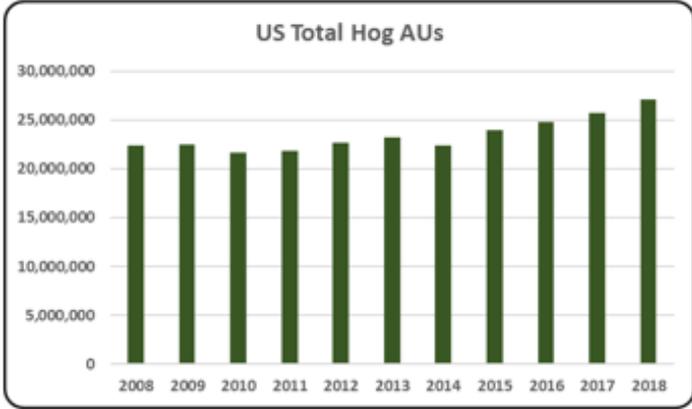
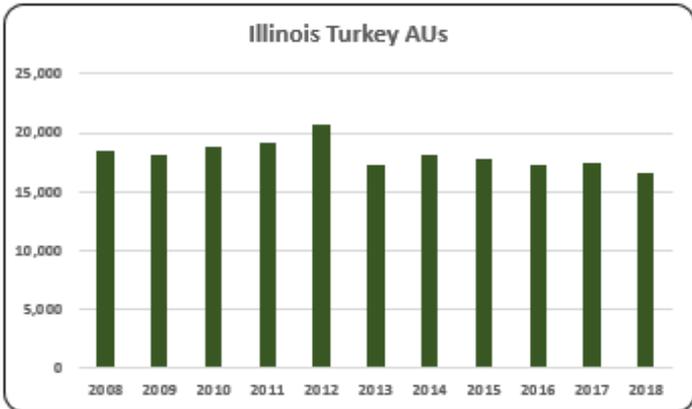
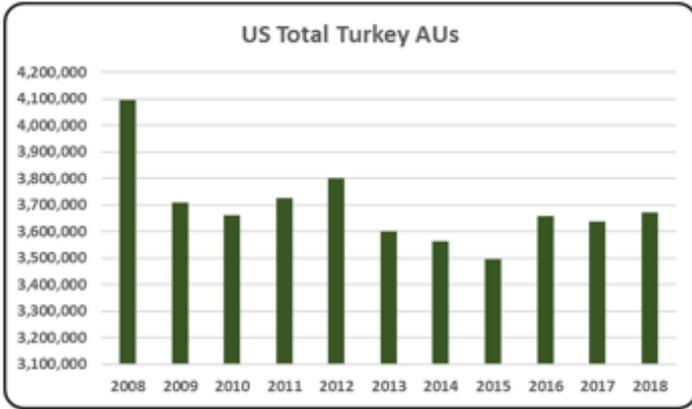


- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).

- There were 75,464 broiler AUs in Illinois in 2018 representing 2.9% of all AUs in the state of Illinois. Overall numbers have decreased 32.3% (36,016 AUs) since 2008.

- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.

- There were 24,755 laying hen AUs in Illinois in 2018 or 1.0% of all AUs in the state. The average laying hen AUs in the 2008-2018 period was at 19,953 AUs.

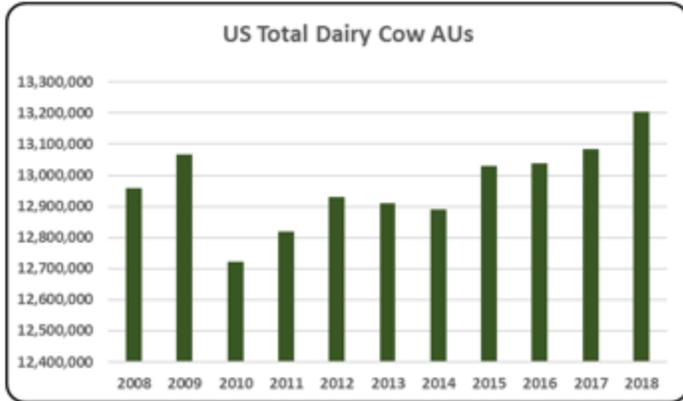


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

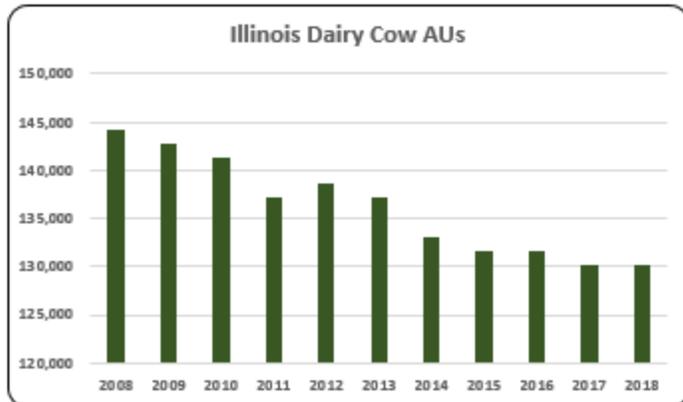
- The turkey industry in Illinois declined 10.3% from 2008 (18,494 AUs) to 2018 (16,590 AUs).

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

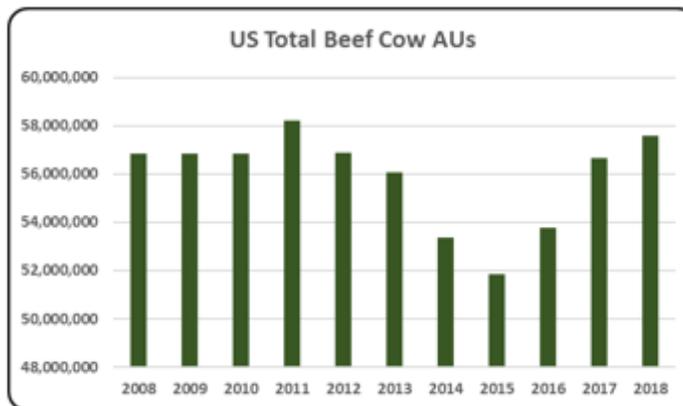
- About 72.6% (1.9 million) of all AUs in Illinois were hog AUs in 2018. This represented 6.9% of all hog AUs in the US.



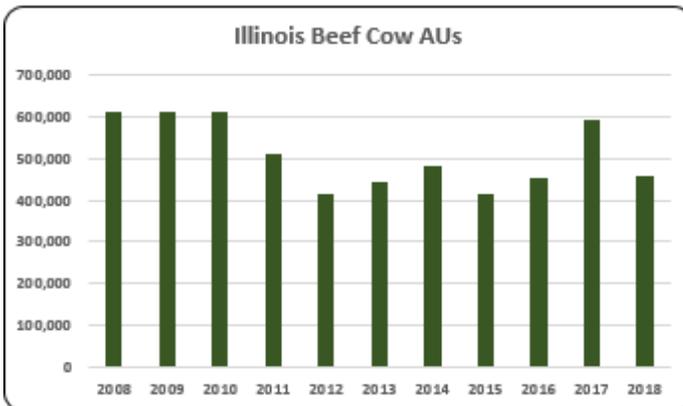
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Illinois had an average of 136,182 dairy cow AUs from 2008 to 2018. Numbers have consistently decreased from 144,200 in 2008 to 130,200 in 2018, which is the lowest during this period.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- The second largest animal sector in terms of animal units in Illinois is beef cows with 456,600 AUs in 2018. However, beef cow AUs decreased 25.5% since 2008 (612,600).

Illinois Additional Information and Methodology

Animal agriculture is an important part of Illinois's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Illinois, of interest is the degree to which the industry impacts the Illinois economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Illinois animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Illinois's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Illinois which have occurred. As shown in this state report, Illinois has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Illinois. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Illinois Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Illinois's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Illinois, \$1.87 to \$2.77 million in total economic activity, \$0.42 to \$0.60 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.076	\$ 0.424	8.3
	Hogs, Pigs, and Other	\$ 1.872	\$ 0.431	8.4
	Poultry and Eggs	\$ 2.771	\$ 0.600	11.6
	Dairy	\$ 2.435	\$ 0.551	11.1

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	612,600	612,600	612,600	512,280	413,100	443,400	481,650	413,250	454,800	591,300	456,600
	Hog and Pig AUs	1,473,750	1,541,100	1,713,900	1,744,650	1,822,500	1,810,350	1,779,900	1,719,300	1,882,905	1,782,000	1,864,050
	Broiler AUs	111,480	103,650	105,044	79,152	72,605	72,351	71,941	73,798	74,349	75,415	75,464
	Turkey AUs	18,494	18,079	18,836	19,172	20,643	17,302	18,159	17,751	17,323	17,406	16,590
	Egg Layer AUs	19,350	19,128	18,400	17,952	17,565	18,763	19,928	19,774	19,851	20,058	24,755
	Dairy AUs	144,200	142,800	141,400	137,200	138,600	137,200	133,000	131,600	131,600	130,200	130,200
	Total Animal Units	2,379,873	2,437,357	2,610,180	2,510,405	2,485,013	2,499,366	2,504,578	2,375,473	2,580,829	2,616,379	2,567,659
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 500,092	\$ 421,683	\$ 489,657	\$ 521,986	\$ 539,376	\$ 570,135	\$ 737,102	\$ 684,767	\$ 593,113	\$ 655,603	\$ 594,198
	Hogs and Pigs (\$1,000)	\$ 910,385	\$ 901,768	\$ 1,115,896	\$ 1,322,243	\$ 1,360,537	\$ 1,455,041	\$ 1,601,021	\$ 1,261,018	\$ 1,211,961	\$ 1,283,406	\$ 1,144,296
	Broilers (\$1,000)	\$ 89,288	\$ 77,036	\$ 80,505	\$ 70,482	\$ 72,345	\$ 88,151	\$ 92,477	\$ 80,678	\$ 71,733	\$ 84,231	\$ 49,184
	Turkeys (\$1,000)	\$ 38,391	\$ 32,906	\$ 30,429	\$ 29,100	\$ 31,289	\$ 22,680	\$ 15,004	\$ 16,456	\$ 18,609	\$ 12,599	\$ 11,074
	Eggs (\$1,000)	\$ 109,290	\$ 71,103	\$ 73,893	\$ 82,016	\$ 88,598	\$ 92,194	\$ 124,361	\$ 180,895	\$ 72,534	\$ 85,996	\$ 147,870
	Milk (\$1,000)	\$ 364,952	\$ 247,646	\$ 314,640	\$ 380,940	\$ 362,392	\$ 378,810	\$ 456,950	\$ 335,238	\$ 317,392	\$ 353,007	\$ 309,870
	Other	\$ 6,554	\$ 7,474	\$ 8,463	\$ 8,201	\$ 9,252	\$ 8,724	\$ 9,351	\$ 9,981	\$ 10,520	\$ 10,810	\$ 11,274
	Sheep and Lambs (\$1,000)	\$ 2,414	\$ 3,013	\$ 3,681	\$ 3,098	\$ 3,827	\$ 2,822	\$ 2,971	\$ 3,124	\$ 3,186	\$ 2,999	\$ 2,986
	Aquaculture (\$1,000)	\$ 4,140	\$ 4,461	\$ 4,782	\$ 5,104	\$ 5,425	\$ 5,902	\$ 6,379	\$ 6,857	\$ 7,334	\$ 7,811	\$ 8,288
	Total (\$1,000)	\$ 2,018,951	\$ 1,759,617	\$ 2,113,484	\$ 2,414,968	\$ 2,463,789	\$ 2,615,735	\$ 3,036,266	\$ 2,569,032	\$ 2,295,862	\$ 2,485,652	\$ 2,267,766

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	6,178	7,296	6,600	6,702	
	Cattle feedlots (112112)	2,217	1,133	662	486	
	Dairy cattle and milk production (11212)	1,226	900	742	579	
	Hog and pig farming (1122)	1,693	1,259	871	951	
	Poultry and egg production (1123)	334	938	603	520	
	Sheep and goat farming (1124)	645	1,078	1,090	1,291	
	Animal aquaculture and other animal production (1125,1129)	3,295	4,186	4,150	4,042	
Value of Sales (\$1,000)	Cattle and Calves	624,976	808,487	984,466	826,851	
	Hogs and Pigs	844,360	1,105,271	1,519,514	1,739,444	
	Poultry and Eggs	83,807	163,507	136,876	199,924	
	Milk*			347,339	350,038	
	Aquaculture	2,282	4,011	5,425	7,811	
	Other (calculated)	22,511	31,080	24,054	42,161	
	Total	1,577,936	2,112,356	3,017,674	3,166,229	
Input Purchases	Livestock and poultry purchased	(Farms)	12,734	11,350	12,350	11,839
		\$1,000	411,546	588,949	689,855	674,724
	Breeding livestock purchased	(Farms)	6,918	6,443	6,746	6,751
		\$1,000	40,328	57,009	81,200	94,864
	Other livestock and poultry purchased	(Farms)	7,362	6,404	7,350	6,908
		\$1,000	371,218	531,940	608,656	579,860
	Feed purchased	(Farms)	24,652	23,374	24,338	24,129
		\$1,000	528,144	705,155	1,246,112	1,040,349

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,233,436	\$ 251,821	4,911	\$ 60,311
	Hogs, Pigs, and Other	\$ 2,162,765	\$ 497,704	9,679	\$ 119,200
	Poultry and Eggs	\$ 576,744	\$ 124,773	2,414	\$ 29,883
	Dairy	\$ 754,502	\$ 170,800	3,442	\$ 40,907
	Total	\$ 4,727,448	\$ 1,045,098	20,446	\$ 250,301
Change from 2008 to 2018	Cattle and Calves	\$ (7,135)	\$ (1,457)	(28)	\$ (349)
	Hogs, Pigs, and Other	\$ 111,889	\$ 25,748	501	\$ 6,167
	Poultry and Eggs	\$ (208,002)	\$ (44,999)	(871)	\$ (10,777)
	Dairy	\$ (307,445)	\$ (69,598)	(1,402)	\$ (16,669)
	Total	\$ (410,692)	\$ (90,305)	(1,801)	\$ (21,628)
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.076	\$ 0.424	8.3	
	Hogs, Pigs, and Other	\$ 1.872	\$ 0.431	8.4	
	Poultry and Eggs	\$ 2.771	\$ 0.600	11.6	
	Dairy	\$ 2.435	\$ 0.551	11.1	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.8%	
	Total			24.0%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: INDIANA

Indiana Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Indiana animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Indiana. The success of Indiana animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Indiana during 2018 animal agriculture contributed:

- \$8.1 billion in economic output
- 35,885 jobs
- \$1.7 billion in earnings
- \$409.8 million in income taxes paid at local, state, and federal levels
- \$332.9 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Indiana has increased economic output by over \$572.3 million, boosted household earnings by \$118.0 million, contributed 2,373 additional jobs and paid \$27.7 million in additional tax revenues.

Indiana's animal agriculture consumed almost 1.1 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (423.8 thousand tons)
- Egg-Laying Hens (302.6 thousand tons)
- Turkeys (197.7 thousand tons)

This report examines animal agriculture in Indiana over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Indiana, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Indiana and beyond.

Indiana Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Indiana's economy. In 2018, Indiana's animal agriculture contributed the following to the economy:

- About \$8.1 billion in economic output
- \$1.7 billion in household earnings
- 35,885 jobs
- \$409.8 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Indiana's animal agriculture has:

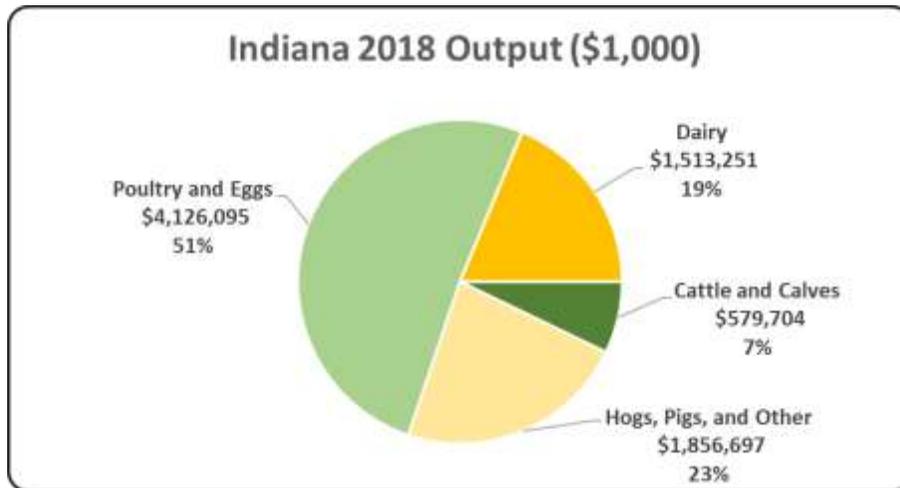
- Increased economic output by \$572.3 million
- Boosted household earnings by \$118.0 million
- Added 2,373 jobs
- Paid an additional \$27.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 8,075,747	\$ 572,281	7.63%
Earnings (\$1,000)	\$ 1,743,892	\$ 118,036	7.26%
Employment (Jobs)	35,885	2,373	7.08%
Income Taxes Paid (\$1,000)	\$ 409,815	\$ 27,738	7.26%
Property Taxes Paid in 2017 (\$1,000)	\$ 332,880		

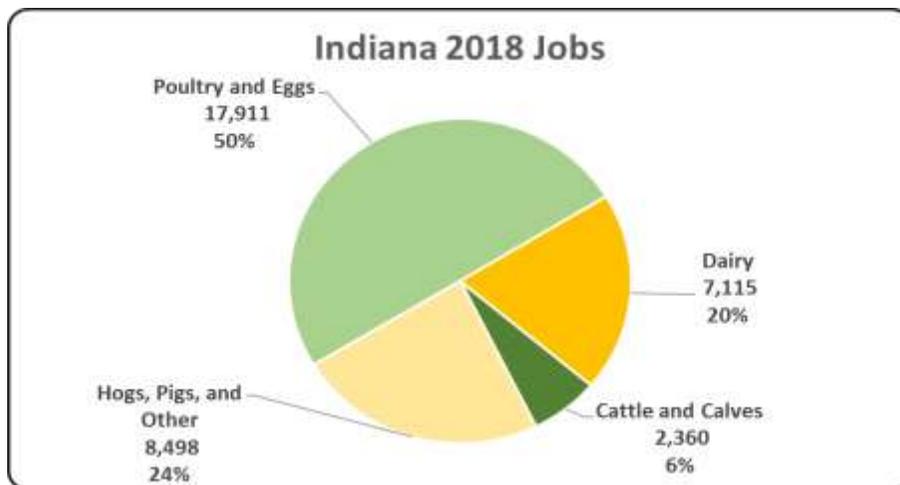
Indiana Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Indiana economy. Animal agriculture’s impact on Indiana total economic output is about \$8.1 billion.



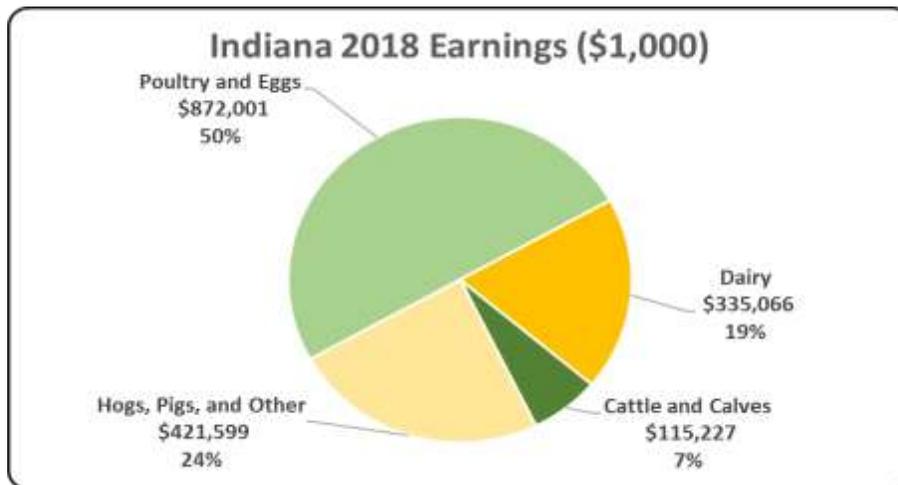
Indiana Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Indiana in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Indiana total jobs, contributing 35,885 jobs within and outside of animal agriculture.



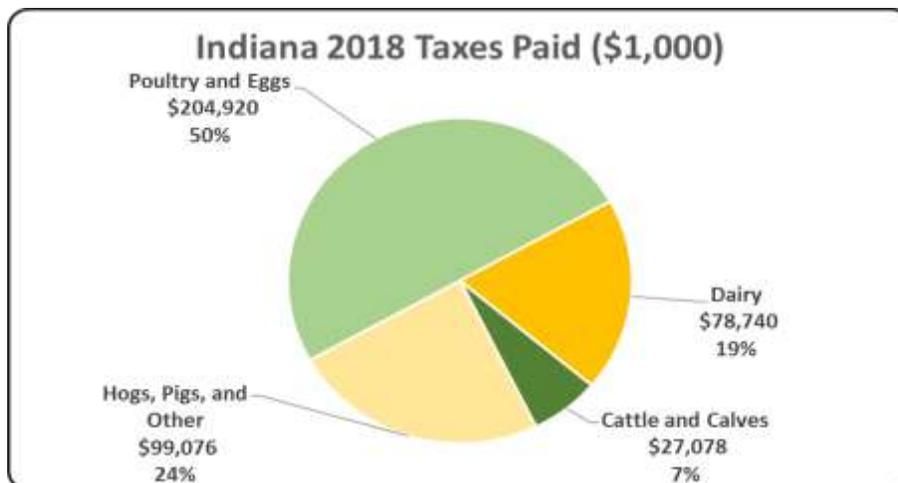
Indiana Earnings

Earnings includes wages and salaries plus proprietors' income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Indiana economy in terms of earnings. Indiana's animal agriculture contributed about \$1.7 billion to household earnings in 2018.



Indiana Taxes Paid by Animal Agriculture

Indiana's animal agriculture is also a significant source of tax revenue. In 2018, the state's animal agriculture industry paid about \$409.8 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$332.9 million in property taxes paid by all of Indiana agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



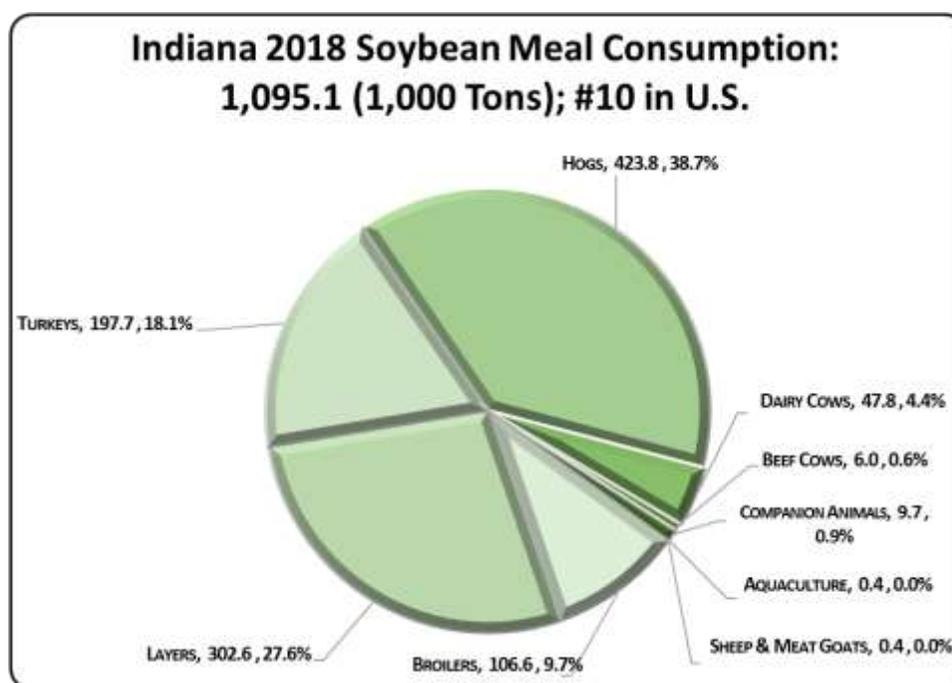
Indiana Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Indiana's animal agriculture consumed almost 1.1 million tons of soybean meal in 2018, placing the state as #10 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Indiana consumed 101.5 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (423.8 thousand tons)
2. Egg-Laying Hens (302.6 thousand tons)
3. Turkeys (197.7 thousand tons)

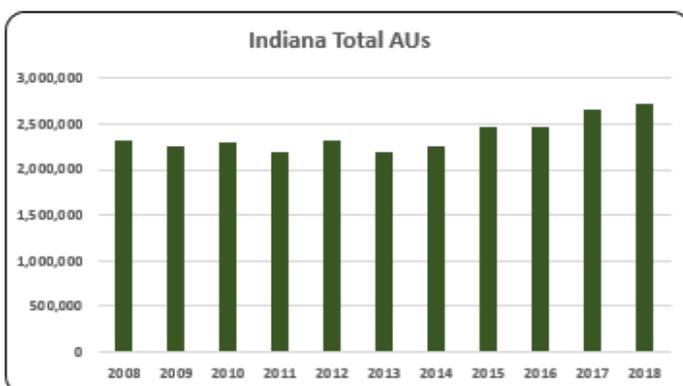
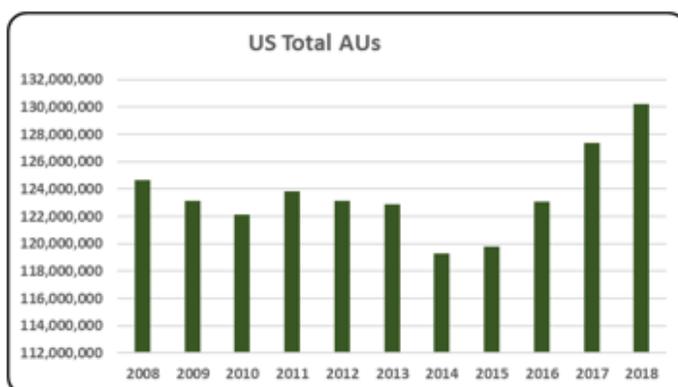


Indiana Animal Unit (AU) Trends

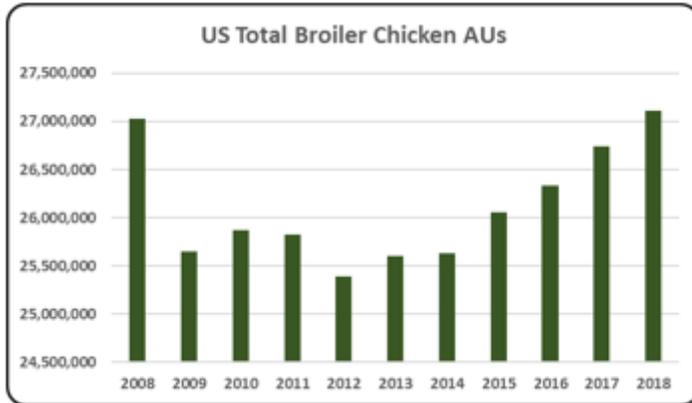
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Indiana. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Indiana and to give perspective on Indiana's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

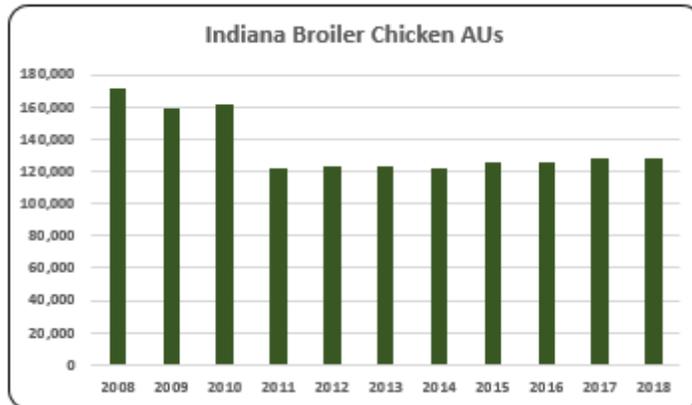
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Indiana, the largest three segments of animal agriculture in terms of AUs during 2018 were: Hogs (1.5 million AUs), Beef Cows (409,200 AUs), and Turkeys (279,380 AUs). Total animal units in Indiana during 2018 were 2.7 million AUs.



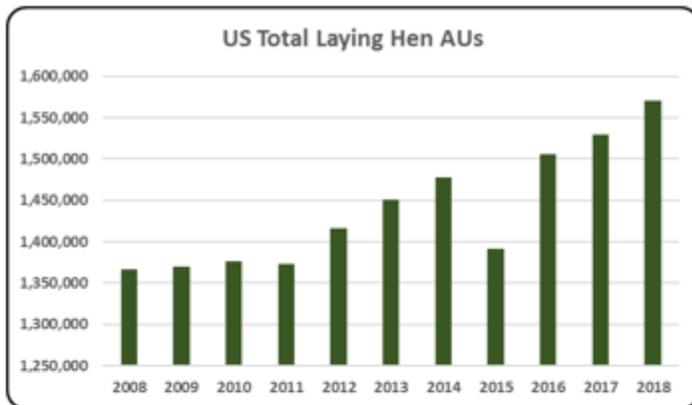
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- In 2018 there were 2.7 million AUs in the state of Indiana and 55.3% (1.5 million) were hog AUs. In general, from 2008 to 2018, AUs have hovered between 2 and 2.7 million AUs in Indiana.



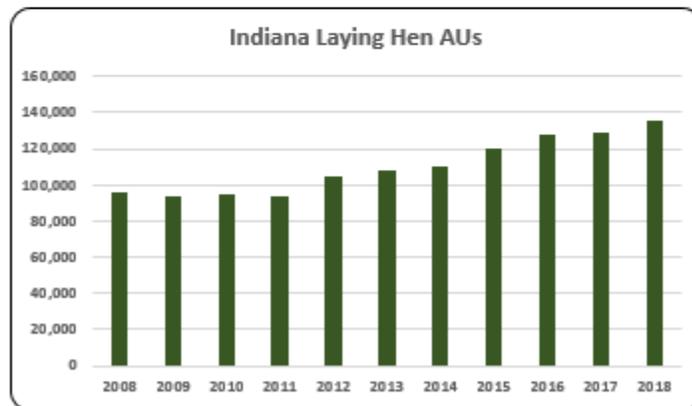
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).



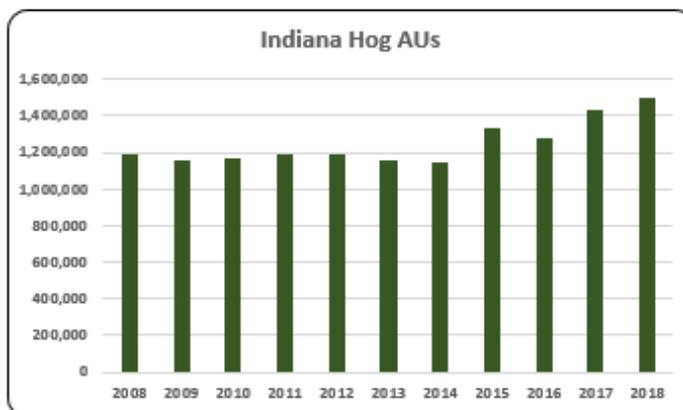
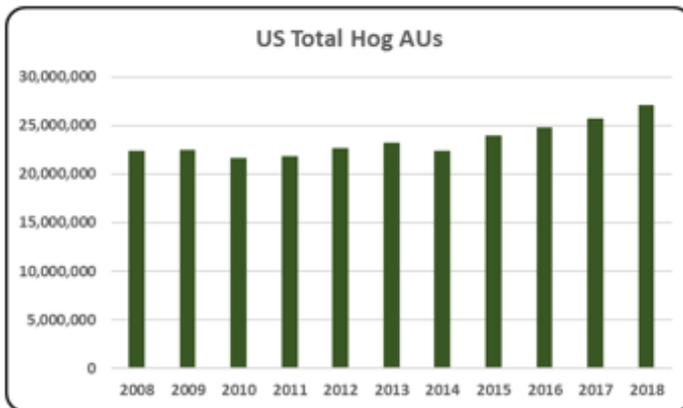
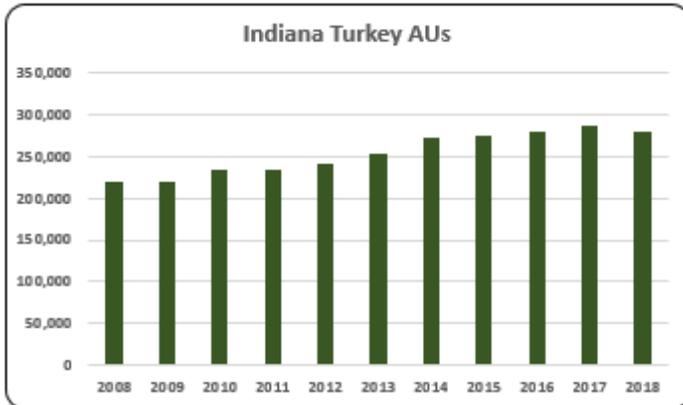
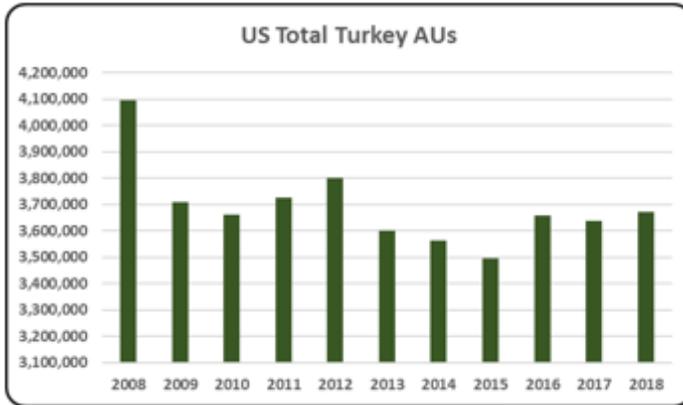
- Broiler AUs were 127,796 in 2018 and experienced a 25.3% decrease from a decade earlier.



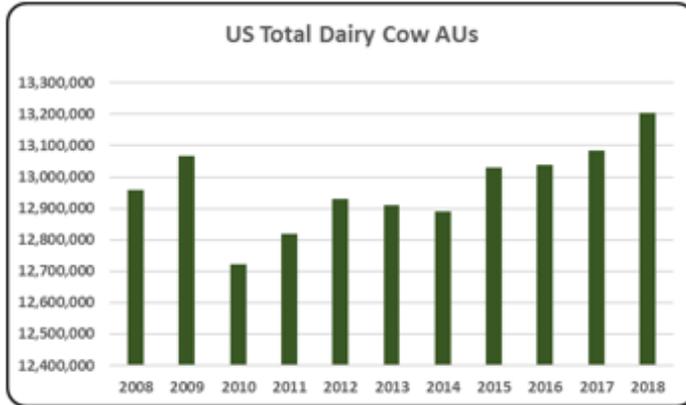
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.



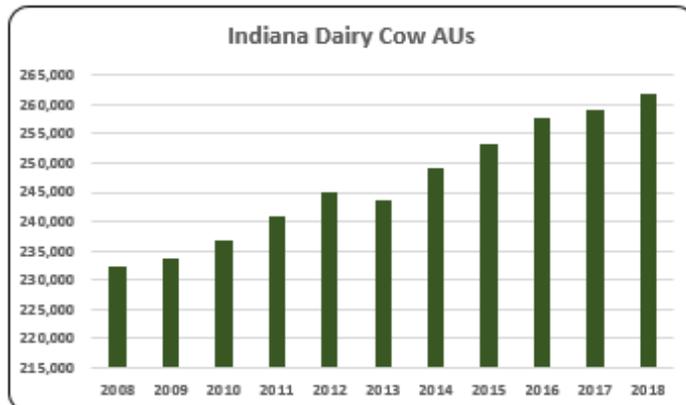
- Layers AUs have increased since 2012. In 2018, layer AUs (135,288) represented 5.0% of all AUs in Indiana.



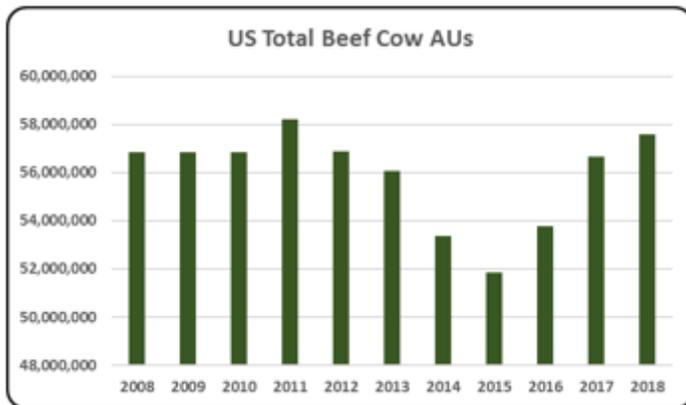
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs in 2018 (279,380) represented 10.3% of all AUs in Indiana. Those numbers represented 7.6% of all turkey AUs in the U.S.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- In 2018, 55.3% (1.5 million) of AUs in Indiana were hog AUs. From 2008 to 2018 hog AUs have averaged about 1.2 million.



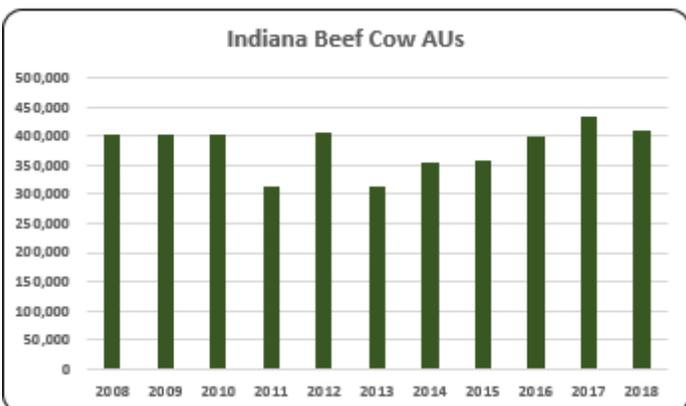
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- From 2008 to 2018, on average, there were 246,655 dairy cow AUs in Indiana. Dairy AUs have steadily increased throughout the decade to 261,800 in 2018.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- In terms of animal units, beef is the second largest animal sector in Indiana. Indiana had 409,200 beef cow AUs in 2018.

Indiana Additional Information and Methodology

Animal agriculture is an important part of Indiana’s current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Indiana, of interest is the degree to which the industry impacts the Indiana economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Indiana animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years’ past. Also presented are estimates of the change in how animal agriculture has impacted Indiana’s economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the “Animal Unit Trends” seeks to quantify production changes in animal agriculture in Indiana which have occurred. As shown in this state report, Indiana has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Indiana. Through in-depth conversations with many of the nation’s top nutritionists and researchers, “bottom up” estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Indiana Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Indiana’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Indiana, \$1.79 to \$3.04 million in total economic activity, \$0.40 to \$0.64 in household wages and 8 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.030	\$ 0.403	8.3
	Hogs, Pigs, and Other	\$ 1.788	\$ 0.406	8.2
	Poultry and Eggs	\$ 3.041	\$ 0.643	13.2
	Dairy	\$ 2.316	\$ 0.513	10.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	403,800	403,800	403,800	314,250	406,350	313,500	354,000	360,000	398,250	433,050	409,200
	Hog and Pig AUs	1,187,400	1,151,700	1,162,950	1,184,400	1,192,050	1,153,800	1,143,750	1,330,050	1,280,550	1,426,650	1,499,700
	Broiler AUs	171,079	159,063	161,202	121,468	122,954	122,525	121,829	124,974	125,908	127,712	127,796
	Turkey AUs	219,542	220,537	234,901	234,548	241,830	254,102	272,311	275,814	279,557	286,188	279,380
	Egg Layer AUs	95,925	94,156	94,384	93,172	105,153	108,486	110,578	120,214	127,484	128,667	135,288
	Dairy AUs	232,400	233,800	236,600	240,800	245,000	243,600	249,200	253,400	257,600	259,000	261,800
	Total Animal Units	2,310,145	2,263,056	2,293,838	2,188,638	2,313,336	2,196,013	2,251,668	2,464,452	2,469,349	2,661,267	2,713,163
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 183,082	\$ 200,726	\$ 215,539	\$ 206,130	\$ 289,984	\$ 275,856	\$ 371,119	\$ 363,481	\$ 294,269	\$ 293,240	\$ 285,639
	Hogs and Pigs (\$1,000)	\$ 818,183	\$ 722,435	\$ 900,624	\$ 1,081,867	\$ 1,081,041	\$ 1,056,695	\$ 1,193,685	\$ 1,097,373	\$ 1,011,604	\$ 1,227,813	\$ 1,028,201
	Broilers (\$1,000)	\$ 137,022	\$ 118,221	\$ 123,545	\$ 108,163	\$ 122,513	\$ 149,280	\$ 156,606	\$ 136,625	\$ 121,477	\$ 142,643	\$ 168,630
	Turkeys (\$1,000)	\$ 294,851	\$ 243,054	\$ 316,963	\$ 375,618	\$ 426,202	\$ 423,883	\$ 557,941	\$ 613,074	\$ 624,788	\$ 504,923	\$ 391,680
	Eggs (\$1,000)	\$ 535,571	\$ 353,020	\$ 373,592	\$ 420,152	\$ 474,014	\$ 545,130	\$ 676,030	\$ 1,066,159	\$ 403,938	\$ 528,743	\$ 796,467
	Milk (\$1,000)	\$ 644,252	\$ 453,322	\$ 590,968	\$ 746,130	\$ 716,632	\$ 796,640	\$ 945,756	\$ 692,300	\$ 672,786	\$ 754,728	\$ 653,277
	Other	\$ 5,521	\$ 6,500	\$ 7,778	\$ 7,834	\$ 8,867	\$ 8,797	\$ 8,847	\$ 9,128	\$ 9,217	\$ 9,703	\$ 10,220
	Sheep and Lambs (\$1,000)	\$ 2,330	\$ 2,827	\$ 3,622	\$ 3,196	\$ 3,747	\$ 3,444	\$ 3,260	\$ 3,309	\$ 3,164	\$ 3,417	\$ 3,701
	Aquaculture (\$1,000)	\$ 3,191	\$ 3,673	\$ 4,156	\$ 4,638	\$ 5,120	\$ 5,353	\$ 5,586	\$ 5,820	\$ 6,053	\$ 6,286	\$ 6,519
	Total (\$1,000)	\$ 2,618,482	\$ 2,097,279	\$ 2,529,008	\$ 2,945,893	\$ 3,119,258	\$ 3,256,281	\$ 3,909,984	\$ 3,978,140	\$ 3,138,079	\$ 3,461,793	\$ 3,334,114

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	8,248	8,676	8,394	8,546
	Cattle feedlots (112112)	2,493	1,114	319	307
	Dairy cattle and milk production (11212)	1,875	1,462	1,459	1,164
	Hog and pig farming (1122)	2,221	1,959	1,301	1,300
	Poultry and egg production (1123)	705	1,442	1,336	1,210
	Sheep and goat farming (1124)	980	1,547	1,719	1,904
	Animal aquaculture and other animal production (1125,1129)	6,570	5,616	6,645	6,023
Value of Sales (\$1,000)	Cattle and Calves	324,054	456,657	522,694	510,529
	Hogs and Pigs	633,112	974,290	1,273,099	1,354,270
	Poultry and Eggs	455,153	887,196	1,164,199	1,357,590
	Milk*			659,314	708,425
	Aquaculture	3,151	2,567	5,120	6,286
	Other (calculated)	41,602	48,350	32,396	49,176
	Total	1,457,072	2,369,060	3,656,822	3,986,276
Input Purchases	Livestock and poultry purchased	(Farms) 14,613	11,645	14,009	13,295
		\$1,000 307,156	511,239	508,824	663,606
	Breeding livestock purchased	(Farms) 6,852	5,669	6,826	6,931
		\$1,000 39,425	57,350	84,804	104,419
	Other livestock and poultry purchased	(Farms) 9,431	7,398	9,346	8,539
		\$1,000 267,731	453,890	424,019	559,186
Feed purchased	(Farms) 29,682	24,908	28,754	27,879	
	\$1,000 660,587	1,092,067	1,592,005	1,401,597	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 579,704	\$ 115,227	2,360	\$ 27,078
	Hogs, Pigs, and Other	\$ 1,856,697	\$ 421,599	8,498	\$ 99,076
	Poultry and Eggs	\$ 4,126,095	\$ 872,001	17,911	\$ 204,920
	Dairy	\$ 1,513,251	\$ 335,066	7,115	\$ 78,740
	Total	\$ 8,075,747	\$ 1,743,892	35,885	\$ 409,815

Change from 2008 to 2018	Cattle and Calves	\$ 135,666	\$ 26,966	552	\$ 6,337
	Hogs, Pigs, and Other	\$ 96,647	\$ 21,946	442	\$ 5,157
	Poultry and Eggs	\$ 610,145	\$ 128,947	2,649	\$ 30,302
	Dairy	\$ (270,177)	\$ (59,823)	(1,270)	\$ (14,058)
	Total	\$ 572,281	\$ 118,036	2,373	\$ 27,738

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.030	\$ 0.403	8.3
	Hogs, Pigs, and Other	\$ 1.788	\$ 0.406	8.2
	Poultry and Eggs	\$ 3.041	\$ 0.643	13.2
	Dairy	\$ 2.316	\$ 0.513	10.9

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.3%
	Total	23.5%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: IOWA

Iowa Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Iowa animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Iowa. The success of Iowa animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Iowa during 2018 animal agriculture contributed:

- \$24.6 billion in economic output
- 111,092 jobs
- \$5.4 billion in earnings
- \$1.3 billion in income taxes paid at local, state, and federal levels
- \$538.3 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Iowa has increased economic output by over \$4.5 billion, boosted household earnings by \$981.3 million, contributed 20,178 additional jobs and paid \$244.1 million in additional tax revenues.

Iowa's animal agriculture consumed almost 3.1 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (2.2 million tons)
- Egg-Laying Hens (512.7 thousand tons)
- Broilers (149.2 thousand tons)

This report examines animal agriculture in Iowa over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Iowa, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Iowa and beyond.

Iowa Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Iowa's economy. In 2018, Iowa's animal agriculture contributed the following to the economy:

- About \$24.6 billion in economic output
- \$5.4 billion in household earnings
- 111,092 jobs
- \$1.3 billion in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Iowa's animal agriculture has:

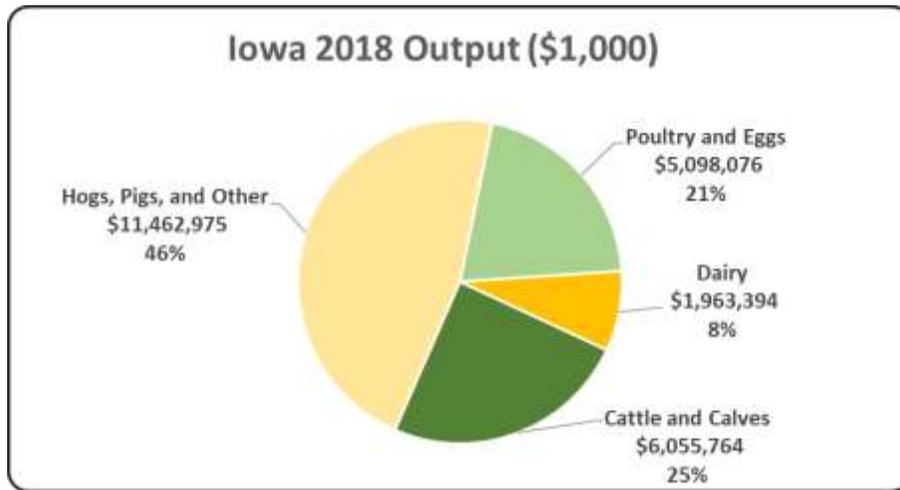
- Increased economic output by \$4.5 billion
- Boosted household earnings by \$981.3 million
- Added 20,178 jobs
- Paid an additional \$244.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 24,580,209	\$ 4,482,379	22.30%
Earnings (\$1,000)	\$ 5,356,511	\$ 981,309	22.43%
Employment (Jobs)	111,092	20,178	22.20%
Income Taxes Paid (\$1,000)	\$ 1,332,164	\$ 244,052	22.43%
Property Taxes Paid in 2017 (\$1,000)	\$ 538,295		

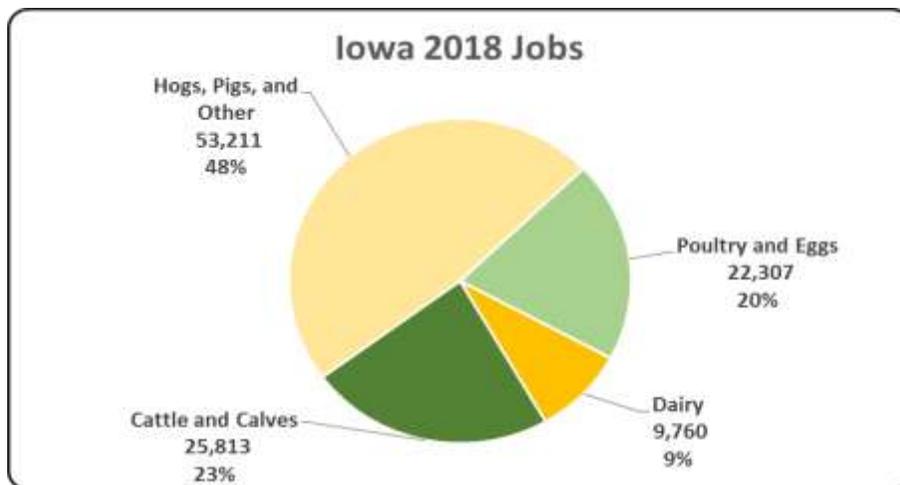
Iowa Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Iowa economy. Animal agriculture’s impact on Iowa total economic output is about \$24.6 billion.



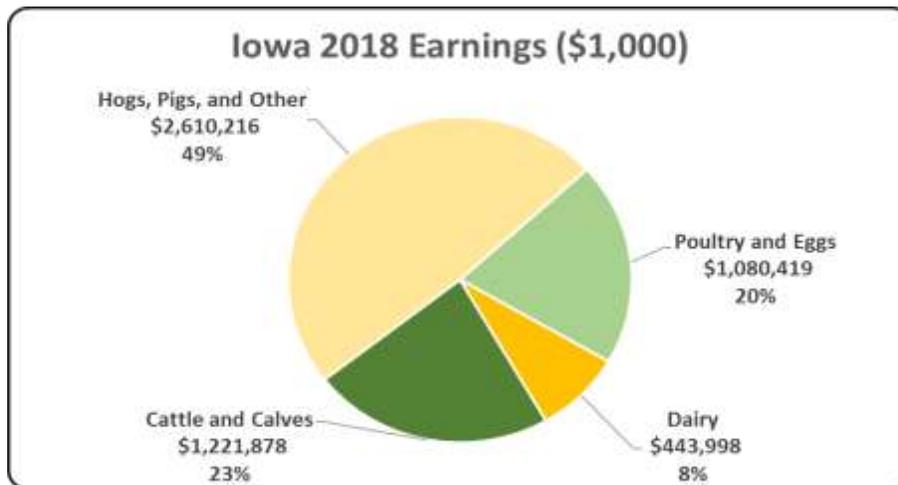
Iowa Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Iowa in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Iowa total jobs, contributing 111,092 jobs within and outside of animal agriculture.



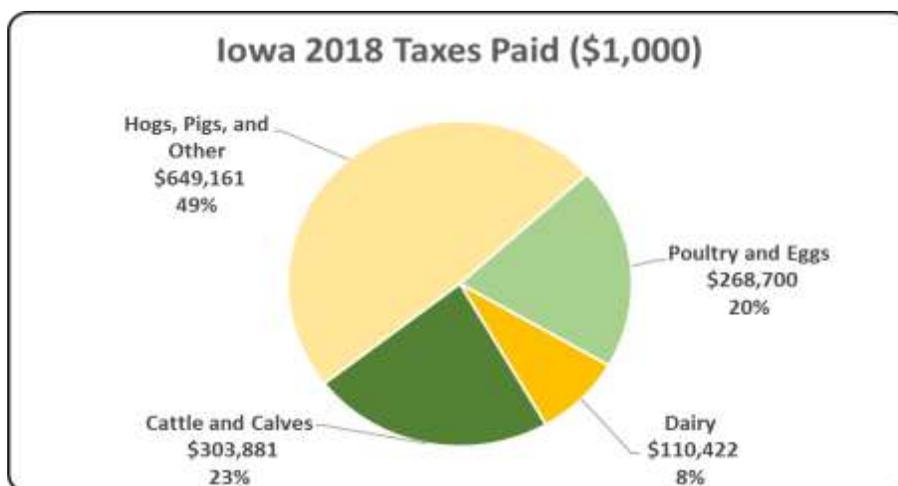
Iowa Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Iowa economy in terms of earnings. Iowa’s animal agriculture contributed about \$5.4 billion to household earnings in 2018.



Iowa Taxes Paid by Animal Agriculture

Iowa’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$1.3 billion in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$538.3 million in property taxes paid by all of Iowa agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



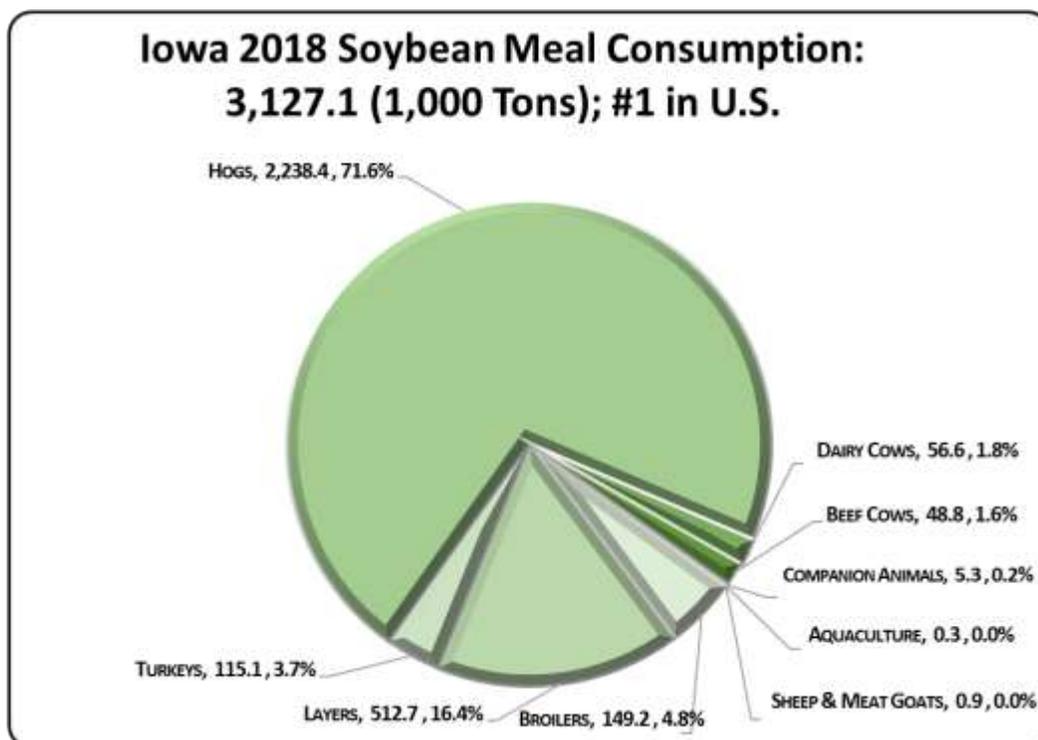
Iowa Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Iowa's animal agriculture consumed almost 3.1 million tons of soybean meal in 2018, placing the state as #1 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Iowa consumed 267.5 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (2.2 million tons)
2. Egg-Laying Hens (512.7 thousand tons)
3. Broilers (149.2 thousand tons)

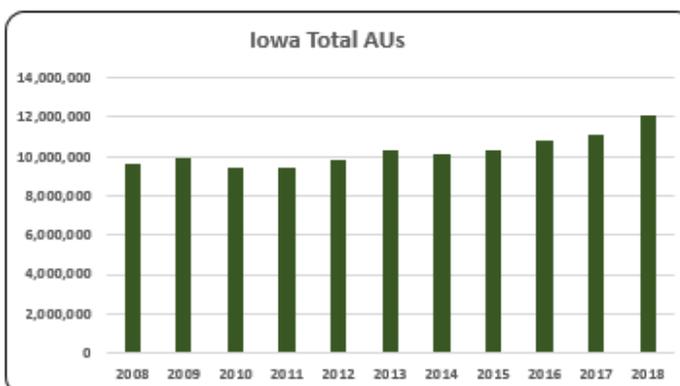
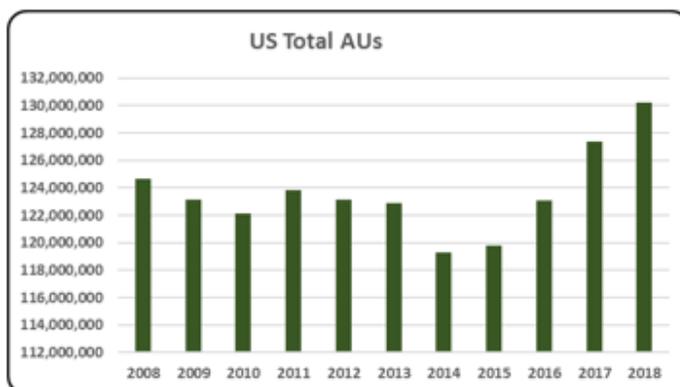


Iowa Animal Unit (AU) Trends

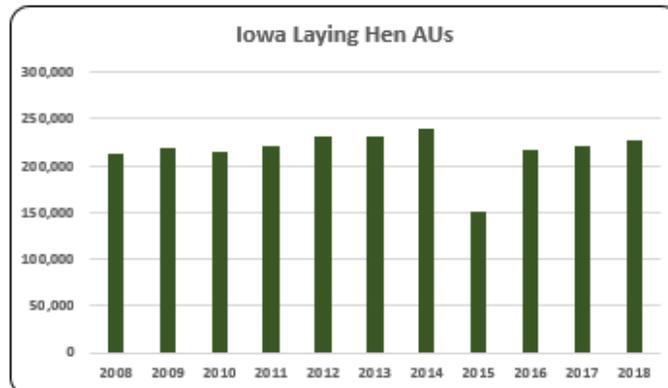
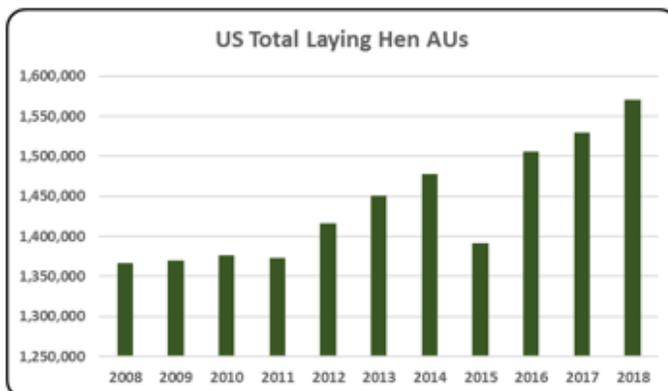
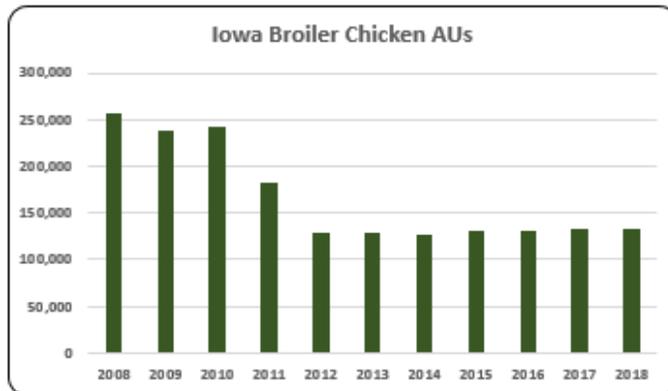
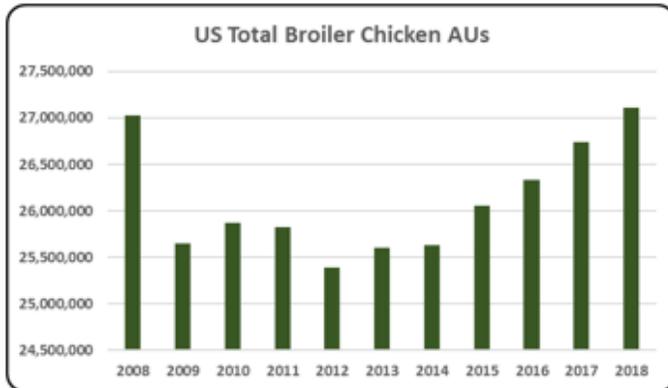
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Iowa. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Iowa and to give perspective on Iowa's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

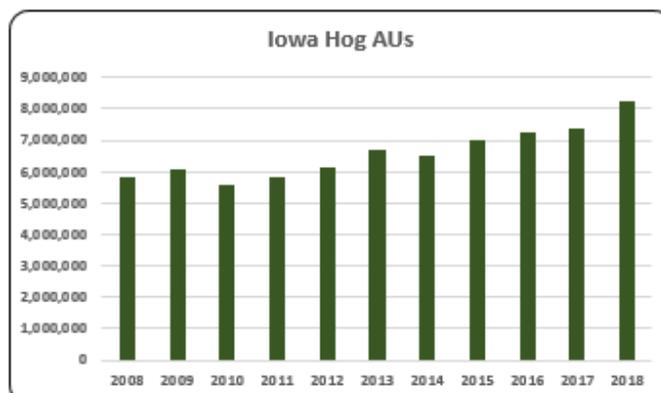
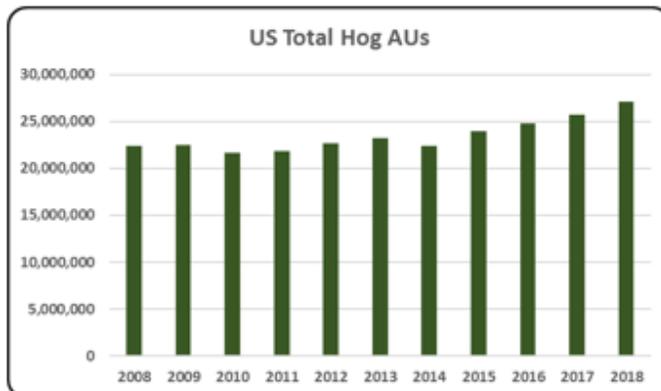
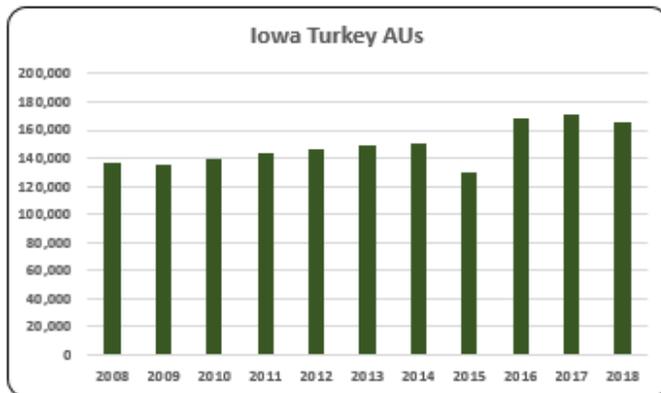
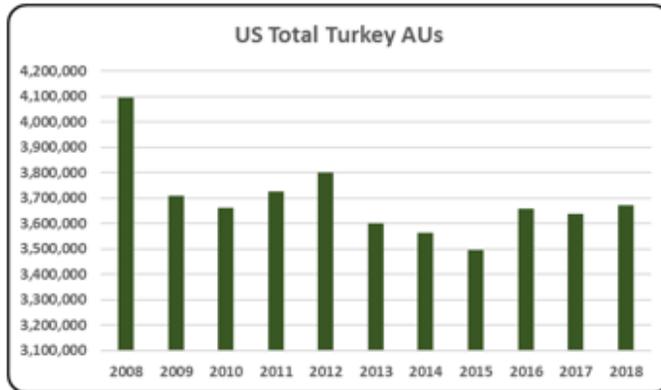
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Iowa, the largest three segments of animal agriculture in terms of AUs during 2018 were: Hogs (8.3 million AUs), Beef Cows (3,011,850 AUs), and Dairy Cows (308,000 AUs). Total animal units in Iowa during 2018 were 12.1 million AUs.



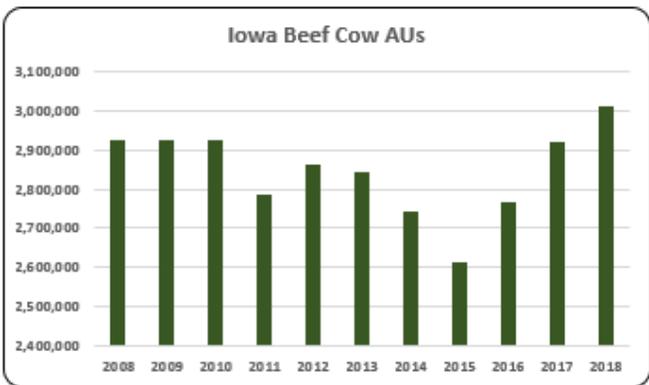
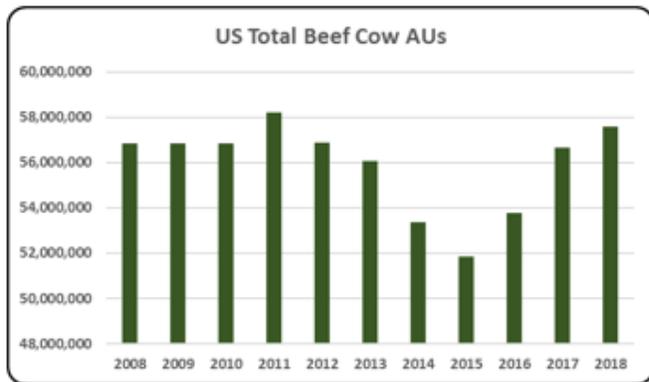
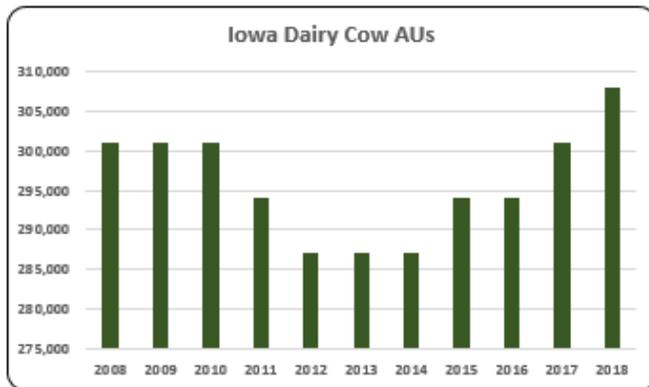
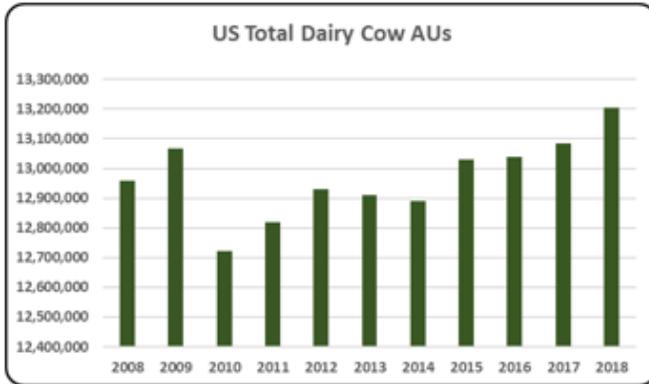
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 12.1 million AUs in the state of Iowa in 2018 which accounted for 9.3% of all AUs in the U.S.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler numbers have been decreasing in Iowa from 256,404 AUs in 2008 to 133,484 AUs in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Iowa housed 14.5% (226,877 AUs) of all layer AUs in the country in 2018. Layer Iowa layer AUs have increased 3.1% from the previous year due to continued recovery from the avian influenza outbreak.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- 4.5% of all turkey AUs in the U.S. in 2018 were in Iowa. In 2018 Iowa's turkey AUs were 166,231 which was up significantly from 2015 due to the continuing recovery from avian influenza.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Iowa is the number one hog producer in the country with 8.3 million hog AUs in 2018, a 41.9% increase from 2008. 30.5% of all hog AUs in the U.S. in 2018 were in Iowa.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Iowa's dairy cow AUs averaged 295,909 from 2008-2018. 2018 was the highest of the decade at 308,000 AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cow AUs make up 24.9% of all AUs in Iowa. In 2018 there were 3.0 million beef cow AUs in Iowa.

Iowa Additional Information and Methodology

Animal agriculture is an important part of Iowa's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Iowa, of interest is the degree to which the industry impacts the Iowa economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Iowa animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Iowa's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Iowa which have occurred. As shown in this state report, Iowa has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Iowa. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Iowa Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Iowa’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Iowa, \$1.72 to \$2.82 million in total economic activity, \$0.39 to \$0.60 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.360	\$ 0.476	10.1
	Hogs, Pigs, and Other	\$ 1.722	\$ 0.392	8.0
	Poultry and Eggs	\$ 2.822	\$ 0.598	12.3
	Dairy	\$ 2.259	\$ 0.511	11.2

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	2,924,700	2,924,700	2,924,700	2,785,500	2,861,100	2,841,900	2,740,875	2,613,225	2,766,075	2,921,475	3,011,850
	Hog and Pig AUs	5,820,300	6,069,150	5,607,000	5,823,450	6,155,250	6,682,800	6,530,250	6,992,400	7,230,000	7,377,450	8,258,850
	Broiler AUs	256,404	238,395	241,602	182,049	128,427	127,978	127,252	130,537	131,512	133,397	133,484
	Turkey AUs	136,267	135,998	139,473	142,928	146,563	148,831	150,488	130,047	167,734	171,713	166,231
	Egg Layer AUs	212,516	218,700	214,856	221,652	231,064	231,096	239,863	150,068	217,768	219,967	226,877
	Dairy AUs	301,000	301,000	301,000	294,000	287,000	287,000	287,000	294,000	294,000	301,000	308,000
	Total Animal Units	9,651,187	9,887,943	9,428,630	9,449,579	9,809,404	10,319,605	10,075,727	10,310,277	10,807,089	11,125,002	12,105,292
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,601,554	\$ 1,416,653	\$ 1,692,657	\$ 1,941,155	\$ 2,201,647	\$ 2,273,750	\$ 2,840,683	\$ 2,828,728	\$ 2,455,768	\$ 2,572,230	\$ 2,565,893
	Hogs and Pigs (\$1,000)	\$ 4,029,267	\$ 3,582,445	\$ 4,503,113	\$ 5,926,789	\$ 6,174,367	\$ 6,890,501	\$ 7,994,929	\$ 7,168,055	\$ 6,516,429	\$ 7,121,183	\$ 6,603,223
	Broilers (\$1,000)	\$ 205,362	\$ 177,184	\$ 185,162	\$ 162,108	\$ 127,967	\$ 155,925	\$ 163,577	\$ 142,706	\$ 126,884	\$ 148,992	\$ 235,946
	Turkeys (\$1,000)	\$ 194,084	\$ 198,185	\$ 218,156	\$ 248,813	\$ 270,347	\$ 288,793	\$ 322,315	\$ 288,325	\$ 379,691	\$ 309,074	\$ 243,367
	Eggs (\$1,000)	\$ 1,117,850	\$ 755,830	\$ 832,528	\$ 947,998	\$ 1,062,683	\$ 1,166,457	\$ 1,404,761	\$ 1,535,042	\$ 555,174	\$ 858,359	\$ 1,327,106
	Milk (\$1,000)	\$ 783,660	\$ 567,732	\$ 716,430	\$ 886,215	\$ 866,496	\$ 944,435	\$ 1,143,162	\$ 836,974	\$ 835,644	\$ 936,132	\$ 869,220
	Other	\$ 28,526	\$ 26,320	\$ 30,649	\$ 36,840	\$ 43,628	\$ 35,736	\$ 37,635	\$ 47,356	\$ 50,228	\$ 54,195	\$ 55,490
	Sheep and Lambs (\$1,000)	\$ 24,391	\$ 21,296	\$ 24,736	\$ 30,038	\$ 35,938	\$ 24,818	\$ 23,491	\$ 29,985	\$ 29,629	\$ 30,369	\$ 28,437
	Aquaculture (\$1,000)	\$ 4,135	\$ 5,024	\$ 5,913	\$ 6,801	\$ 7,690	\$ 10,917	\$ 14,144	\$ 17,372	\$ 20,599	\$ 23,826	\$ 27,053
	Total (\$1,000)	\$ 7,960,303	\$ 6,724,348	\$ 8,178,695	\$ 10,149,918	\$ 10,747,135	\$ 11,755,596	\$ 13,907,062	\$ 12,847,186	\$ 10,919,819	\$ 12,000,166	\$ 11,900,246

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,065	10,673	9,697	10,415	
	Cattle feedlots (112112)	4,259	3,119	2,129	2,325	
	Dairy cattle and milk production (11212)	2,306	1,686	1,224	1,022	
	Hog and pig farming (1122)	5,742	4,970	3,310	3,672	
	Poultry and egg production (1123)	442	775	732	706	
	Sheep and goat farming (1124)	1,098	1,434	1,621	2,011	
	Animal aquaculture and other animal production (1125,1129)	4,162	4,308	3,941	3,868	
Value of Sales (\$1,000)	Cattle and Calves	2,119,935	3,606,633	4,504,373	4,760,338	
	Hogs and Pigs	3,078,455	4,827,224	6,767,424	7,796,511	
	Poultry and Eggs	511,949	872,263	1,291,808	1,579,664	
	Milk*			799,467	868,320	
	Aquaculture	2,308	3,507	7,690	23,826	
	Other (calculated)	47,284	75,204	69,206	95,223	
	Total	5,759,931	9,384,831	13,439,968	15,123,882	
Input Purchases	Livestock and poultry purchased	(Farms)	25,756	22,679	24,040	22,211
		\$1,000	1,854,227	3,290,203	3,435,345	4,211,863
	Breeding livestock purchased	(Farms)	13,436	10,743	12,791	11,608
		\$1,000	100,883	180,644	239,793	263,390
	Other livestock and poultry purchased	(Farms)	16,372	15,086	15,123	14,099
		\$1,000	1,753,344	3,109,559	3,195,553	3,948,473
Feed purchased	(Farms)	41,037	35,808	38,194	36,879	
	\$1,000	1,922,817	3,058,988	5,377,863	4,943,801	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 6,055,764	\$ 1,221,878	25,813	\$ 303,881
	Hogs, Pigs, and Other	\$ 11,462,975	\$ 2,610,216	53,211	\$ 649,161
	Poultry and Eggs	\$ 5,098,076	\$ 1,080,419	22,307	\$ 268,700
	Dairy	\$ 1,963,394	\$ 443,998	9,760	\$ 110,422
	Total	\$ 24,580,209	\$ 5,356,511	111,092	\$ 1,332,164
Change from 2008 to 2018	Cattle and Calves	\$ 1,538,681	\$ 310,461	6,559	\$ 77,212
	Hogs, Pigs, and Other	\$ 3,114,963	\$ 709,303	14,460	\$ 176,404
	Poultry and Eggs	\$ (19,263)	\$ (4,082)	(84)	\$ (1,015)
	Dairy	\$ (152,001)	\$ (34,373)	(756)	\$ (8,549)
	Total	\$ 4,482,379	\$ 981,309	20,178	\$ 244,052
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.360	\$ 0.476	10.1	
	Hogs, Pigs, and Other	\$ 1.722	\$ 0.392	8.0	
	Poultry and Eggs	\$ 2.822	\$ 0.598	12.3	
	Dairy	\$ 2.259	\$ 0.511	11.2	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.7%	
	Total			24.9%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: KANSAS

Kansas Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Kansas animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Kansas. The success of Kansas animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Kansas during 2018 animal agriculture contributed:

- \$13.8 billion in economic output
- 55,387 jobs
- \$2.7 billion in earnings
- \$664.0 million in income taxes paid at local, state, and federal levels
- \$323.8 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Kansas has increased economic output by over \$1.4 billion, boosted household earnings by \$281.5 million, contributed 5,666 additional jobs and paid \$68.3 million in additional tax revenues.

Kansas's animal agriculture consumed almost 328.6 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (204.6 thousand tons)
- Dairy Cows (40.2 thousand tons)
- Beef Cows (30.6 thousand tons)

This report examines animal agriculture in Kansas over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Kansas, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Kansas and beyond.

Kansas Economic Impact of Animal Agriculture

Animal agriculture is an important part of Kansas's economy. In 2018, Kansas's animal agriculture contributed the following to the economy:

- About \$13.8 billion in economic output
- \$2.7 billion in household earnings
- 55,387 jobs
- \$664.0 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Kansas's animal agriculture has:

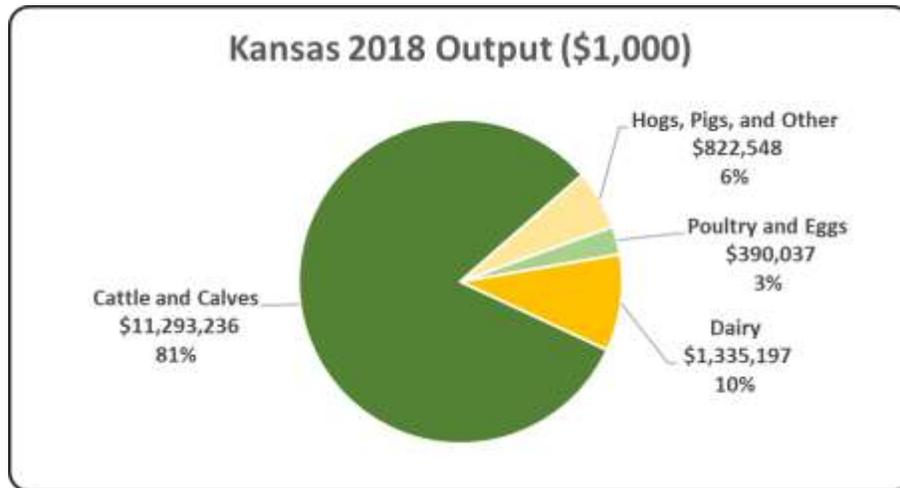
- Increased economic output by \$1.4 billion
- Boosted household earnings by \$281.5 million
- Added 5,666 jobs
- Paid an additional \$68.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 13,841,017	\$ 1,434,567	11.56%
Earnings (\$1,000)	\$ 2,737,955	\$ 281,454	11.46%
Employment (Jobs)	55,387	5,666	11.40%
Income Taxes Paid (\$1,000)	\$ 663,954	\$ 68,253	11.46%
Property Taxes Paid in 2017 (\$1,000)	\$ 323,821		

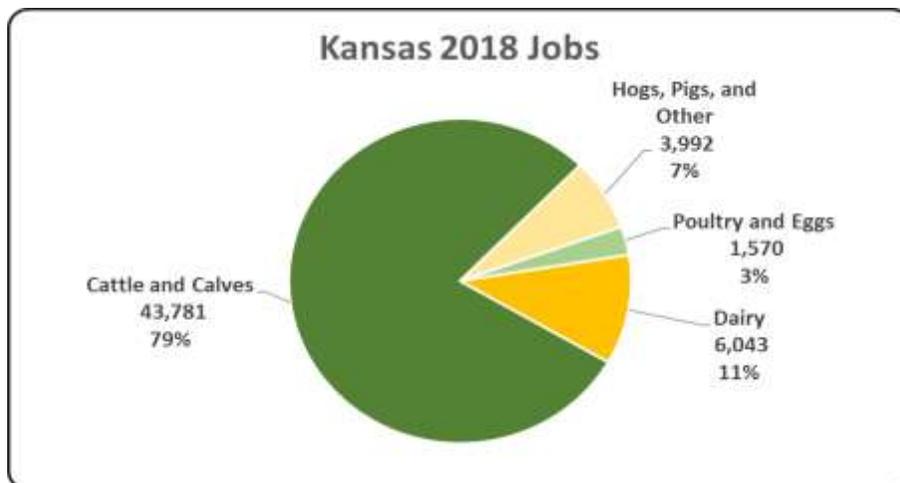
Kansas Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Kansas economy. Animal agriculture’s impact on Kansas total economic output is about \$13.8 billion.



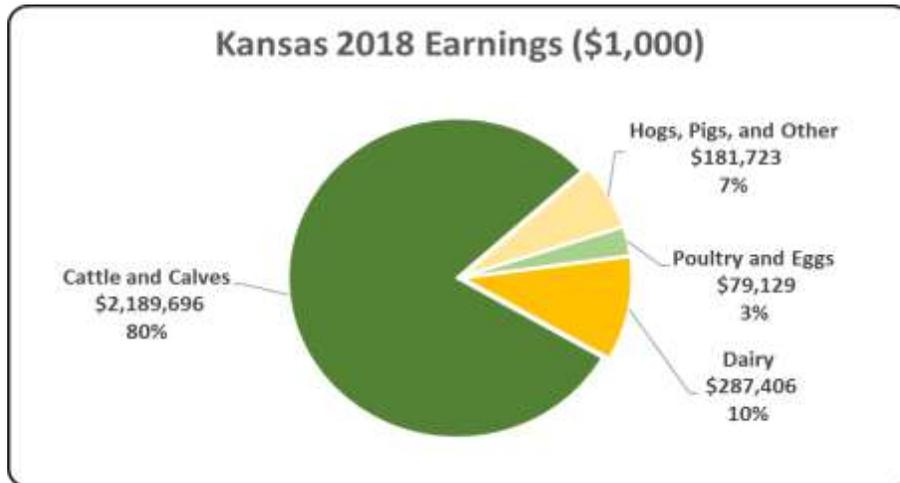
Kansas Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Kansas in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Kansas total jobs, contributing 55,387 jobs within and outside of animal agriculture.



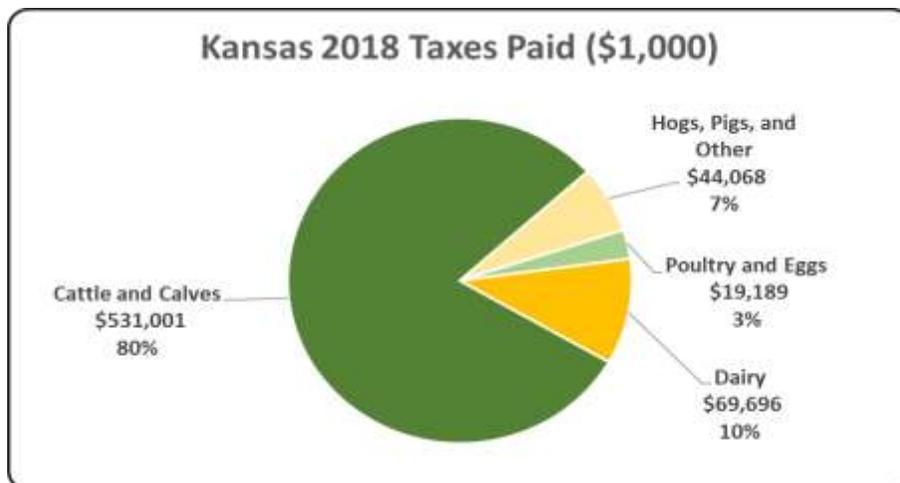
Kansas Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Kansas economy in terms of earnings. Kansas’s animal agriculture contributed about \$2.7 billion to household earnings in 2018.



Kansas Taxes Paid by Animal Agriculture

Kansas’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$664.0 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$323.8 million in property taxes paid by all of Kansas agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



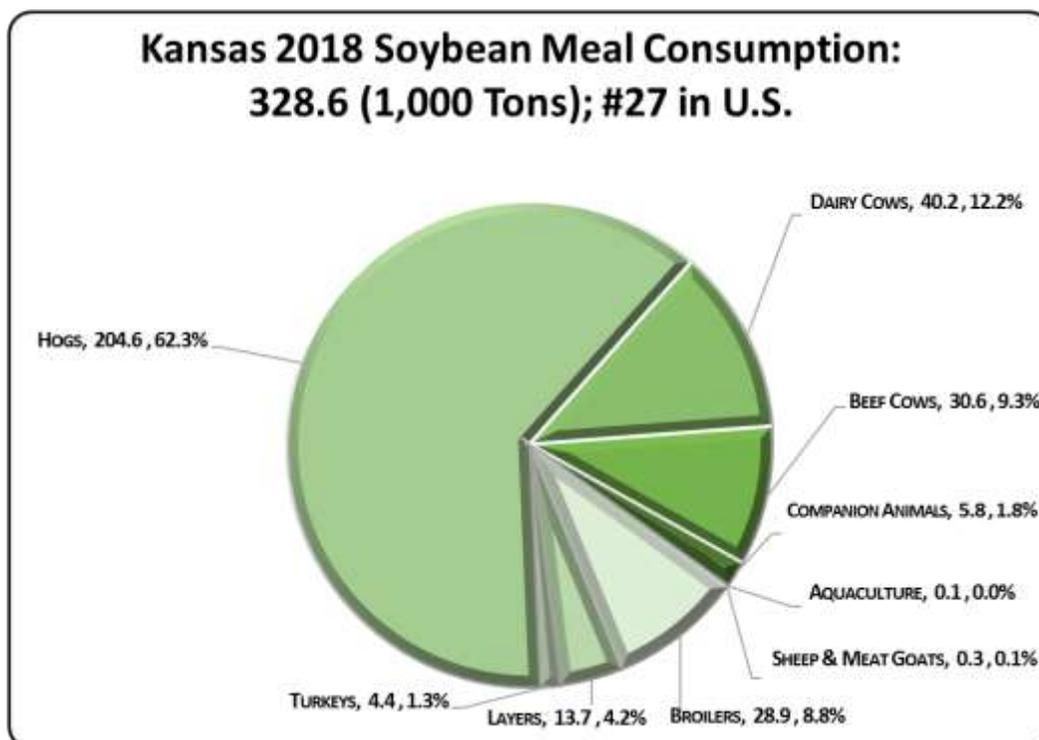
Kansas Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Kansas's animal agriculture consumed almost 328.6 thousand tons of soybean meal in 2018, placing the state as #27 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Kansas consumed 232.7 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (204.6 thousand tons)
2. Dairy Cows (40.2 thousand tons)
3. Beef Cows (30.6 thousand tons)

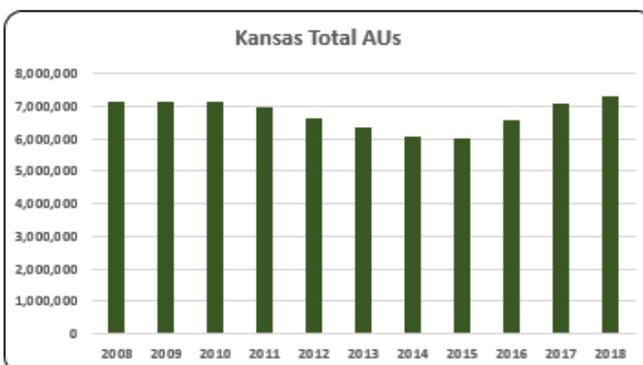
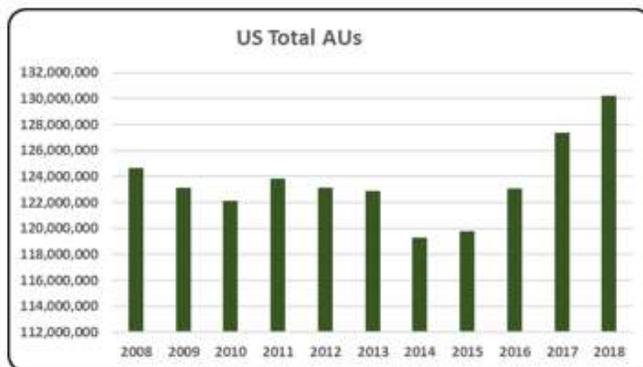


Kansas Animal Unit (AU) Trends

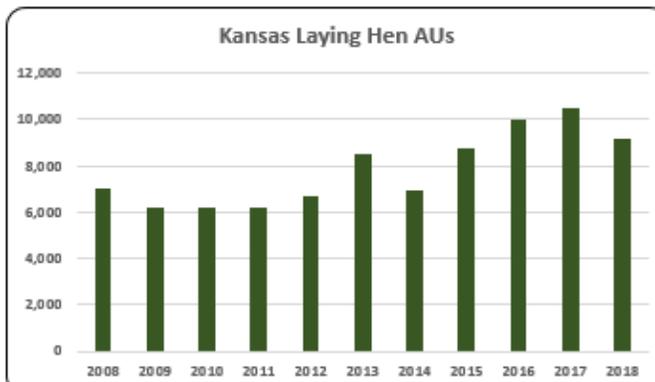
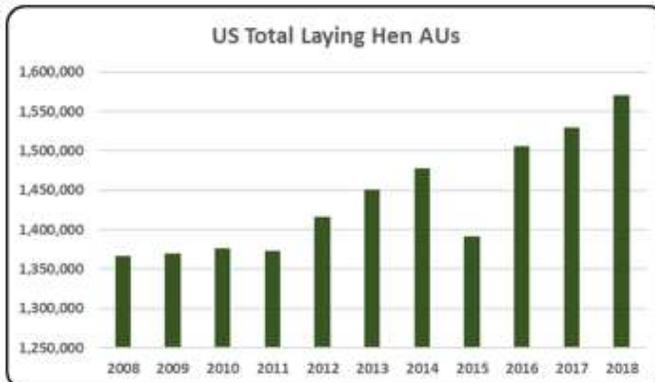
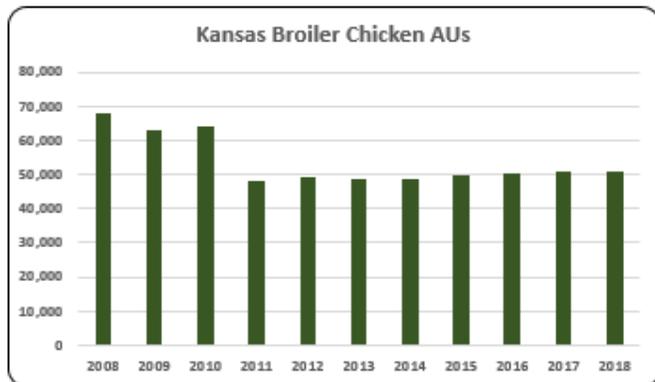
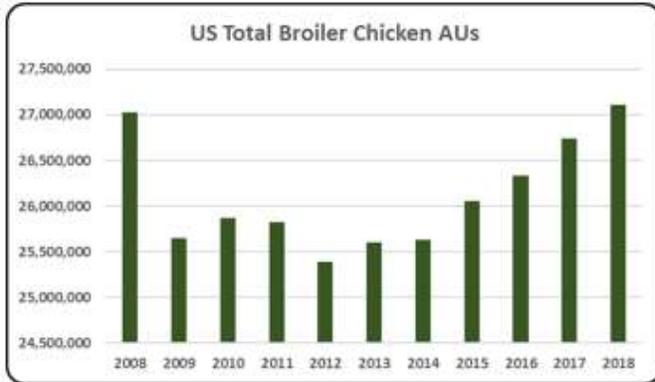
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Kansas. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Kansas and to give perspective on Kansas's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

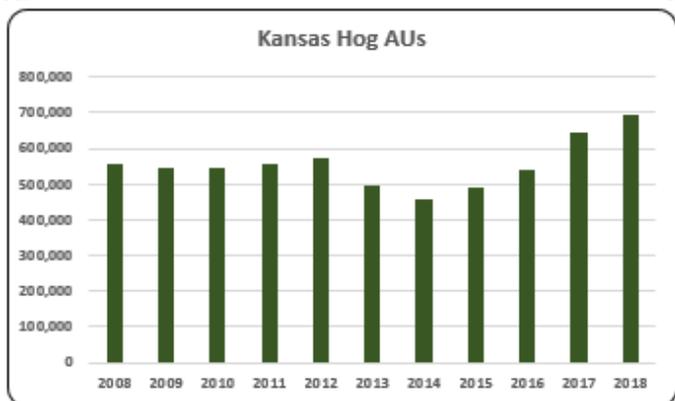
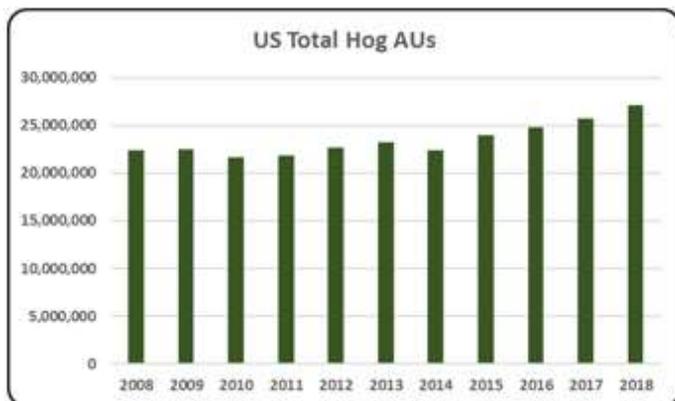
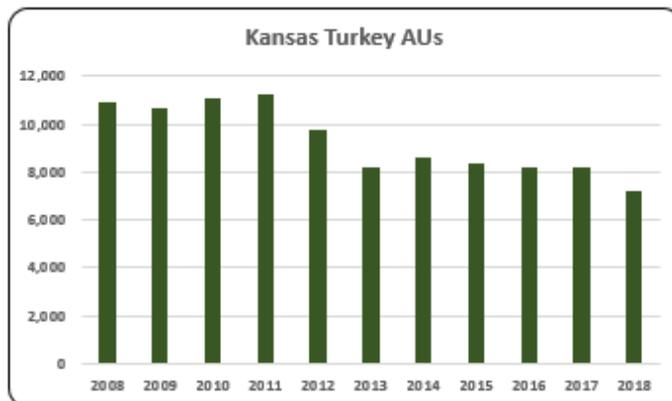
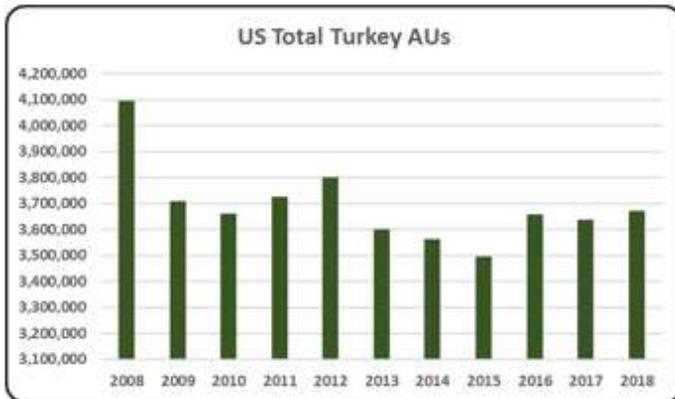
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Kansas, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (6.3 million AUs), Hogs (693,000 AUs), and Dairy Cows (218,400 AUs). Total animal units in Kansas during 2018 were 7.3 million AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 7.3 million AUs in Kansas in 2018. AUs have increased from a decade ago in 2008. Since 2014 AUs have increased 20.4% (1.2 million AUs).



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler numbers in Kansas have shrunk since the beginning of the decade by 24.7% to 51,005 AUs in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- On average there were 7,841 layer AUs in the state in the 2008 to 2018 decade.

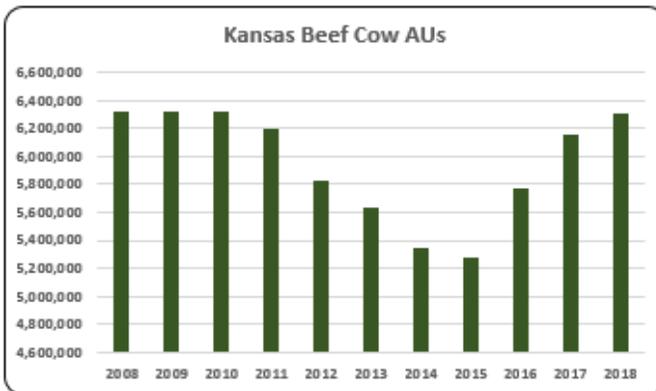
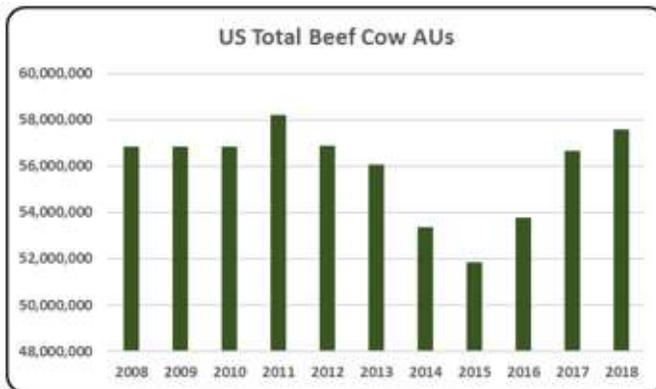
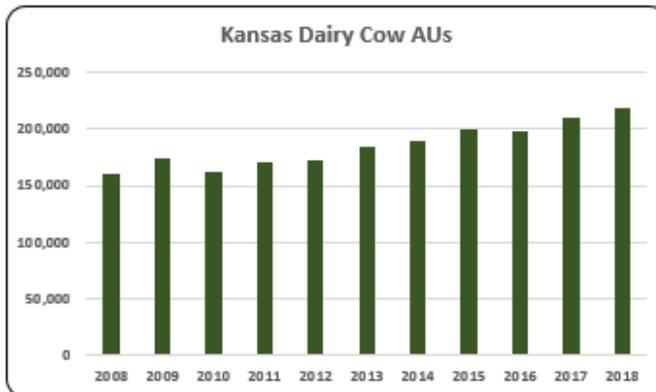
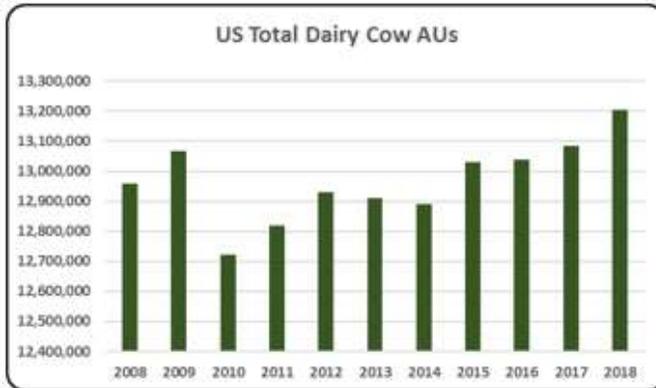


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

- Despite the decreasing trend in turkey AUs in Kansas, turkey AUs were at 7,176 in 2018.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- Hog AUs in 2018 (693,000) represent 9.5% of all AUs present in the state. Hog AUs have rebounded since the 2013-2014 decrease.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Kansas’ dairy cow numbers have shown consistent growth during this decade with an increase from 161,000 dairy cow AUs in 2008 to 218,400 dairy cow AUs in 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- About 86.6% of all AUs in Kansas were beef cow AUs in 2018. Beef cow AUs declined over much of the past decade from 2010 to 2015 in part due to long term drought. This decrease has reversed starting in 2015.

Kansas Additional Information and Methodology

Animal agriculture is an important part of Kansas's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Kansas, of interest is the degree to which the industry impacts the Kansas economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Kansas animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Kansas's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Kansas which have occurred. As shown in this state report, Kansas has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Kansas. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Kansas Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Kansas’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Kansas, \$1.77 to \$2.56 million in total economic activity, \$0.39 to \$0.52 in household wages and 9 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.526	\$ 0.490	9.8
	Hogs, Pigs, and Other	\$ 1.768	\$ 0.391	8.6
	Poultry and Eggs	\$ 2.560	\$ 0.519	10.3
	Dairy	\$ 2.354	\$ 0.507	10.7

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	6,323,475	6,323,475	6,323,475	6,192,150	5,832,150	5,628,150	5,340,150	5,279,850	5,772,600	6,156,600	6,306,600
	Hog and Pig AUs	555,450	544,200	546,750	558,000	572,250	497,250	458,400	489,600	540,600	642,600	693,000
	Broiler AUs	67,745	62,987	63,835	48,100	49,072	48,901	48,623	49,878	50,251	50,971	51,005
	Turkey AUs	10,886	10,642	11,088	11,285	9,748	8,170	8,575	8,382	8,180	8,220	7,176
	Egg Layer AUs	7,046	6,231	6,190	6,226	6,707	8,548	6,921	8,736	9,971	10,527	9,150
	Dairy AUs	161,000	175,000	162,400	170,800	172,200	184,800	190,400	200,200	198,800	210,000	218,400
	Total Animal Units	7,125,603	7,122,536	7,113,737	6,986,562	6,642,127	6,375,820	6,053,069	6,036,647	6,580,402	7,078,918	7,285,330
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 3,320,511	\$ 2,964,814	\$ 3,444,301	\$ 4,224,540	\$ 4,216,036	\$ 4,167,701	\$ 4,613,606	\$ 4,711,927	\$ 4,589,650	\$ 4,508,849	\$ 4,471,506
	Hogs and Pigs (\$1,000)	\$ 350,741	\$ 325,010	\$ 438,565	\$ 599,038	\$ 568,278	\$ 567,739	\$ 606,292	\$ 472,255	\$ 474,582	\$ 542,318	\$ 456,607
	Broilers (\$1,000)	\$ 54,260	\$ 46,814	\$ 48,922	\$ 42,831	\$ 48,896	\$ 59,579	\$ 62,503	\$ 54,528	\$ 48,483	\$ 56,930	\$ 48,504
	Turkeys (\$1,000)	\$ 16,847	\$ 15,967	\$ 21,785	\$ 17,130	\$ 18,418	\$ 13,351	\$ 8,832	\$ 7,771	\$ 8,788	\$ 5,950	\$ 4,791
	Eggs (\$1,000)	\$ 41,461	\$ 29,509	\$ 32,393	\$ 35,517	\$ 39,831	\$ 45,001	\$ 72,032	\$ 120,082	\$ 47,223	\$ 63,851	\$ 99,082
	Milk (\$1,000)	\$ 456,435	\$ 348,320	\$ 431,981	\$ 542,850	\$ 519,080	\$ 592,264	\$ 747,360	\$ 536,744	\$ 532,640	\$ 590,824	\$ 567,324
	Other	\$ 7,228	\$ 8,365	\$ 9,556	\$ 9,939	\$ 11,744	\$ 10,081	\$ 10,402	\$ 10,369	\$ 9,590	\$ 9,466	\$ 8,635
	Sheep and Lambs (\$1,000)	\$ 4,891	\$ 5,363	\$ 5,889	\$ 5,607	\$ 6,747	\$ 5,642	\$ 6,522	\$ 7,047	\$ 6,826	\$ 7,260	\$ 6,987
	Aquaculture (\$1,000)	\$ 2,337	\$ 3,002	\$ 3,667	\$ 4,332	\$ 4,997	\$ 4,439	\$ 3,881	\$ 3,322	\$ 2,764	\$ 2,206	\$ 1,648
Total (\$1,000)	\$ 4,247,483	\$ 3,738,799	\$ 4,427,503	\$ 5,471,845	\$ 5,422,284	\$ 5,455,715	\$ 6,121,028	\$ 5,913,676	\$ 5,710,955	\$ 5,778,188	\$ 5,656,448	

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	20,314	18,708	15,991	17,286
	Cattle feedlots (112112)	1,506	894	492	544
	Dairy cattle and milk production (11212)	608	523	398	298
	Hog and pig farming (1122)	634	618	348	292
	Poultry and egg production (1123)	299	691	385	309
	Sheep and goat farming (1124)	497	782	946	1,138
	Animal aquaculture and other animal production (1125,1129)	3,110	3,493	3,484	3,233
Value of Sales (\$1,000)	Cattle and Calves	5,715,204	8,542,872	10,153,087	10,914,404
	Hogs and Pigs	297,505	506,448	697,020	711,689
	Poultry and Eggs	withheld	69,807	88,403	63,415
	Milk*			482,765	591,154
	Aquaculture	745	2,228	4,997	2,206
	Other (calculated)	65,801	28,105	33,581	39,421
	Total	6,079,255	9,149,460	11,459,853	12,322,289
Input Purchases	Livestock and poultry purchased	(Farms) 16,103	15,145	16,190	15,781
		\$1,000 3,554,091	5,192,954	5,440,898	6,312,155
	Breeding livestock purchased	(Farms) 9,506	9,558	10,480	11,056
		\$1,000 60,943	150,517	206,584	252,334
	Other livestock and poultry purchased	(Farms) 8,750	7,797	8,352	7,167
		\$1,000 3,493,148	5,042,438	5,234,314	6,059,820
Feed purchased	(Farms) 33,531	29,672	32,131	31,845	
	\$1,000 1,410,837	2,237,287	4,207,051	3,183,636	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 11,293,236	\$ 2,189,696	43,781	\$ 531,001
	Hogs, Pigs, and Other	\$ 822,548	\$ 181,723	3,992	\$ 44,068
	Poultry and Eggs	\$ 390,037	\$ 79,129	1,570	\$ 19,189
	Dairy	\$ 1,335,197	\$ 287,406	6,043	\$ 69,696
	Total	\$ 13,841,017	\$ 2,737,955	55,387	\$ 663,954
Change from 2008 to 2018	Cattle and Calves	\$ 1,271,207	\$ 246,480	4,928	\$ 59,771
	Hogs, Pigs, and Other	\$ 66,213	\$ 14,628	321	\$ 3,547
	Poultry and Eggs	\$ 45,696	\$ 9,271	184	\$ 2,248
	Dairy	\$ 51,451	\$ 11,075	233	\$ 2,686
	Total	\$ 1,434,567	\$ 281,454	5,666	\$ 68,253
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.526	\$ 0.490	9.8	
	Hogs, Pigs, and Other	\$ 1.768	\$ 0.391	8.6	
	Poultry and Eggs	\$ 2.560	\$ 0.519	10.3	
	Dairy	\$ 2.354	\$ 0.507	10.7	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.1%
	Total				24.3%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: KENTUCKY

Kentucky Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Kentucky animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Kentucky. The success of Kentucky animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Kentucky during 2018 animal agriculture contributed:

- \$6.2 billion in economic output
- 39,830 jobs
- \$1.3 billion in earnings
- \$314.5 million in income taxes paid at local, state, and federal levels
- \$148.1 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Kentucky has increased economic output by over \$551.8 million, boosted household earnings by \$109.7 million, contributed 3,132 additional jobs and paid \$26.6 million in additional tax revenues.

Kentucky's animal agriculture consumed almost 736.1 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (616.3 thousand tons)
- Hogs (48.0 thousand tons)
- Egg-Laying Hens (32.7 thousand tons)

This report examines animal agriculture in Kentucky over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Kentucky, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Kentucky and beyond.

Kentucky Economic Impact of Animal Agriculture

Animal agriculture is an important part of Kentucky's economy. In 2018, Kentucky's animal agriculture contributed the following to the economy:

- About \$6.2 billion in economic output
- \$1.3 billion in household earnings
- 39,830 jobs
- \$314.5 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Kentucky's animal agriculture has:

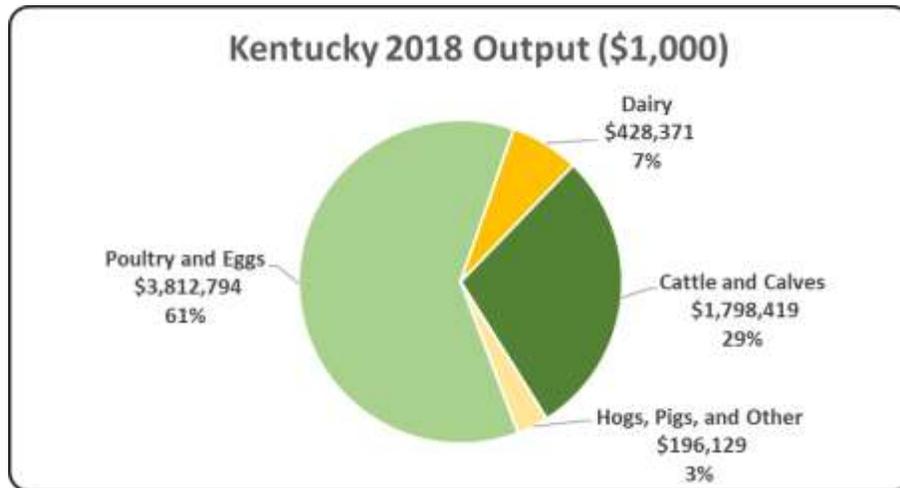
- Increased economic output by \$551.8 million
- Boosted household earnings by \$109.7 million
- Added 3,132 jobs
- Paid an additional \$26.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 6,235,713	\$ 551,805	9.71%
Earnings (\$1,000)	\$ 1,299,748	\$ 109,727	9.22%
Employment (Jobs)	39,830	3,132	8.53%
Income Taxes Paid (\$1,000)	\$ 314,539	\$ 26,554	9.22%
Property Taxes Paid in 2017 (\$1,000)	\$ 148,097		

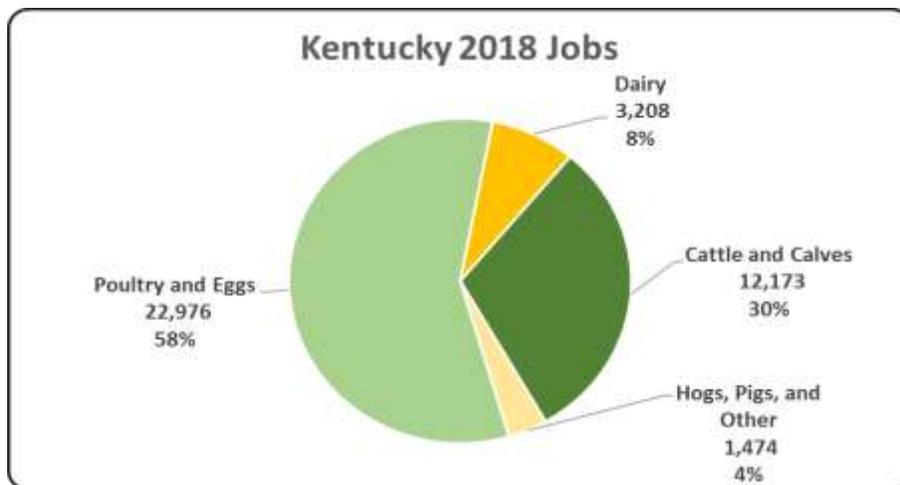
Kentucky Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Kentucky economy. Animal agriculture’s impact on Kentucky total economic output is about \$6.2 billion.



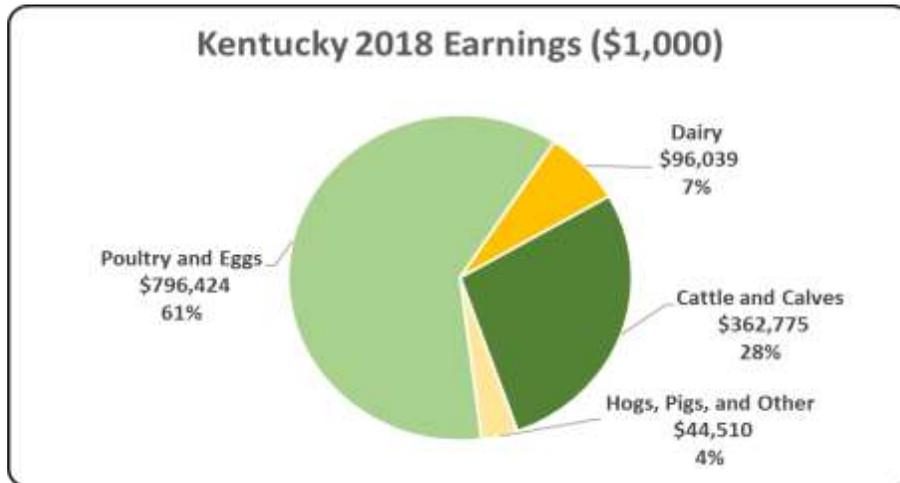
Kentucky Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Kentucky in terms of animal agriculture jobs. As shown, animal agriculture contributes 39,830 jobs within and outside of animal agriculture.



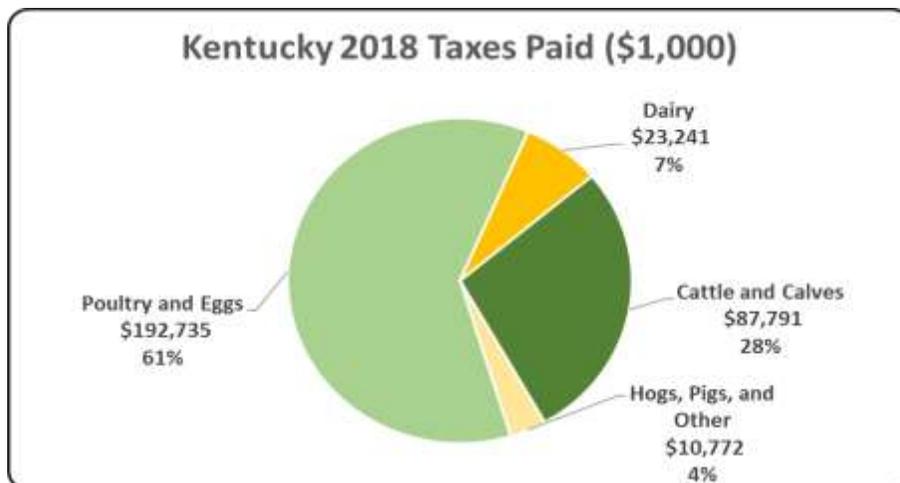
Kentucky Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Kentucky economy in terms of earnings. Kentucky’s animal agriculture contributed about \$1.3 billion to household earnings in 2018.



Kentucky Taxes Paid by Animal Agriculture

Kentucky’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$314.5 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$148.1 million in property taxes paid by all of Kentucky agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



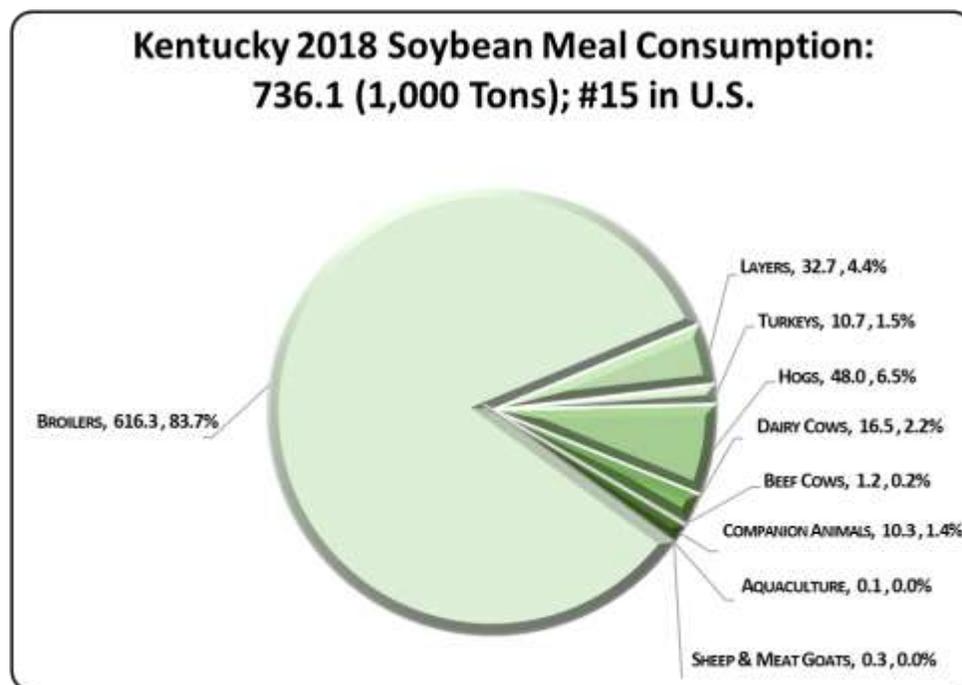
Kentucky Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Kentucky's animal agriculture consumed almost 736.1 thousand tons of soybean meal in 2018, placing the state as #15 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Kentucky consumed 24,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (616.3 thousand tons)
2. Hogs (48.0 thousand tons)
3. Egg-Laying Hens (32.7 thousand tons)

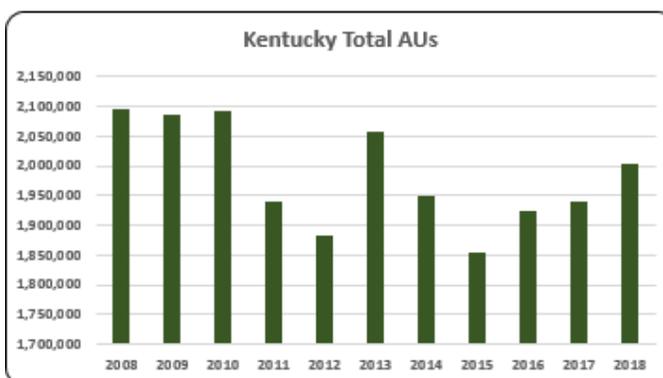
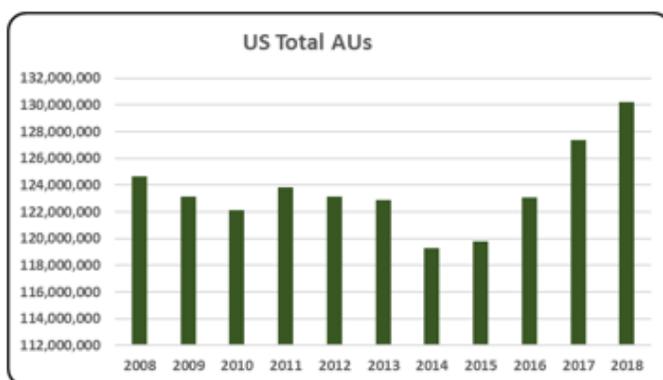


Kentucky Animal Unit (AU) Trends

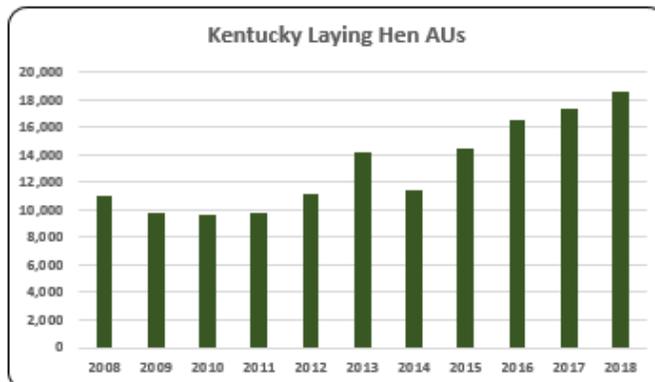
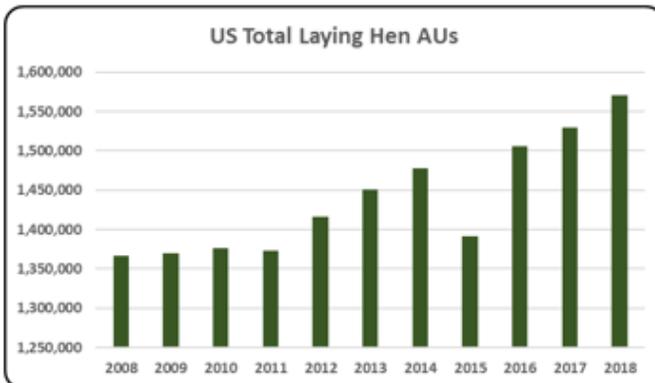
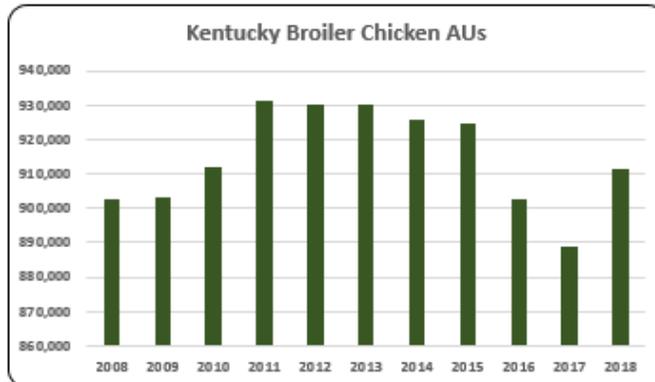
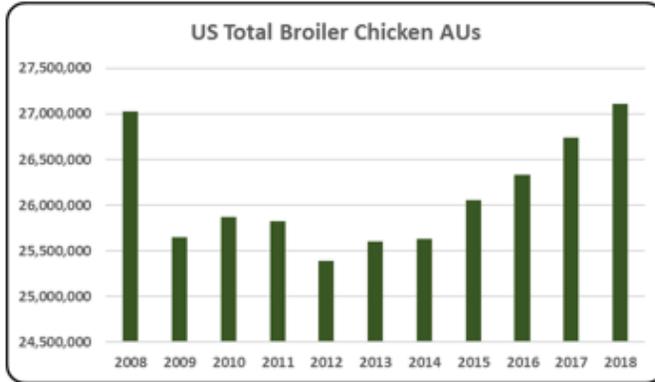
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Kentucky. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Kentucky and to give perspective on Kentucky's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

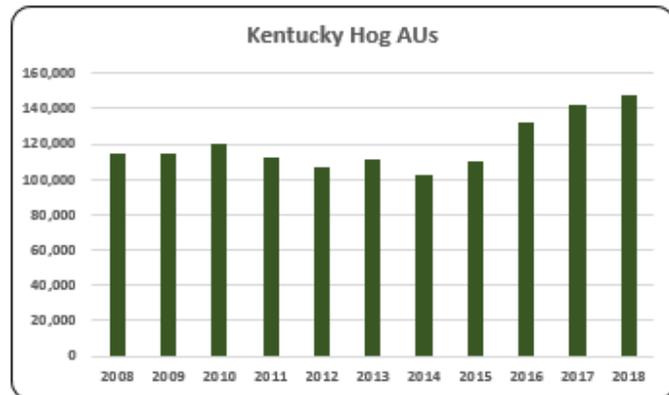
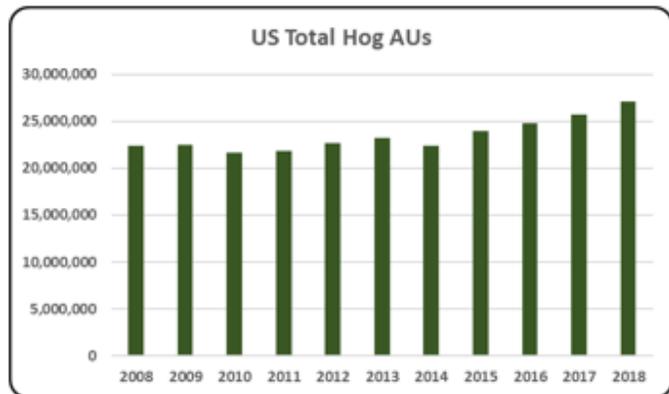
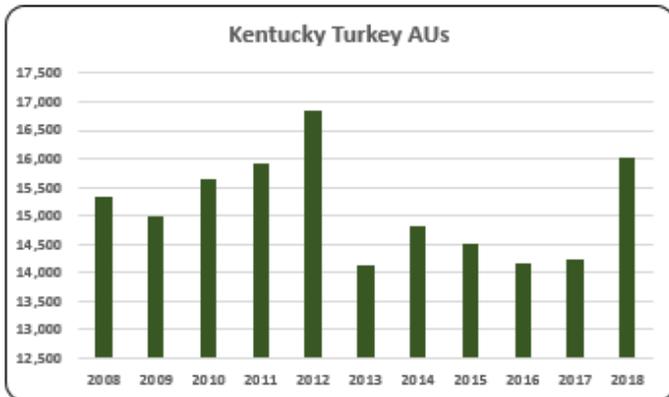
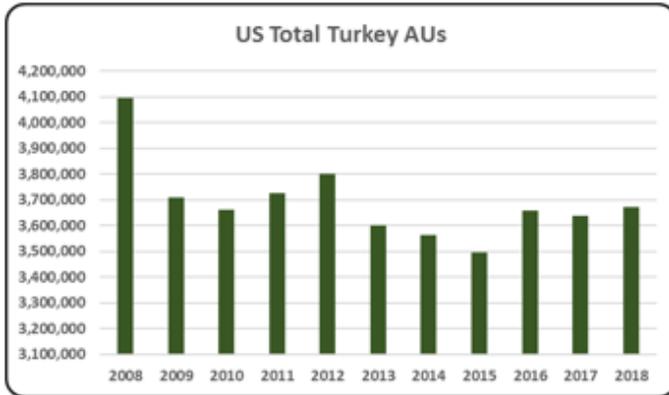
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Kentucky, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (911,523 AUs), Beef Cows (829,200 AUs), and Hogs (147,150 AUs). Total animal units in Kentucky during 2018 were 2.0 million AUs.



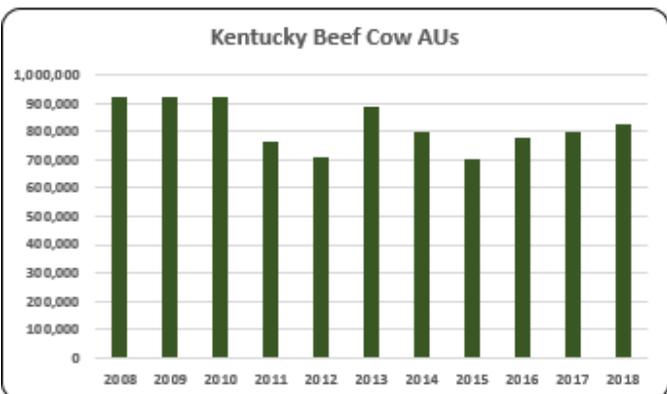
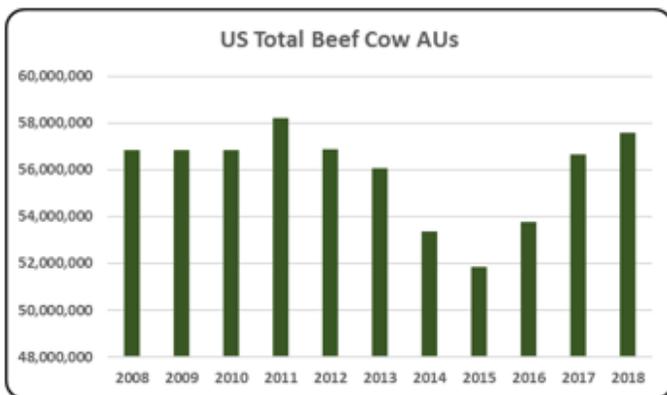
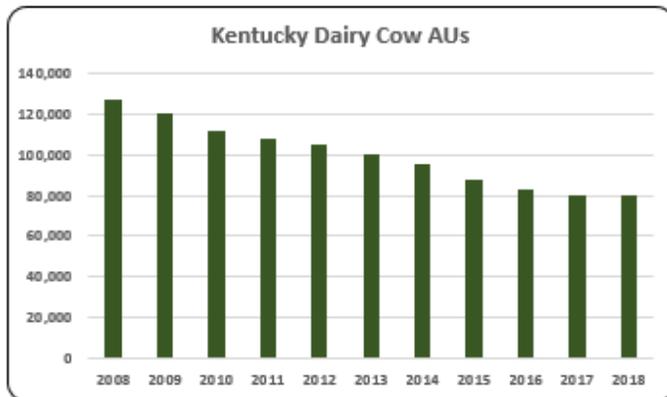
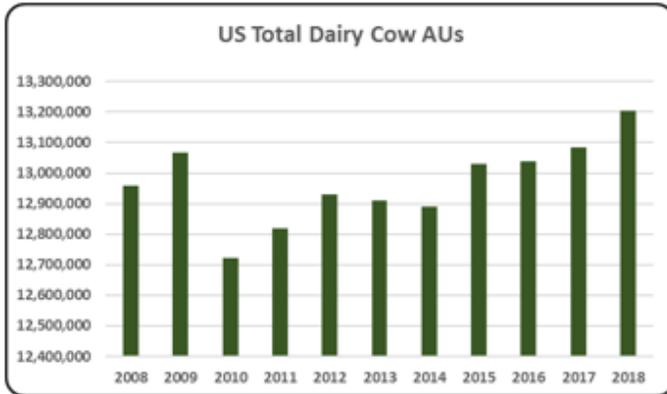
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- The total number of AUs in Kentucky in 2018 was 2.0 million. Animal units decreased 4.4% compared to 2008 but has been increasing since 2015.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- There were 911,523 broiler AUs in 2018, which was an increase from 2017. Kentucky’s broiler AUs increased 1.0% since 2008.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layer AUs in 2018 were 18,525 compared to 11,046 in 2008. On average for the decade there were 13,074 AUs.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey numbers in Kentucky increased in 2018 to 16,030 which was the highest since 2012. 2018 saw a 12.8% (1,815 AUs) increase from 2017.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs have grown 28.7% from 2008 (114,300 AUs) to 2018 (147,150 AUs). Hogs make up 7.4% of the AUs in Kentucky.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Kentucky’s dairy cow numbers have been consistently declining from 127,400 dairy cow AUs in 2008 to 79,800 dairy cow AUs in 2018. Over the past decade this was a 37.4% decrease.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- 41.4% (829,200 AUs) of all AUs in the state of Kentucky in 2018 were beef cow AUs. There was a 10.2% decrease in beef cow AUs since 2008.

Kentucky Additional Information and Methodology

Animal agriculture is an important part of Kentucky's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Kentucky, of interest is the degree to which the industry impacts the Kentucky economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Kentucky animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Kentucky's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Kentucky which have occurred. As shown in this state report, Kentucky has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Kentucky. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Kentucky Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Kentucky’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Kentucky, \$1.81 to \$3.00 million in total economic activity, \$0.41 to \$0.63 in household wages and 14 to 18 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.572	\$ 0.519	17.4
	Hogs, Pigs, and Other	\$ 1.814	\$ 0.412	13.6
	Poultry and Eggs	\$ 2.999	\$ 0.627	18.1
	Dairy	\$ 2.426	\$ 0.544	18.2

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	923,700	923,700	923,700	762,150	712,500	887,550	801,300	703,050	777,300	798,075	829,200
	Hog and Pig AUs	114,300	114,000	119,550	112,650	107,250	111,150	102,000	110,550	131,850	141,600	147,150
	Broiler AUs	902,564	903,320	911,682	931,403	930,291	930,248	925,704	924,816	902,557	889,021	911,523
	Turkey AUs	15,346	15,002	15,630	15,908	16,859	14,130	14,830	14,496	14,147	14,215	16,030
	Egg Layer AUs	11,046	9,768	9,703	9,761	11,090	14,135	11,444	14,445	16,487	17,406	18,525
	Dairy AUs	127,400	120,400	112,000	107,800	105,000	100,800	95,200	88,200	82,600	79,800	79,800
	Total Animal Units	2,094,355	2,086,190	2,092,265	1,939,672	1,882,990	2,058,013	1,950,478	1,855,558	1,924,941	1,940,118	2,002,228
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 507,540	\$ 476,884	\$ 563,075	\$ 585,804	\$ 736,272	\$ 670,516	\$ 940,912	\$ 980,781	\$ 703,234	\$ 722,468	\$ 699,257
	Hogs and Pigs (\$1,000)	\$ 76,419	\$ 66,990	\$ 101,443	\$ 115,178	\$ 105,609	\$ 115,851	\$ 128,741	\$ 108,637	\$ 104,009	\$ 112,831	\$ 99,636
	Broilers (\$1,000)	\$ 760,334	\$ 757,615	\$ 806,338	\$ 782,595	\$ 866,600	\$ 1,014,479	\$ 1,098,698	\$ 960,169	\$ 875,600	\$ 1,029,846	\$ 1,102,069
	Turkeys (\$1,000)	\$ 14,888	\$ 14,110	\$ 30,709	\$ 24,147	\$ 25,963	\$ 18,820	\$ 12,450	\$ 13,439	\$ 15,197	\$ 10,290	\$ 10,701
	Eggs (\$1,000)	\$ 130,387	\$ 110,285	\$ 101,530	\$ 115,438	\$ 116,170	\$ 131,969	\$ 154,883	\$ 191,617	\$ 118,592	\$ 118,459	\$ 158,458
	Milk (\$1,000)	\$ 242,000	\$ 168,072	\$ 206,208	\$ 235,440	\$ 221,760	\$ 230,050	\$ 258,516	\$ 202,476	\$ 180,084	\$ 196,749	\$ 176,575
	Other	\$ 4,933	\$ 5,146	\$ 5,443	\$ 5,556	\$ 6,164	\$ 6,614	\$ 7,112	\$ 7,085	\$ 8,089	\$ 7,699	\$ 8,478
	Sheep and Lambs (\$1,000)	\$ 2,359	\$ 2,495	\$ 2,714	\$ 2,749	\$ 3,280	\$ 3,623	\$ 4,014	\$ 3,880	\$ 4,776	\$ 4,279	\$ 4,950
	Aquaculture (\$1,000)	\$ 2,574	\$ 2,651	\$ 2,729	\$ 2,806	\$ 2,884	\$ 2,991	\$ 3,098	\$ 3,206	\$ 3,313	\$ 3,420	\$ 3,527
Total (\$1,000)	\$ 1,736,501	\$ 1,599,102	\$ 1,814,746	\$ 1,864,158	\$ 2,078,539	\$ 2,188,299	\$ 2,601,313	\$ 2,464,204	\$ 2,004,805	\$ 2,198,341	\$ 2,255,174	

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	31,035	33,966	30,041	30,575	
	Cattle feedlots (112112)	1,820	1,073	541	395	
	Dairy cattle and milk production (11212)	2,078	1,641	890	649	
	Hog and pig farming (1122)	366	354	262	323	
	Poultry and egg production (1123)	904	1,593	1,603	1,407	
	Sheep and goat farming (1124)	901	2,038	1,746	2,821	
	Animal aquaculture and other animal production (1125,1129)	7,309	9,351	7,826	8,049	
Value of Sales (\$1,000)	Cattle and Calves	622,855	935,611	1,033,722	1,002,387	
	Hogs and Pigs	69,722	90,198	122,130	128,036	
	Poultry and Eggs	561,178	978,025	1,107,452	1,310,132	
	Milk*			207,602	166,813	
	Aquaculture	2,017	2,683	2,884	3,420	
	Other (calculated)	499,734	1,162,970	134,038	586,046	
	Total	1,755,506	3,169,487	2,607,828	3,196,834	
Input Purchases	Livestock and poultry purchased	(Farms)	21,156	18,470	21,345	21,952
		\$1,000	298,839	523,127	598,201	706,338
	Breeding livestock purchased	(Farms)	13,530	11,737	13,387	14,319
		\$1,000	71,492	171,651	124,223	225,367
	Other livestock and poultry purchased	(Farms)	9,936	9,159	11,237	11,006
		\$1,000	227,347	351,475	473,978	480,971
	Feed purchased	(Farms)	51,368	46,766	50,685	51,006
		\$1,000	443,883	793,669	1,176,273	784,571

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,798,419	\$ 362,775	12,173	\$ 87,791
	Hogs, Pigs, and Other	\$ 196,129	\$ 44,510	1,474	\$ 10,772
	Poultry and Eggs	\$ 3,812,794	\$ 796,424	22,976	\$ 192,735
	Dairy	\$ 428,371	\$ 96,039	3,208	\$ 23,241
	Total	\$ 6,235,713	\$ 1,299,748	39,830	\$ 314,539
Change from 2008 to 2018	Cattle and Calves	\$ 238,470	\$ 48,104	1,614	\$ 11,641
	Hogs, Pigs, and Other	\$ 19,763	\$ 4,485	148	\$ 1,085
	Poultry and Eggs	\$ 566,806	\$ 118,396	3,416	\$ 28,652
	Dairy	\$ (273,233)	\$ (61,258)	(2,046)	\$ (14,824)
	Total	\$ 551,805	\$ 109,727	3,132	\$ 26,554
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.572	\$ 0.519	17.4	
	Hogs, Pigs, and Other	\$ 1.814	\$ 0.412	13.6	
	Poultry and Eggs	\$ 2.999	\$ 0.627	18.1	
	Dairy	\$ 2.426	\$ 0.544	18.2	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.0%
	Total				24.2%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: LOUISIANA

Louisiana Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Louisiana animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Louisiana. The success of Louisiana animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Louisiana during 2018 animal agriculture contributed:

- \$1.0 billion in economic output
- 4,749 jobs
- \$226.0 million in earnings
- \$54.7 million in income taxes paid at local, state, and federal levels
- \$41.8 million in the form of property taxes

Louisiana's animal agriculture consumed almost 63.7 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (39.3 thousand tons)
- Egg-Laying Hens (10.3 thousand tons)
- Companion Animals (5.5 thousand tons)

This report examines animal agriculture in Louisiana over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Louisiana, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Louisiana and beyond.

Louisiana Economic Impact of Animal Agriculture

Animal agriculture is an important but shrinking part of Louisiana's economy. In 2018, Louisiana's animal agriculture contributed the following to the economy:

- About \$1.0 billion in economic output
- \$226.0 million in household earnings
- 4,749 jobs
- \$54.7 million in income taxes

During the last decade, contractions in Louisiana's animal agriculture has:

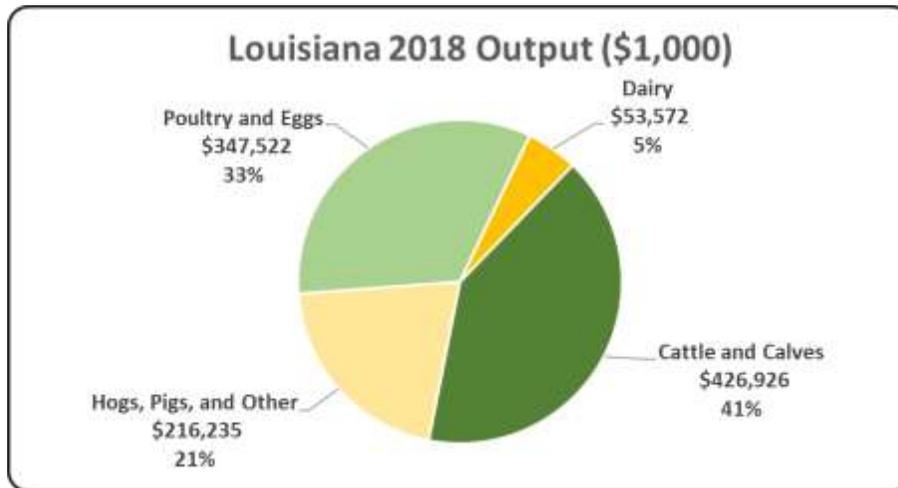
- Decreased economic output by \$201.0 million
- Reduced household earnings by \$45.2 million
- Shrunk by 1,040 jobs
- Paid \$10.9 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 1,044,254	\$ (201,038)	-16.14%
Earnings (\$1,000)	\$ 225,951	\$ (45,237)	-16.68%
Employment (Jobs)	4,749	(1,040)	-17.96%
Income Taxes Paid (\$1,000)	\$ 54,680	\$ (10,947)	-16.68%
Property Taxes Paid in 2017 (\$1,000)	\$ 41,829		

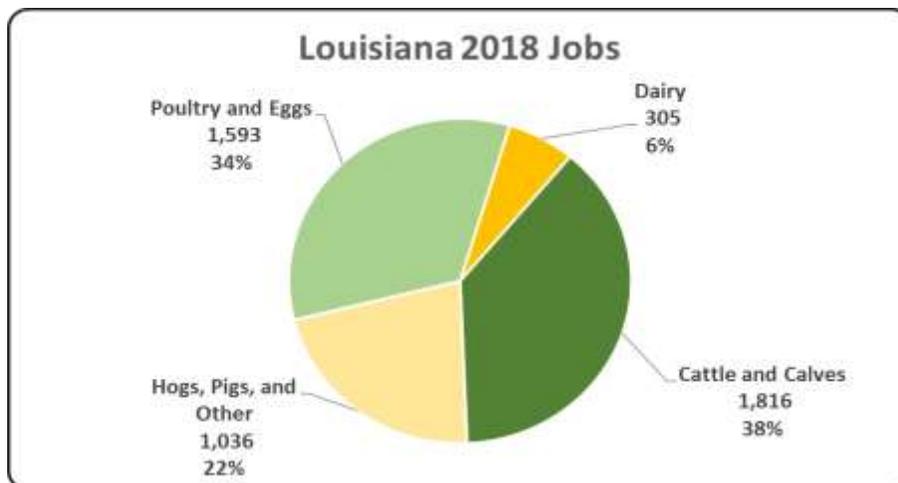
Louisiana Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Louisiana economy. Animal agriculture’s impact on Louisiana total economic output is about \$1.0 billion.



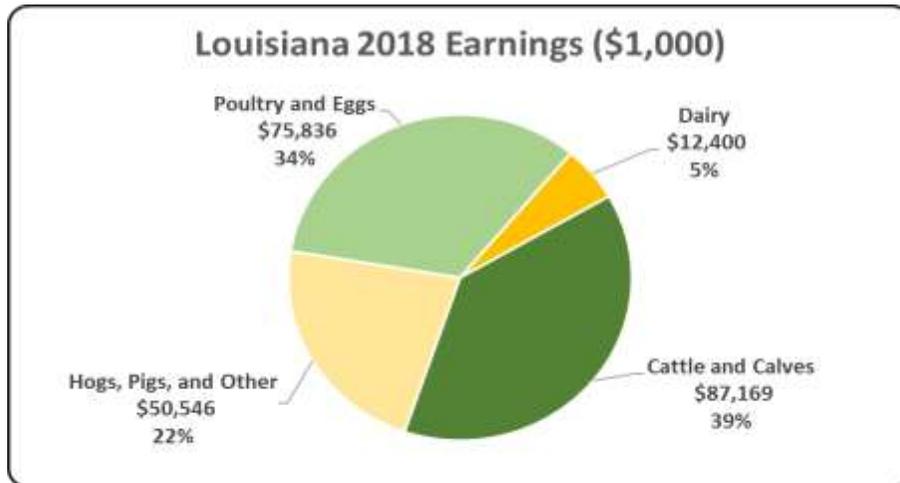
Louisiana Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Louisiana in terms of animal agriculture jobs. As shown, animal agriculture contributes 4,749 jobs within and outside of animal agriculture.



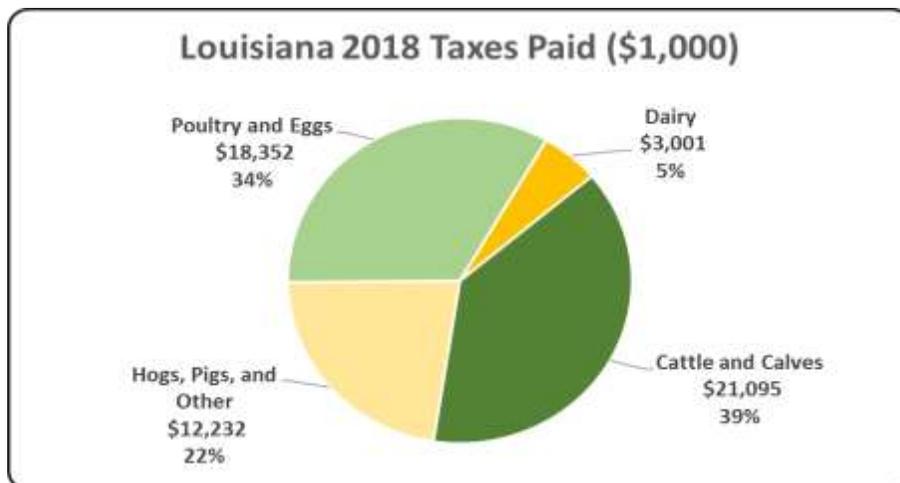
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Louisiana Taxes Paid by Animal Agriculture

Louisiana’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$54.7 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$41.8 million in property taxes paid by all of Louisiana agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



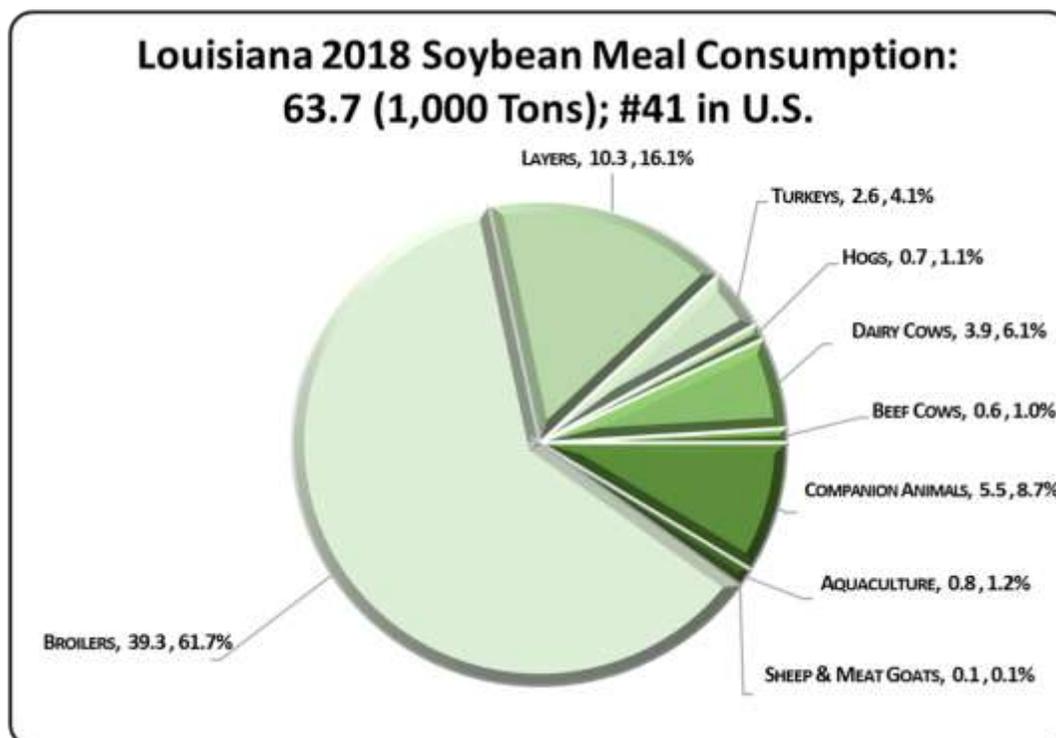
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The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

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Louisiana's animal agriculture consumed almost 63.7 thousand tons of soybean meal in 2018, placing the state as #41 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Louisiana consumed 4,200 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (39.3 thousand tons)
2. Egg-Laying Hens (10.3 thousand tons)
3. Companion Animals (5.5 thousand tons)

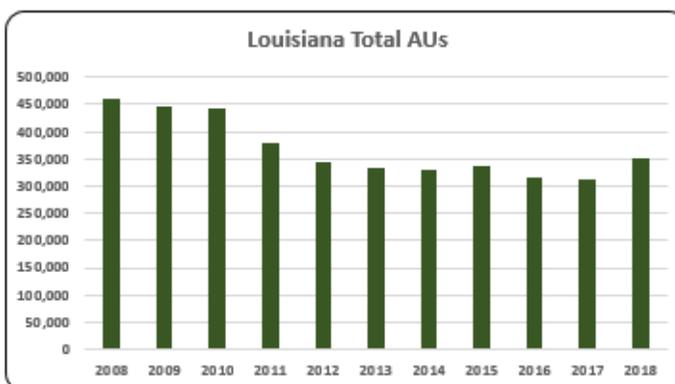
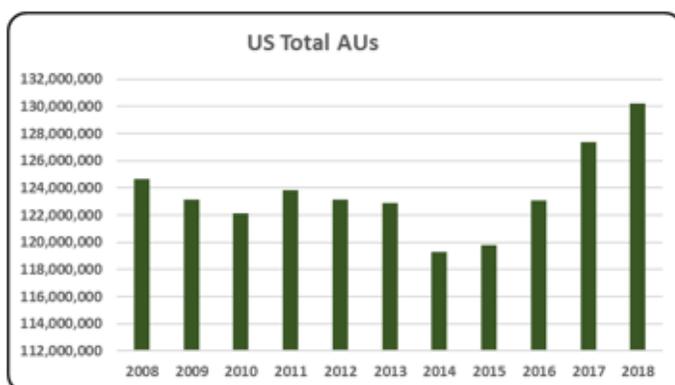


Louisiana Animal Unit (AU) Trends

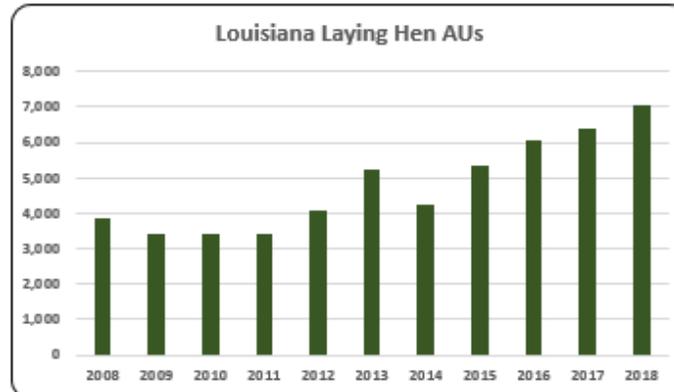
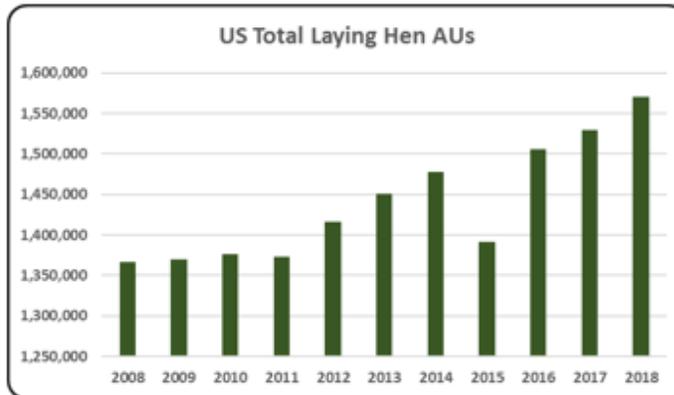
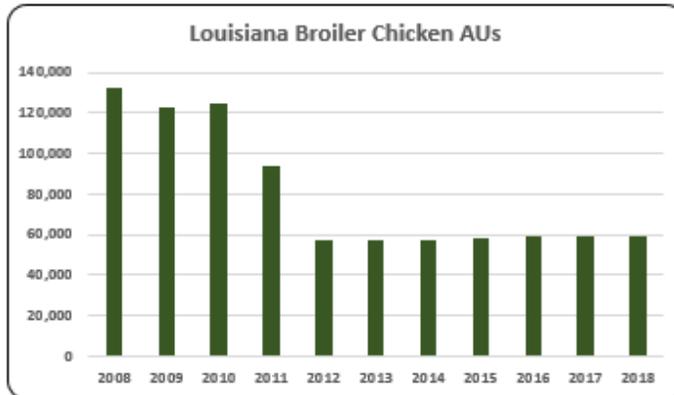
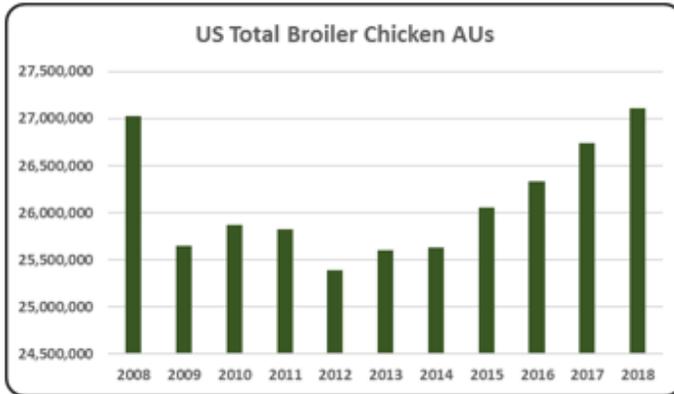
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Louisiana. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Louisiana and to give perspective on Louisiana's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

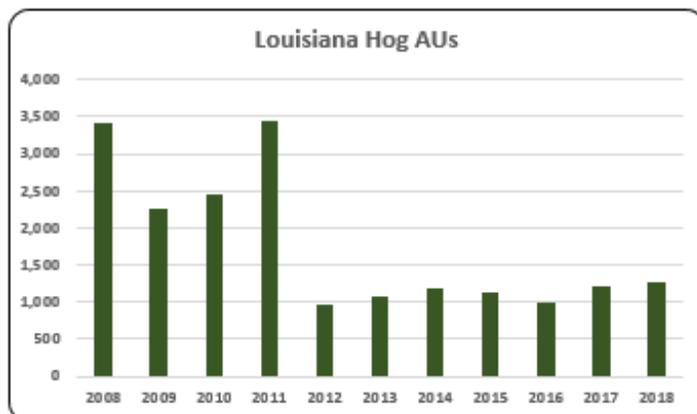
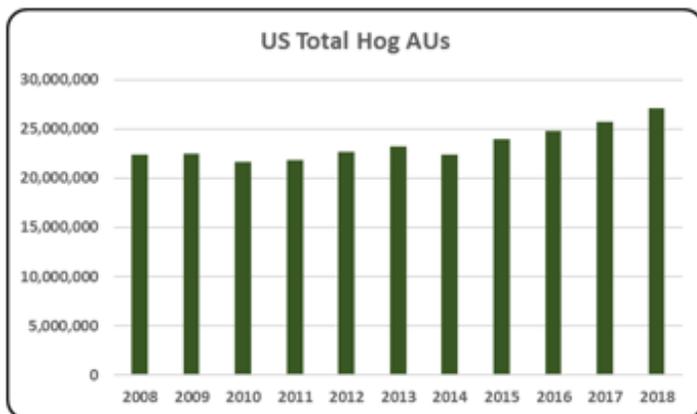
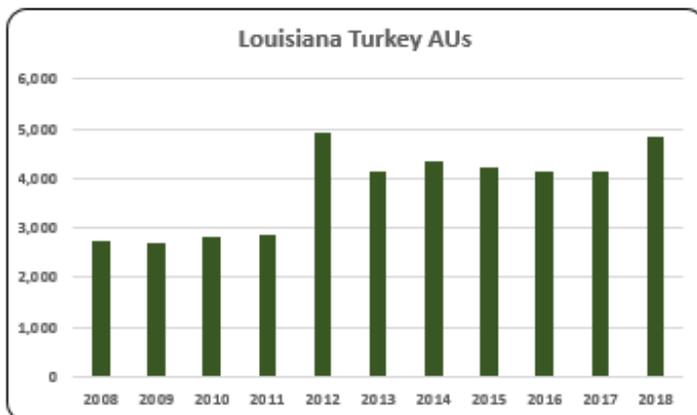
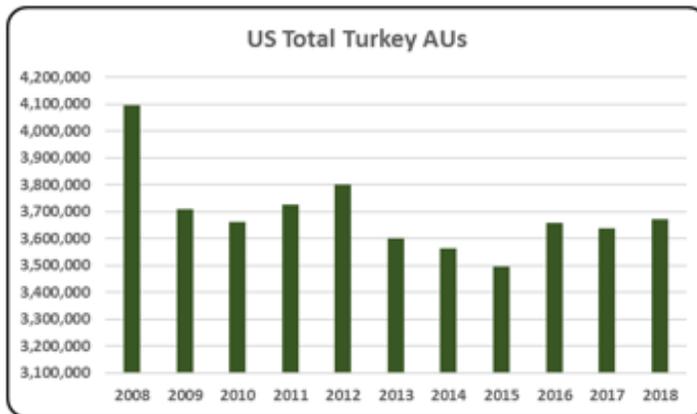
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Louisiana, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (263,025 AUs), Broilers (59,537 AUs), and Dairy Cows (16,800 AUs). Total animal units in Louisiana during 2018 were 352,513 AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- The largest animal sector in Louisiana in terms of animal units is beef. 74.6% (263,025) of all AUs in Louisiana in 2018 were beef cow AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler numbers in Louisiana have decreased by 54.9% from 132,061 in 2008 to 59,537 in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hen AUs dropped during 2009-2011 to an average of 3,422. By 2018, there were 7,030 layer AUs, increasing 81.2% from 2008.

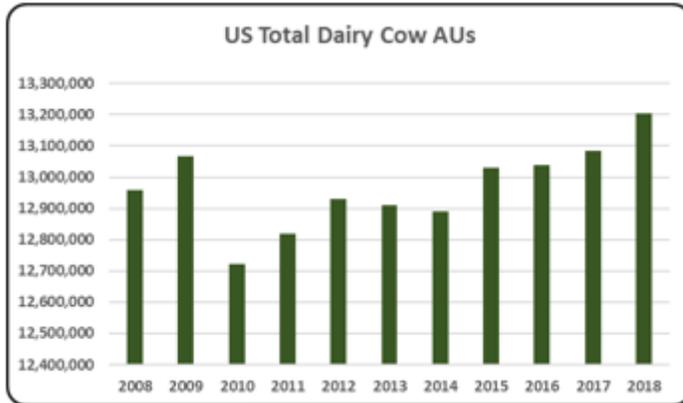


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

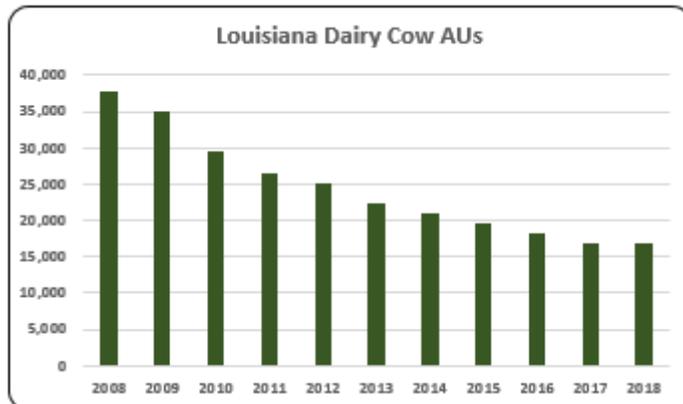
- The average number of turkey AUs for the 2008-2018 decade was 3,809 AUs, with 4,846 AUs in 2018.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

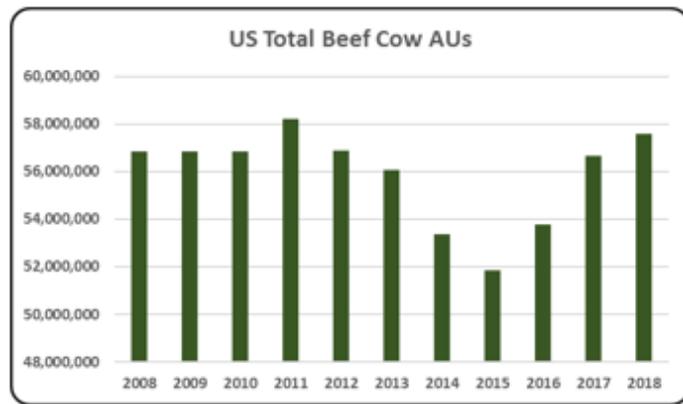
- Hog AUs only make up 0.4% of total AUs in Louisiana. There were 1,275 hog AUs in 2018.



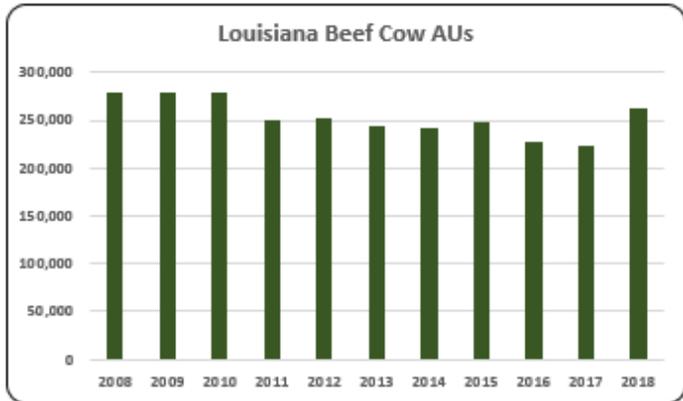
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Louisiana had 16,800 dairy cow AUs in 2018. This is a 55.6% drop from 2008.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Beef cow AUs have declined 5.7% since 2008 (278,850). There were 263,025 beef cow AUs in 2018.

Louisiana Additional Information and Methodology

Animal agriculture is a modest part of Louisiana's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Louisiana, of interest is the degree to which the industry impacts the Louisiana economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Louisiana animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Louisiana's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Louisiana which have occurred. As shown in this state report, Louisiana has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Louisiana. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Louisiana Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Louisiana’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Louisiana, \$1.58 to \$2.35 million in total economic activity, \$0.37 to \$0.51 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.886	\$ 0.385	8.0
	Hogs, Pigs, and Other	\$ 1.580	\$ 0.369	7.6
	Poultry and Eggs	\$ 2.351	\$ 0.513	10.8
	Dairy	\$ 2.049	\$ 0.474	11.6

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	278,850	278,850	278,850	249,150	251,250	244,650	241,200	248,250	228,450	223,050	263,025
	Hog and Pig AUs	3,405	2,265	2,445	3,450	960	1,080	1,185	1,125	1,005	1,200	1,275
	Broiler AUs	132,061	122,785	124,437	93,764	57,281	57,081	56,757	58,222	58,657	59,498	59,537
	Turkey AUs	2,754	2,693	2,805	2,855	4,931	4,133	4,338	4,240	4,138	4,158	4,846
	Egg Layer AUs	3,879	3,430	3,408	3,428	4,085	5,207	4,215	5,321	6,073	6,412	7,030
	Dairy AUs	37,800	35,000	29,400	26,600	25,200	22,400	21,000	19,600	18,200	16,800	16,800
	Total Animal Units	458,749	445,023	441,345	379,247	343,708	334,551	328,696	336,759	316,524	311,118	352,513
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 189,780	\$ 170,208	\$ 171,121	\$ 225,510	\$ 262,296	\$ 254,357	\$ 346,724	\$ 348,718	\$ 222,237	\$ 237,500	\$ 226,414
	Hogs and Pigs (\$1,000)	\$ 1,817	\$ 975	\$ 1,426	\$ 2,770	\$ 862	\$ 1,015	\$ 1,239	\$ 915	\$ 772	\$ 943	\$ 741
	Broilers (\$1,000)	\$ 105,772	\$ 91,258	\$ 95,368	\$ 83,494	\$ 57,076	\$ 69,546	\$ 72,959	\$ 63,650	\$ 56,593	\$ 66,454	\$ 81,369
	Turkeys (\$1,000)	\$ 4,310	\$ 4,085	\$ 5,512	\$ 4,334	\$ 4,660	\$ 3,378	\$ 2,235	\$ 3,931	\$ 4,445	\$ 3,010	\$ 3,235
	Eggs (\$1,000)	\$ 47,694	\$ 38,009	\$ 46,210	\$ 55,356	\$ 58,699	\$ 62,904	\$ 72,790	\$ 89,081	\$ 53,193	\$ 53,041	\$ 63,196
	Milk (\$1,000)	\$ 66,033	\$ 38,482	\$ 42,300	\$ 50,808	\$ 43,512	\$ 45,114	\$ 53,448	\$ 35,720	\$ 28,223	\$ 29,920	\$ 26,144
	Other	\$ 110,761	\$ 113,872	\$ 117,047	\$ 120,112	\$ 123,238	\$ 125,416	\$ 127,530	\$ 129,685	\$ 131,800	\$ 133,974	\$ 136,090
	Sheep and Lambs (\$1,000)	\$ 158	\$ 173	\$ 251	\$ 220	\$ 249	\$ 308	\$ 304	\$ 339	\$ 335	\$ 391	\$ 389
	Aquaculture (\$1,000)	\$ 110,603	\$ 113,700	\$ 116,796	\$ 119,893	\$ 122,989	\$ 125,108	\$ 127,227	\$ 129,345	\$ 131,464	\$ 133,583	\$ 135,702
Total (\$1,000)	\$ 526,167	\$ 456,889	\$ 478,984	\$ 542,384	\$ 550,343	\$ 561,730	\$ 676,925	\$ 671,700	\$ 497,263	\$ 524,842	\$ 537,189	

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	12,715	11,775	11,218	11,593	
	Cattle feedlots (112112)	12	-	28	1	
	Dairy cattle and milk production (11212)	143	282	111	93	
	Hog and pig farming (1122)	237	232	202	190	
	Poultry and egg production (1123)	815	808	717	653	
	Sheep and goat farming (1124)	256	627	607	797	
	Animal aquaculture and other animal production (1125,1129)	3,334	4,699	4,116	3,940	
Value of Sales (\$1,000)	Cattle and Calves	170,569	223,922	249,963	256,959	
	Hogs and Pigs	withheld	1,235	-	withheld	
	Poultry and Eggs	417,755	575,989	574,239	648,163	
	Milk*			42,628	32,776	
	Aquaculture	41,285	109,138	122,989	133,583	
	Other (calculated)	37,717	31,030	-	40,546	
	Total	667,326	941,314	989,819	1,112,027	
Input Purchases	Livestock and poultry purchased	(Farms)	6,664	5,909	6,651	7,242
		\$1,000	89,122	120,621	134,875	169,839
	Breeding livestock purchased	(Farms)	4,440	3,899	4,314	4,850
		\$1,000	13,593	27,852	42,909	57,577
	Other livestock and poultry purchased	(Farms)	3,140	2,804	3,282	3,595
		\$1,000	75,529	92,769	91,965	112,261
Feed purchased	(Farms)	17,496	16,578	18,356	18,669	
	\$1,000	260,900	369,975	452,403	270,870	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 426,926	\$ 87,169	1,816	\$ 21,095
	Hogs, Pigs, and Other	\$ 216,235	\$ 50,546	1,036	\$ 12,232
	Poultry and Eggs	\$ 347,522	\$ 75,836	1,593	\$ 18,352
	Dairy	\$ 53,572	\$ 12,400	305	\$ 3,001
	Total	\$ 1,044,254	\$ 225,951	4,749	\$ 54,680
Change from 2008 to 2018	Cattle and Calves	\$ (721)	\$ (147)	(3)	\$ (36)
	Hogs, Pigs, and Other	\$ 3,627	\$ 848	17	\$ 205
	Poultry and Eggs	\$ (95,815)	\$ (20,909)	(439)	\$ (5,060)
	Dairy	\$ (108,128)	\$ (25,028)	(615)	\$ (6,057)
	Total	\$ (201,038)	\$ (45,237)	(1,040)	\$ (10,947)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.886	\$ 0.385	8.0	
	Hogs, Pigs, and Other	\$ 1.580	\$ 0.369	7.6	
	Poultry and Eggs	\$ 2.351	\$ 0.513	10.8	
	Dairy	\$ 2.049	\$ 0.474	11.6	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.0%	
	Total			24.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: MAINE

Maine Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Maine's animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Maine. The success of Maine animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Maine during 2018 animal agriculture contributed:

- \$604.3 million in economic output
- 4,409 jobs
- \$135.7 million in earnings
- \$36.2 million in income taxes paid at local, state, and federal levels
- \$33.9 million in the form of property taxes

Maine's animal agriculture consumed almost 72.4 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (39.8 thousand tons)
- Turkeys (12.3 thousand tons)
- Dairy Cows (11.2 thousand tons)

This report examines animal agriculture in Maine over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Maine, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a minor contributor to the economic well-being of the people of Maine and beyond.

Maine Economic Impact of Animal Agriculture

Animal agriculture is a small and shrinking part of Maine's economy. In 2018, Maine's animal agriculture contributed the following to the economy:

- About \$604.3 million in economic output
- \$135.7 million in household earnings
- 4,409 jobs
- \$36.2 million in income taxes

During the last decade Maine's animal agriculture has:

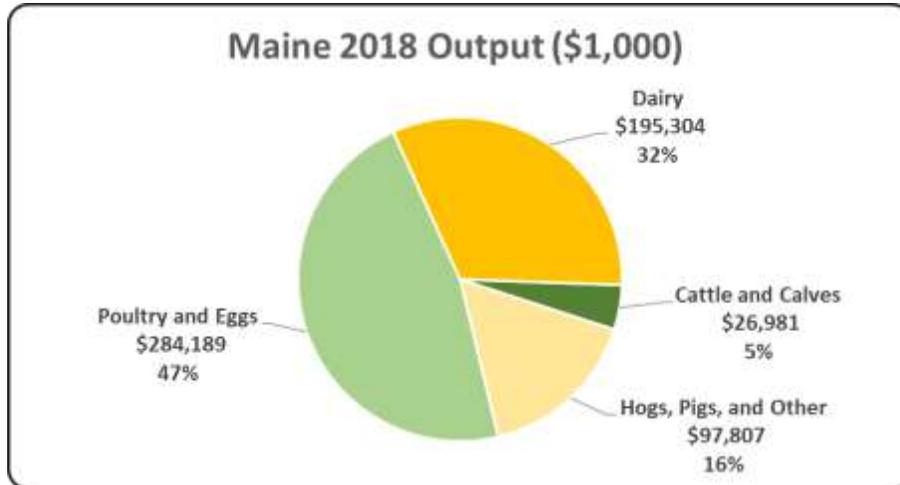
- Decreased economic output by \$230.7 million
- Reduced household earnings by \$51.0 million
- Shrunk by 1,595 jobs
- Paid \$13.6 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 604,281	\$ (230,712)	-27.63%
Earnings (\$1,000)	\$ 135,750	\$ (51,018)	-27.32%
Employment (Jobs)	4,409	(1,595)	-26.56%
Income Taxes Paid (\$1,000)	\$ 36,211	\$ (13,609)	-27.32%
Property Taxes Paid in 2017 (\$1,000)	\$ 33,875		

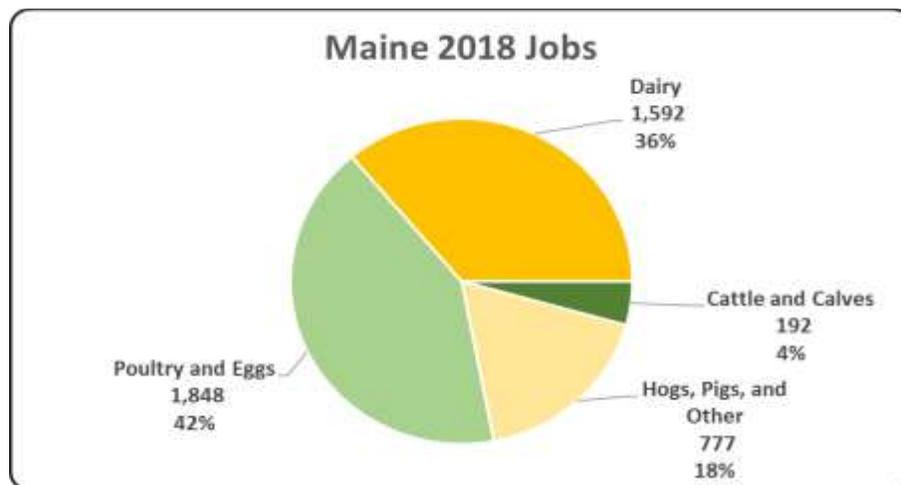
Maine Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Maine economy. Animal agriculture’s impact on Maine total economic output is about \$604.3 million.



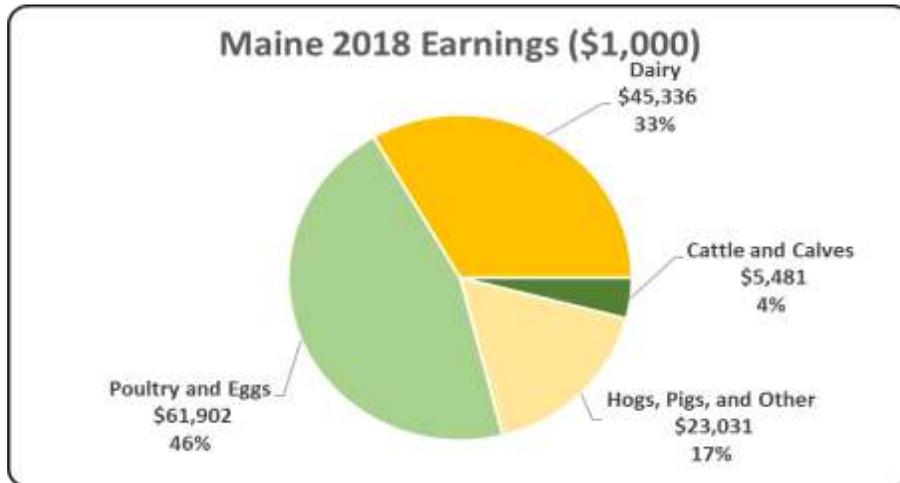
Maine Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Maine in terms of animal agriculture jobs. As shown, animal agriculture contributes 4,409 jobs within and outside of animal agriculture.



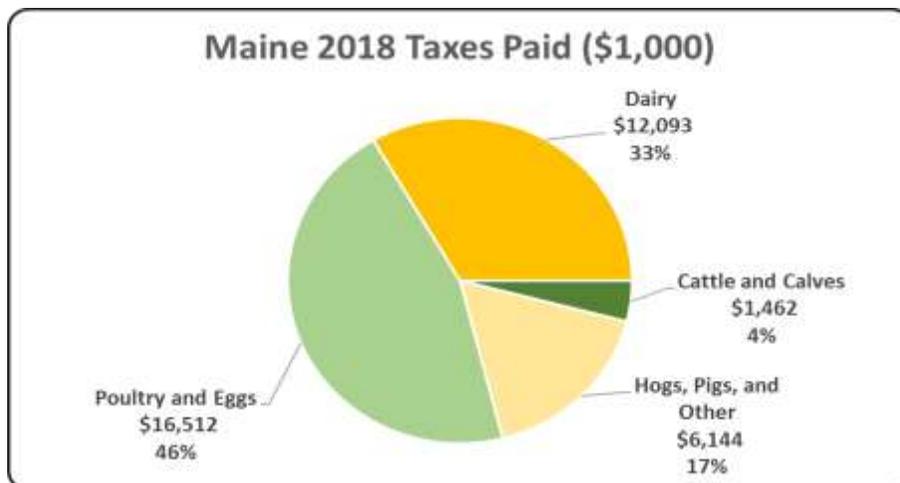
Maine Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Maine economy in terms of earnings. Maine’s animal agriculture contributed about \$135.7 million to household earnings in 2018.



Maine Taxes Paid by Animal Agriculture

Maine’s animal agriculture is also a small source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$36.2 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$33.9 million in property taxes paid by all of Maine agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



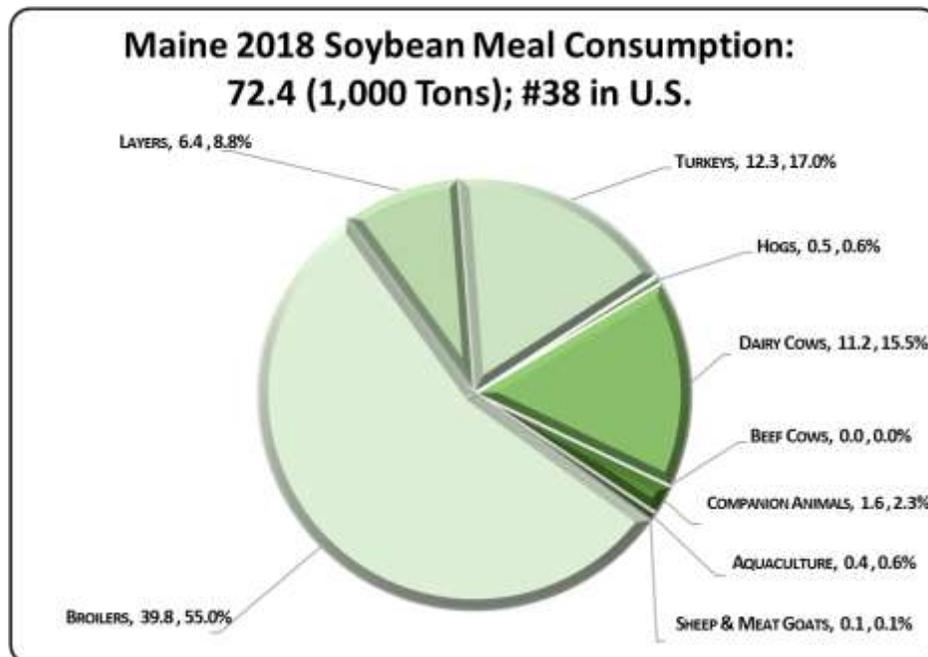
Maine Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Maine's animal agriculture consumed almost 72.4 thousand tons of soybean meal in 2018, placing the state as #38 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Maine consumed 200 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (39.8 thousand tons)
2. Turkeys (12.3 thousand tons)
3. Dairy Cows (11.2 thousand tons)

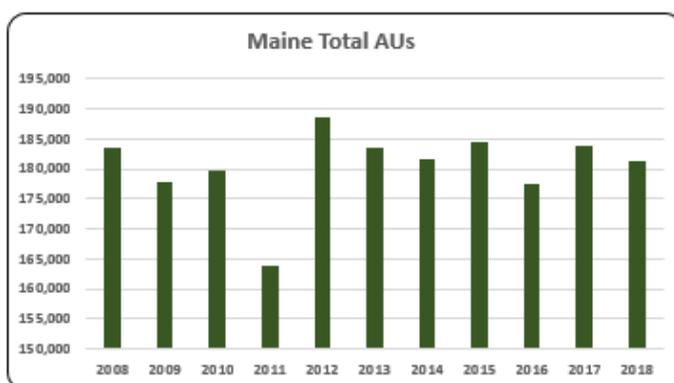
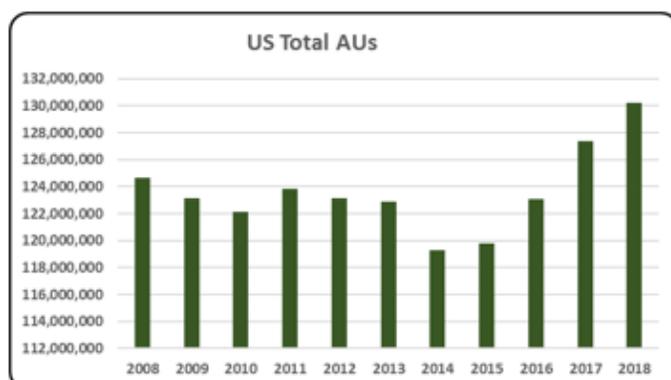


Maine Animal Unit (AU) Trends

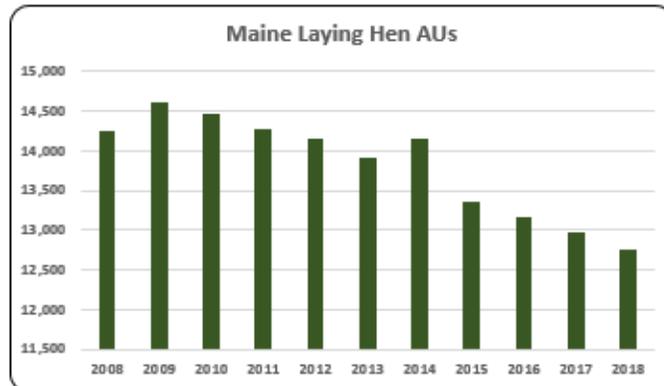
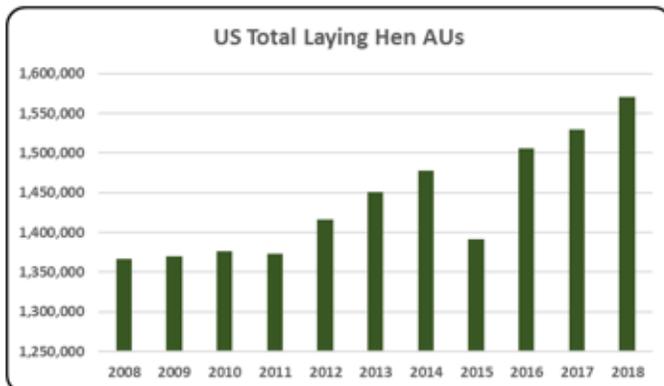
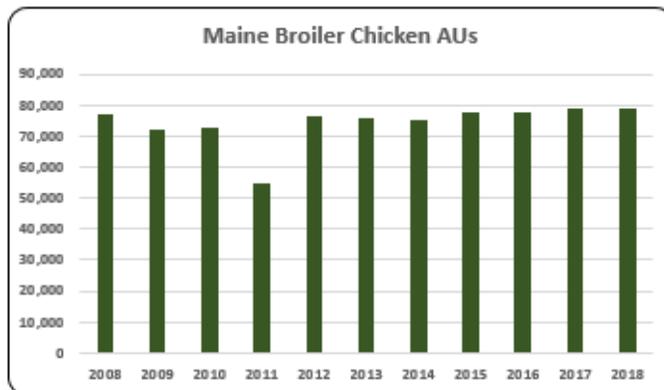
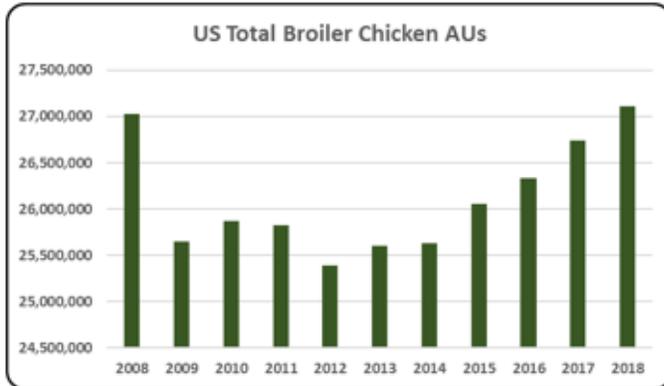
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Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

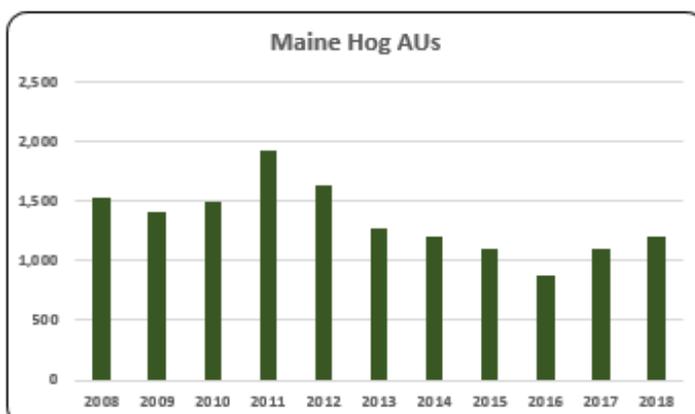
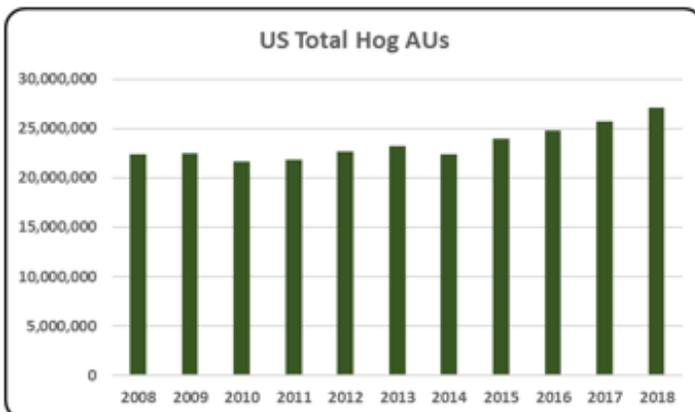
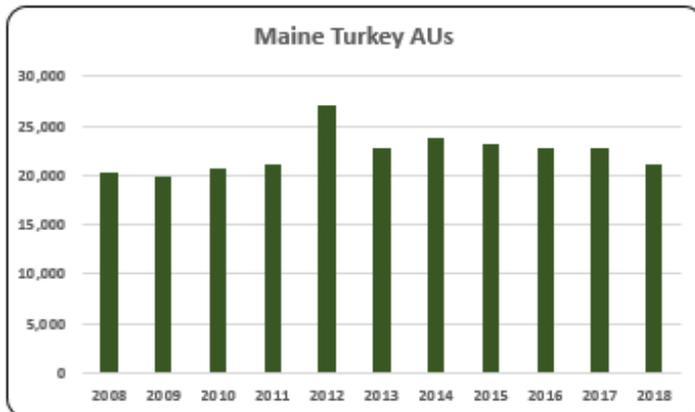
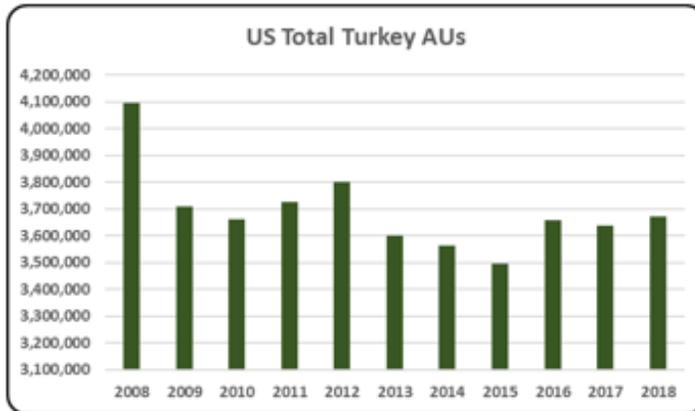
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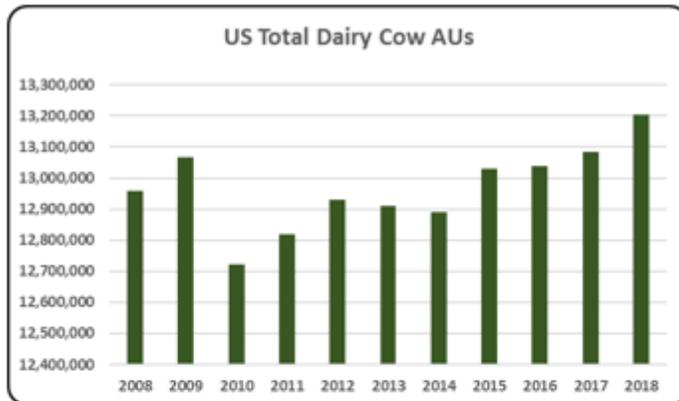
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 181,208 total AUs in Maine in 2018. From 2008 to 2018 AU numbers fluctuated between 162,000 and 187,000, and represented 0.14% of all AUs in the country in 2018.



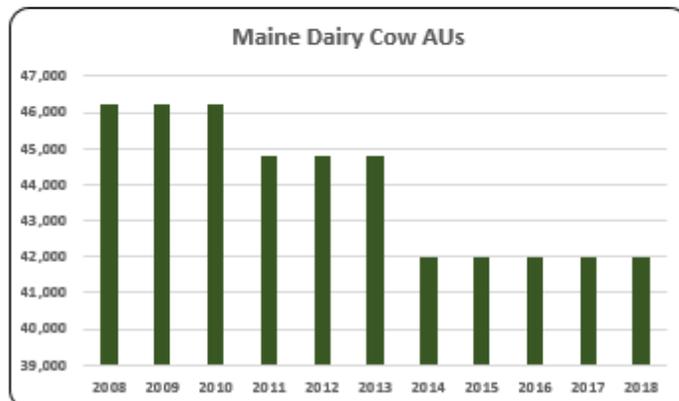
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 43.6% (79,067) of all AUs in Maine were broiler AUs in 2018. This is the largest animal sector in the state in terms of animal units.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- The average number of layer AUs in Maine during 2008-2018 was 13,819 layer AUs. Laying Hen numbers have remained below 15,000 over the past decade.



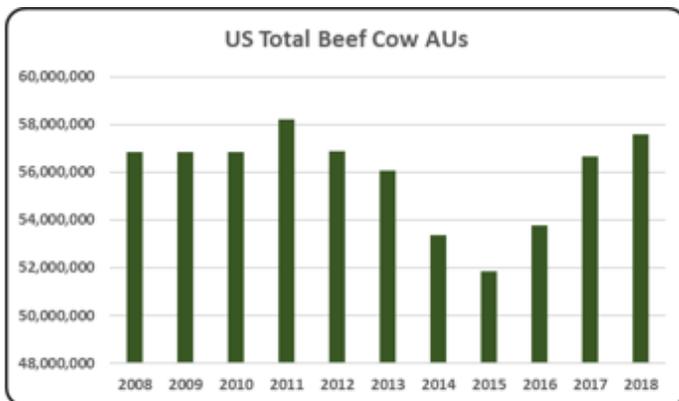
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey production in Maine has remained steady over the past decade. 2018 turkey AUs were 21,156.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Maine’s hog sector represents 0.7% (1,200 AUs) of all AUs in the state. Hog AUs have declined 21.6% since 2008.



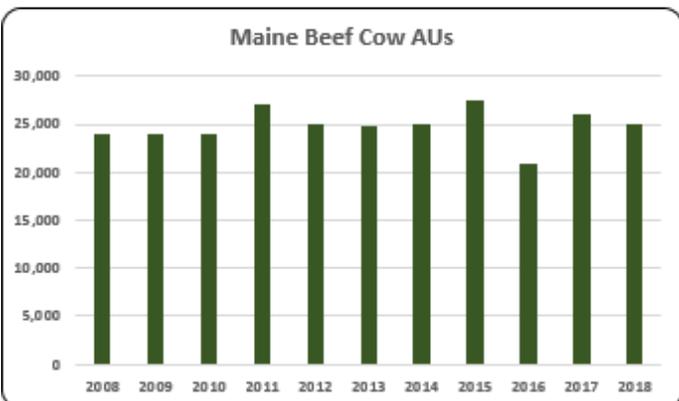
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Maine had 42,000 dairy cow AUs in 2018, this is a 9.1% drop from 2008. This is also 23.2% of all AUs in the state.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Beef cow AUs for Maine in 2008 were 23,970 AUs. Since then beef cow numbers have slowly increased until 2016 when they dropped to 20,940 AUs. However, 2018 beef cow AUs increased from the 2016 low to 25,035.

Maine Additional Information and Methodology

Animal agriculture is a small part of Maine’s current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Maine, of interest is the degree to which the industry impacts the Maine economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Maine animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years’ past. Also presented are estimates of the change in how animal agriculture has impacted Maine’s economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the “Animal Unit Trends” seeks to quantify production changes in animal agriculture in Maine which have occurred. As shown in this state report, Maine has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

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Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Maine Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Maine’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Maine, \$1.54 to \$1.87 million in total economic activity, \$0.31 to \$0.41 in household wages and 11 to 14 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.541	\$ 0.313	10.9
	Hogs, Pigs, and Other	\$ 1.545	\$ 0.364	12.3
	Poultry and Eggs	\$ 1.872	\$ 0.408	12.2
	Dairy	\$ 1.746	\$ 0.405	14.2

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	23,970	23,970	23,970	27,060	24,990	24,885	25,110	27,525	20,940	25,965	25,035
	Hog and Pig AUs	1,530	1,410	1,500	1,920	1,635	1,275	1,200	1,110	885	1,110	1,200
	Broiler AUs	77,178	71,758	72,723	54,797	76,071	75,805	75,375	77,321	77,899	79,015	79,067
	Turkey AUs	20,330	19,874	20,706	21,075	27,065	22,685	23,809	23,273	22,713	22,822	21,156
	Egg Layer AUs	14,246	14,608	14,456	14,264	14,147	13,915	14,140	13,355	13,165	12,961	12,750
	Dairy AUs	46,200	46,200	46,200	44,800	44,800	44,800	42,000	42,000	42,000	42,000	42,000
	Total Animal Units	183,455	177,820	179,555	163,917	188,709	183,365	181,634	184,584	177,601	183,872	181,208
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 14,939	\$ 10,910	\$ 12,096	\$ 15,121	\$ 21,564	\$ 19,579	\$ 26,778	\$ 24,806	\$ 19,760	\$ 18,653	\$ 17,511
	Hogs and Pigs (\$1,000)	\$ 995	\$ 860	\$ 1,206	\$ 2,140	\$ 1,933	\$ 1,514	\$ 1,490	\$ 1,139	\$ 819	\$ 1,073	\$ 1,028
	Broilers (\$1,000)	\$ 61,815	\$ 53,333	\$ 55,734	\$ 48,795	\$ 75,798	\$ 92,359	\$ 96,891	\$ 84,529	\$ 75,157	\$ 88,253	\$ 82,955
	Turkeys (\$1,000)	\$ 38,592	\$ 36,575	\$ 40,683	\$ 31,989	\$ 34,396	\$ 24,932	\$ 16,494	\$ 21,575	\$ 24,398	\$ 16,519	\$ 14,123
	Eggs (\$1,000)	\$ 104,433	\$ 63,226	\$ 57,690	\$ 64,544	\$ 69,041	\$ 72,208	\$ 39,779	\$ 66,314	\$ 26,078	\$ 35,261	\$ 54,716
	Milk (\$1,000)	\$ 124,821	\$ 88,208	\$ 109,182	\$ 134,550	\$ 125,052	\$ 135,138	\$ 160,532	\$ 119,988	\$ 117,180	\$ 124,740	\$ 111,858
	Other	\$ 47,053	\$ 54,152	\$ 61,350	\$ 68,376	\$ 75,498	\$ 73,382	\$ 71,168	\$ 69,017	\$ 66,803	\$ 64,471	\$ 62,261
	Sheep and Lambs (\$1,000)	\$ 247	\$ 270	\$ 393	\$ 344	\$ 391	\$ 483	\$ 476	\$ 532	\$ 526	\$ 401	\$ 399
	Aquaculture (\$1,000)	\$ 46,806	\$ 53,881	\$ 60,956	\$ 68,032	\$ 75,107	\$ 72,900	\$ 70,692	\$ 68,485	\$ 66,277	\$ 64,070	\$ 61,863
	Total (\$1,000)	\$ 392,648	\$ 307,263	\$ 337,941	\$ 365,516	\$ 403,282	\$ 419,112	\$ 413,132	\$ 387,368	\$ 330,196	\$ 348,970	\$ 344,452

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	573	765	950	795	
	Cattle feedlots (112112)	122	119	14	3	
	Dairy cattle and milk production (11212)	406	396	308	286	
	Hog and pig farming (1122)	62	97	160	141	
	Poultry and egg production (1123)	215	323	209	177	
	Sheep and goat farming (1124)	189	364	326	445	
	Animal aquaculture and other animal production (1125,1129)	1,316	1,147	1,291	1,190	
Value of Sales (\$1,000)	Cattle and Calves	15,994	15,660	31,076	26,423	
	Hogs and Pigs	n/a	813	1,726	1,892	
	Poultry and Eggs	78,848	75,831	38,938	16,683	
	Milk*			126,632	134,560	
	Aquaculture	31,944	26,300	75,107	64,070	
	Other (calculated)	26,917	45,621	8,572	14,495	
	Total	153,703	164,225	282,051	258,123	
Input Purchases	Livestock and poultry purchased	(Farms)	1,845	1,741	2,456	2,035
		\$1,000	16,895	13,601	26,557	14,659
	Breeding livestock purchased	(Farms)	1,007	721	946	725
		\$1,000	5,319	4,596	3,163	3,002
	Other livestock and poultry purchased	(Farms)	1,112	1,291	1,975	1,667
		\$1,000	11,576	9,005	23,394	11,657
Feed purchased	(Farms)	3,567	3,640	4,659	3,964	
	\$1,000	73,459	103,475	104,563	77,257	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 26,981	\$ 5,481	192	\$ 1,462
	Hogs, Pigs, and Other	\$ 97,807	\$ 23,031	777	\$ 6,144
	Poultry and Eggs	\$ 284,189	\$ 61,902	1,848	\$ 16,512
	Dairy	\$ 195,304	\$ 45,336	1,592	\$ 12,093
	Total	\$ 604,281	\$ 135,750	4,409	\$ 36,211
Change from 2008 to 2018	Cattle and Calves	\$ (527)	\$ (107)	(4)	\$ (29)
	Hogs, Pigs, and Other	\$ 9,070	\$ 2,136	72	\$ 570
	Poultry and Eggs	\$ (174,114)	\$ (37,925)	(1,132)	\$ (10,117)
	Dairy	\$ (65,142)	\$ (15,121)	(531)	\$ (4,034)
	Total	\$ (230,712)	\$ (51,018)	(1,595)	\$ (13,609)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.541	\$ 0.313	10.9	
	Hogs, Pigs, and Other	\$ 1.545	\$ 0.364	12.3	
	Poultry and Eggs	\$ 1.872	\$ 0.408	12.2	
	Dairy	\$ 1.746	\$ 0.405	14.2	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				6.5%
	Total				26.7%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: MARYLAND

Maryland Executive Summary

The use of soybean meal as a key feed ingredient is a modest part of Maryland animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Maryland. The success of Maryland animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Maryland during 2018 animal agriculture contributed:

- \$2.4 billion in economic output
- 13,082 jobs
- \$490.3 million in earnings
- \$118.0 million in income taxes paid at local, state, and federal levels
- \$54.4 million in the form of property taxes

Maryland's animal agriculture consumed almost 548.1 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (488.4 thousand tons)
- Egg-Laying Hens (25.7 thousand tons)
- Dairy Cows (18.1 thousand tons)

This report examines animal agriculture in Maryland over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Maryland, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a minor contributor to the economic well-being of the people of Maryland and beyond.

Maryland Economic Impact of Animal Agriculture

Animal agriculture is an important but shrinking part of Maryland's economy. In 2018, Maryland's animal agriculture contributed the following to the economy:

- About \$2.4 billion in economic output
- \$490.3 million in household earnings
- 13,082 jobs
- \$118.0 million in income taxes

During the last decade Maryland's animal agriculture has:

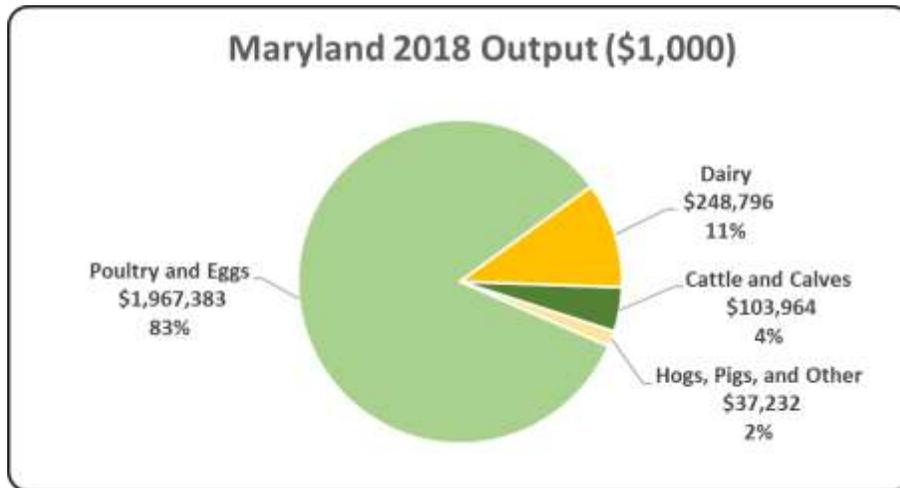
- Decreased in economic output by \$8.8 million
- Reduced household earnings by \$3.1 million
- Shrunk by 199 jobs
- Paid \$738,000 less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,357,375	\$ (8,787)	-0.37%
Earnings (\$1,000)	\$ 490,261	\$ (3,065)	-0.62%
Employment (Jobs)	13,082	(199)	-1.50%
Income Taxes Paid (\$1,000)	\$ 118,030	\$ (738)	-0.62%
Property Taxes Paid in 2017 (\$1,000)	\$ 54,431		

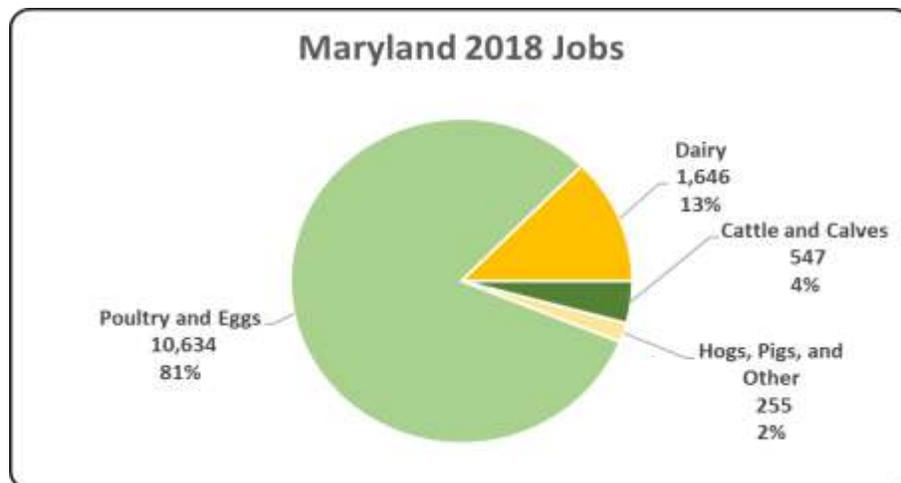
Maryland Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Maryland economy. Animal agriculture’s impact on Maryland total economic output is about \$2.4 billion.



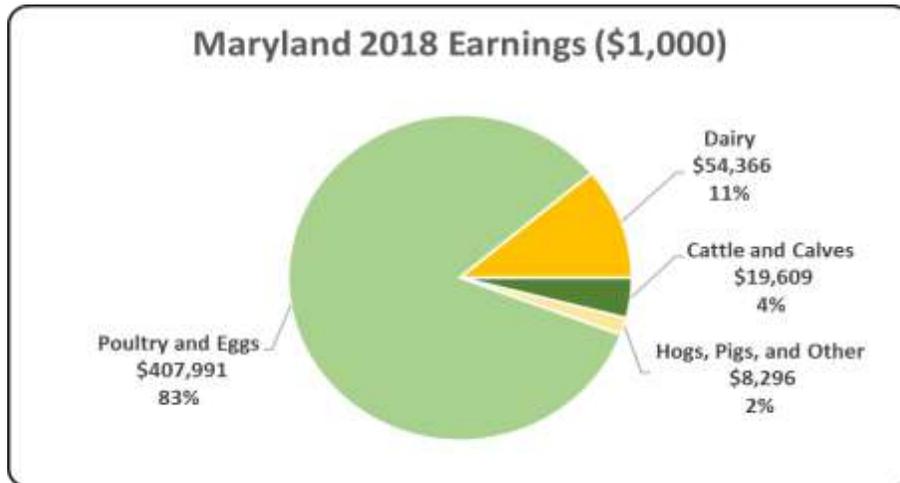
Maryland Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Maryland in terms of animal agriculture jobs. As shown, animal agriculture contributes 13,082 jobs within and outside of animal agriculture.



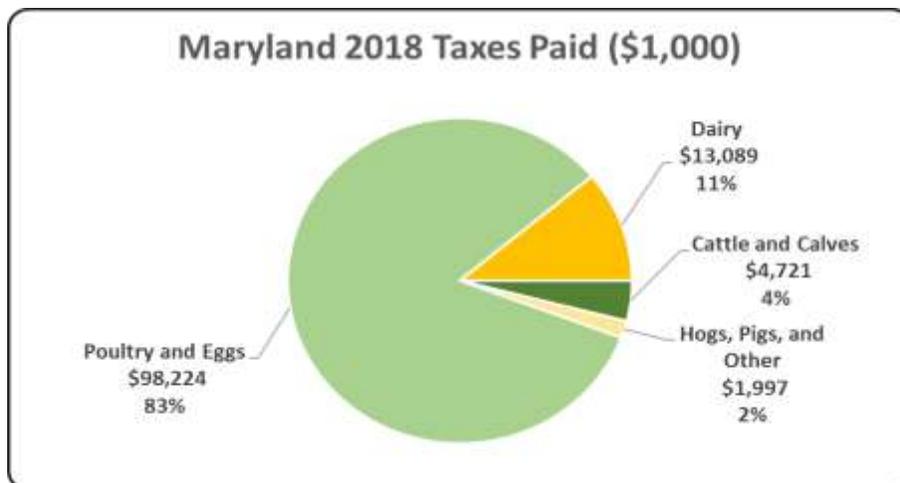
Maryland Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Maryland economy in terms of earnings. Maryland’s animal agriculture contributed about \$490.3 million to household earnings in 2018.



Maryland Taxes Paid by Animal Agriculture

Maryland’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$118.0 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$54.4 million in property taxes paid by all of Maryland agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



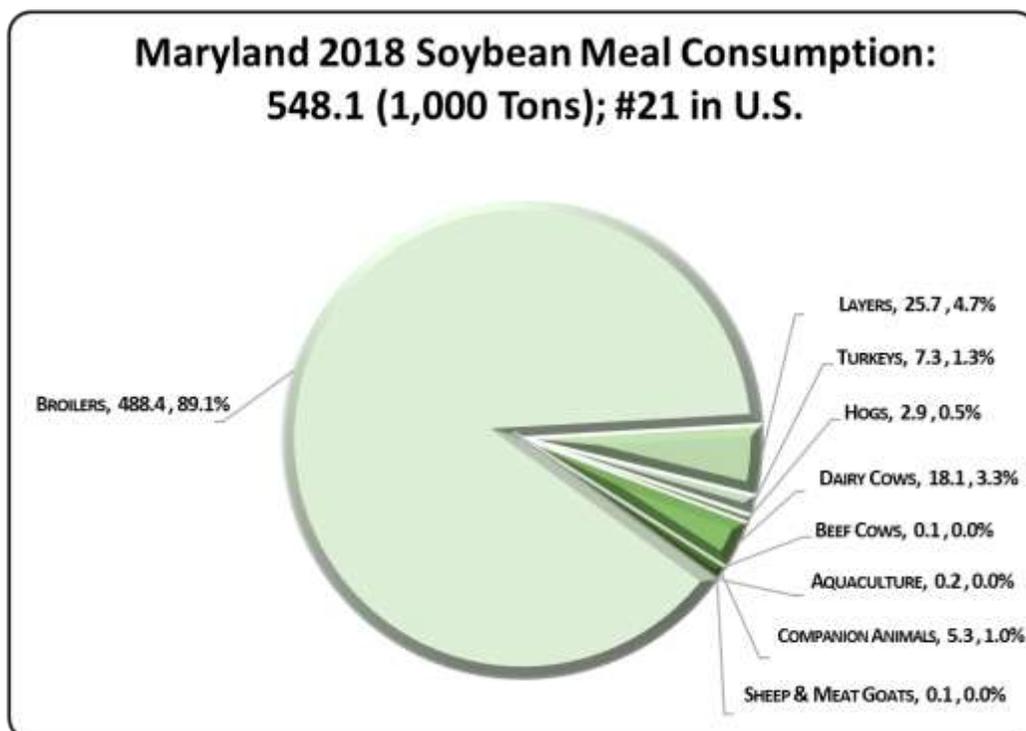
Maryland Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Maryland's animal agriculture consumed almost 548.1 thousand tons of soybean meal in 2018, placing the state as #21 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Maryland consumed 500 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (488.4 thousand tons)
2. Egg-Laying Hens (25.7 thousand tons)
3. Dairy Cows (18.1 thousand tons)

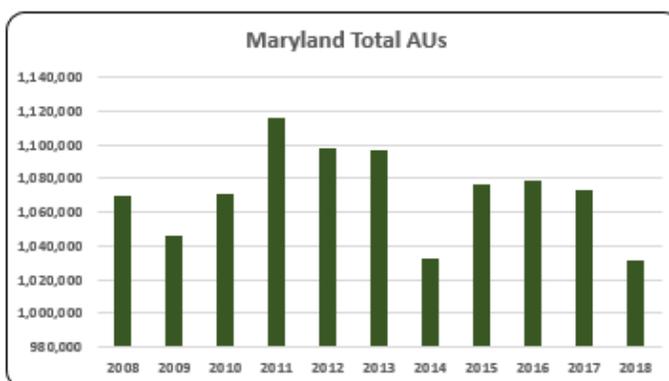
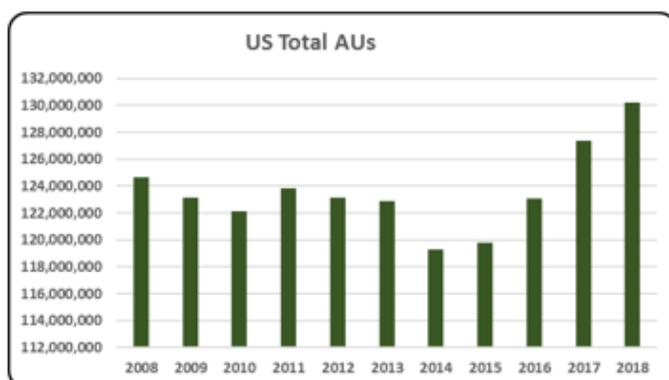


Maryland Animal Unit (AU) Trends

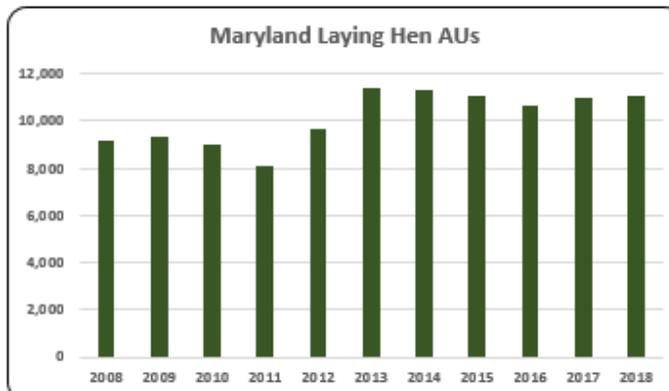
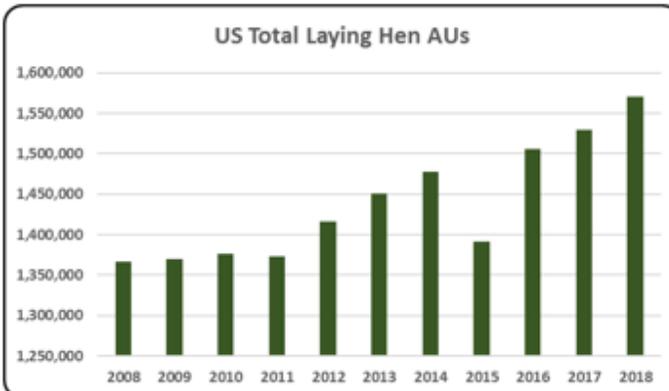
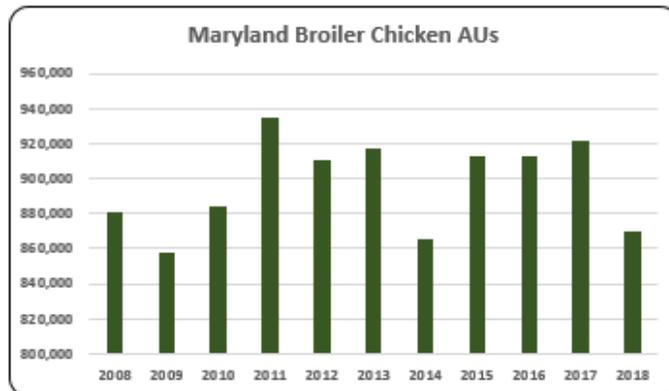
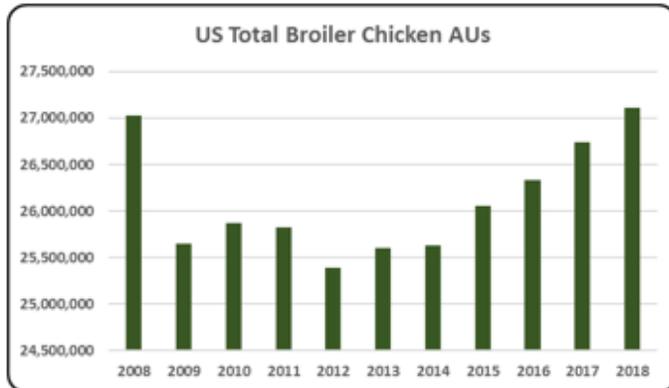
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Maryland. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Maryland and to give perspective on Maryland's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

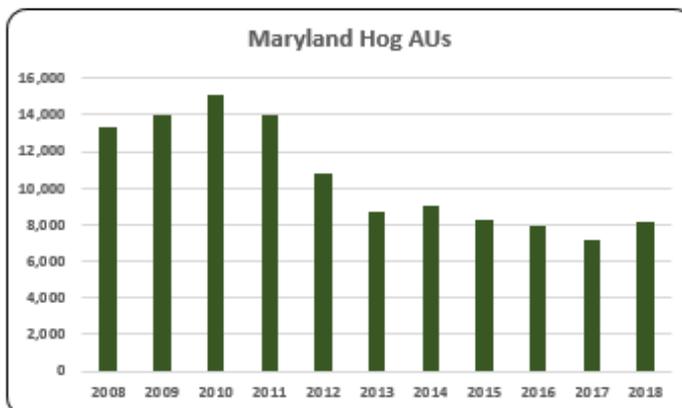
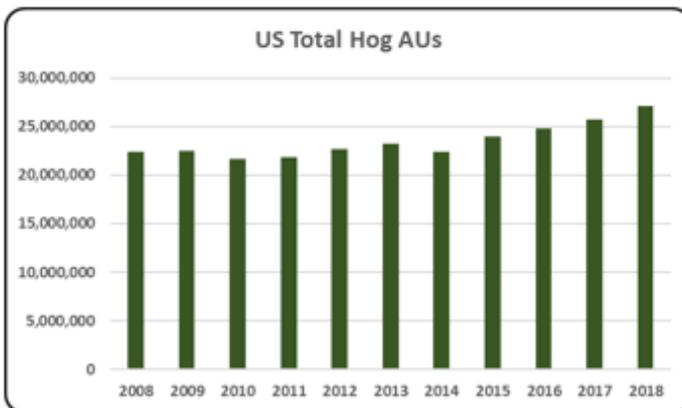
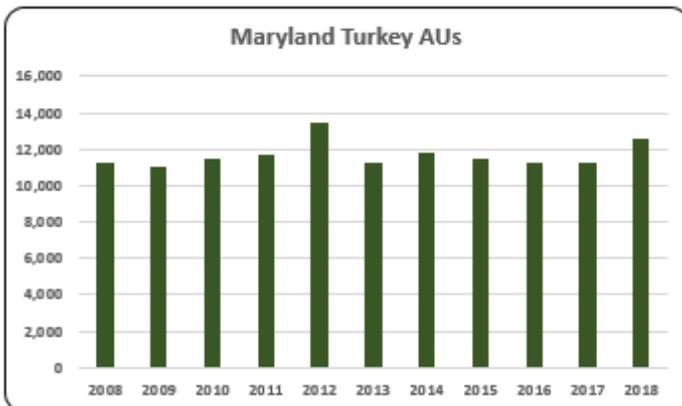
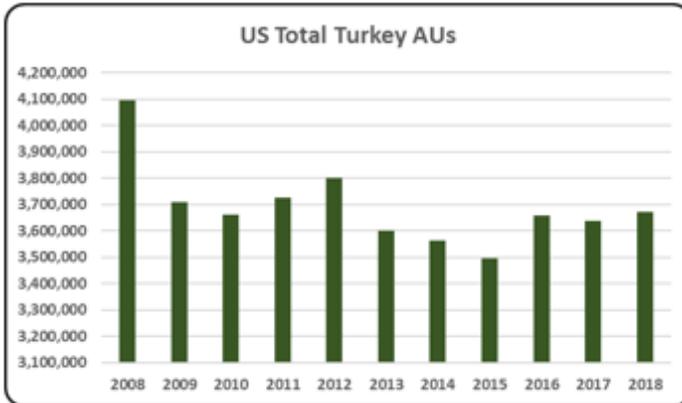
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Maryland, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (869,749 AUs), Dairy Cows (65,800 AUs), and Beef Cows (64,455 AUs). Total animal units in Maryland during 2018 were 1.0 million AUs.



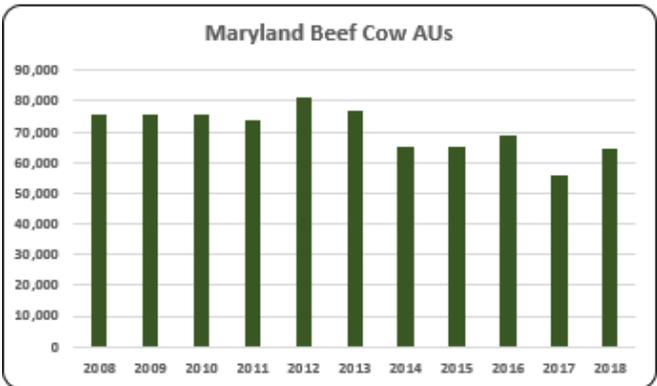
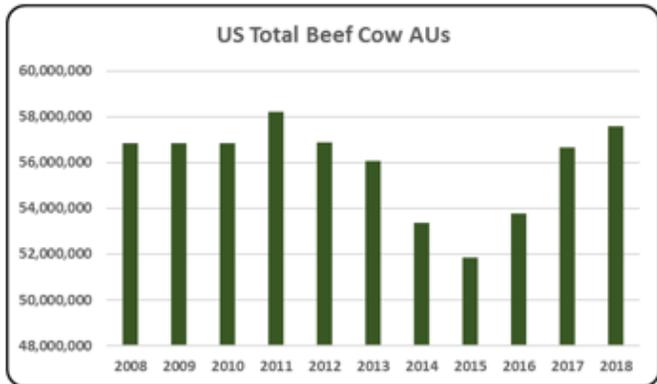
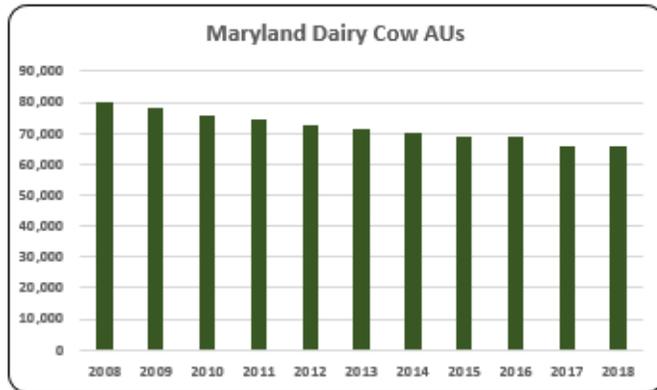
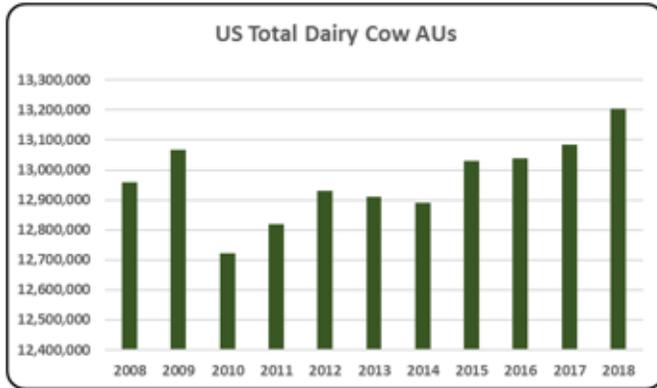
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 1.0 million AUs in Maryland in 2018. Broilers have the highest proportion of AUs with 84.3% of AUs in 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- The average number of broiler AUs in Maryland during 2008-2018 was 896,869. Total broiler AUs in 2018 were 869,749, representing 84.3% of all AUs in the state.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layers represent only 1.1% of the total AUs in Maryland. There were 11,101 layers AUs in 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey numbers in Maryland are very small with only 0.34% (12,582 AUs) of total U.S. AUs in 2018. Turkey numbers have been relatively steady during the last decade averaging about 11,696 turkey AUs.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Maryland’s hog production represents 0.8% (8,145) of all AUs in the state in 2018.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Maryland had 65,800 dairy cow AUs in 2018. The dairy sector has consistently declined throughout the decade from 79,800 AUs in 2008 to 65,800 in 2018, representing a 17.5% reduction.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- There were 64,455 beef cow AUs in Maryland in 2018 which is 6.3% of Maryland's total AUs.

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Animal agriculture is a moderate part of Maryland's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

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Maryland Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Maryland's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Maryland, \$1.43 to \$1.89 million in total economic activity, \$0.28 to \$0.39 in household wages and 8 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.459	\$ 0.275	7.7
	Hogs, Pigs, and Other	\$ 1.425	\$ 0.318	9.8
	Poultry and Eggs	\$ 1.892	\$ 0.392	10.2
	Dairy	\$ 1.660	\$ 0.363	11.0

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	75,750	75,750	75,750	73,590	81,345	76,995	65,265	65,025	68,670	55,785	64,455
	Hog and Pig AUs	13,290	14,040	15,090	14,040	10,785	8,670	9,060	8,250	7,980	7,125	8,145
	Broiler AUs	880,449	857,418	884,314	934,708	910,152	917,324	865,293	912,193	912,174	921,781	869,749
	Turkey AUs	11,280	11,027	11,489	11,693	13,418	11,246	11,803	11,538	11,260	11,314	12,582
	Egg Layer AUs	9,210	9,368	9,016	8,120	9,681	11,374	11,315	11,069	10,614	10,997	11,101
	Dairy AUs	79,800	78,400	75,600	74,200	72,800	71,400	70,000	68,600	68,600	65,800	65,800
	Total Animal Units	1,069,779	1,046,003	1,071,258	1,116,351	1,098,181	1,097,009	1,032,736	1,076,675	1,079,299	1,072,802	1,031,832
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 63,869	\$ 54,222	\$ 63,252	\$ 78,061	\$ 89,314	\$ 79,343	\$ 95,789	\$ 103,094	\$ 75,386	\$ 65,049	\$ 71,252
	Hogs and Pigs (\$1,000)	\$ 6,503	\$ 6,079	\$ 6,481	\$ 6,626	\$ 6,099	\$ 6,629	\$ 8,644	\$ 7,028	\$ 6,172	\$ 6,190	\$ 5,554
	Broilers (\$1,000)	\$ 741,704	\$ 639,206	\$ 690,899	\$ 756,799	\$ 802,400	\$ 981,883	\$ 990,344	\$ 930,740	\$ 884,969	\$ 1,001,069	\$ 970,648
	Turkeys (\$1,000)	\$ 9,536	\$ 11,466	\$ 14,213	\$ 17,749	\$ 19,084	\$ 13,833	\$ 9,152	\$ 10,696	\$ 12,096	\$ 8,190	\$ 8,399
	Eggs (\$1,000)	\$ 62,682	\$ 33,150	\$ 35,837	\$ 38,008	\$ 46,750	\$ 52,925	\$ 70,726	\$ 99,117	\$ 31,449	\$ 44,046	\$ 60,686
	Milk (\$1,000)	\$ 195,510	\$ 145,580	\$ 184,184	\$ 206,610	\$ 188,947	\$ 203,148	\$ 246,750	\$ 173,008	\$ 156,948	\$ 169,634	\$ 149,850
	Other	\$ 8,979	\$ 8,530	\$ 8,891	\$ 9,091	\$ 9,380	\$ 11,311	\$ 13,149	\$ 15,046	\$ 16,885	\$ 18,725	\$ 20,566
	Sheep and Lambs (\$1,000)	\$ 950	\$ 256	\$ 372	\$ 326	\$ 369	\$ 456	\$ 450	\$ 503	\$ 497	\$ 493	\$ 490
	Aquaculture (\$1,000)	\$ 8,029	\$ 8,274	\$ 8,520	\$ 8,765	\$ 9,011	\$ 10,855	\$ 12,699	\$ 14,544	\$ 16,388	\$ 18,232	\$ 20,076
Total (\$1,000)	\$ 1,088,783	\$ 898,233	\$ 1,003,757	\$ 1,112,944	\$ 1,161,975	\$ 1,349,072	\$ 1,434,554	\$ 1,338,730	\$ 1,183,904	\$ 1,312,903	\$ 1,286,955	

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	1,655	1,582	1,649	1,587
	Cattle feedlots (112112)	420	189	45	52
	Dairy cattle and milk production (11212)	698	565	417	369
	Hog and pig farming (1122)	94	109	76	88
	Poultry and egg production (1123)	964	1,001	922	841
	Sheep and goat farming (1124)	370	594	482	729
	Animal aquaculture and other animal production (1125,1129)	1,757	2,070	1,995	2,115
Value of Sales (\$1,000)	Cattle and Calves	50,570	58,293	69,917	75,040
	Hogs and Pigs	8,268	withheld	withheld	7,250
	Poultry and Eggs	583,343	903,531	922,999	1,180,970
	Milk*			187,497	174,468
	Aquaculture	1,459	4,023	9,011	18,232
	Other (calculated)	5,065	47,514	withheld	68,721
	Total	648,705	1,013,361	1,189,424	1,524,681
Input Purchases	Livestock and poultry purchased	(Farms) 3,300	3,087	3,184	3,438
		\$1,000 96,056	171,246	161,816	218,980
	Breeding livestock purchased	(Farms) 1,208	1,216	1,293	1,306
		\$1,000 7,486	10,151	13,058	12,284
	Other livestock and poultry purchased	(Farms) 2,376	2,236	2,296	2,634
		\$1,000 88,569	161,095	148,758	206,696
Feed purchased	(Farms) 6,740	6,474	7,133	7,416	
	\$1,000 318,290	456,411	629,143	539,094	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 103,964	\$ 19,609	547	\$ 4,721
	Hogs, Pigs, and Other	\$ 37,232	\$ 8,296	255	\$ 1,997
	Poultry and Eggs	\$ 1,967,383	\$ 407,991	10,634	\$ 98,224
	Dairy	\$ 248,796	\$ 54,366	1,646	\$ 13,089
	Total	\$ 2,357,375	\$ 490,261	13,082	\$ 118,030
Change from 2008 to 2018	Cattle and Calves	\$ (7,404)	\$ (1,397)	(39)	\$ (336)
	Hogs, Pigs, and Other	\$ 10,860	\$ 2,420	74	\$ 583
	Poultry and Eggs	\$ 126,881	\$ 26,312	686	\$ 6,335
	Dairy	\$ (139,124)	\$ (30,401)	(920)	\$ (7,319)
	Total	\$ (8,787)	\$ (3,065)	(199)	\$ (738)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.459	\$ 0.275	7.7	
	Hogs, Pigs, and Other	\$ 1.425	\$ 0.318	9.8	
	Poultry and Eggs	\$ 1.892	\$ 0.392	10.2	
	Dairy	\$ 1.660	\$ 0.363	11.0	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				3.9%
	Total				24.1%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: MASSACHUSETTS

Massachusetts Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Massachusetts animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Massachusetts. The success of Massachusetts animal agriculture in turn has a small impact on the rest of the state and regional economies. For example, in the State of Massachusetts during 2018 animal agriculture contributed:

- \$189.8 million in economic output
- 935 jobs
- \$39.6 million in earnings
- \$10.0 million in income taxes paid at local, state, and federal levels
- \$40.1 million in the form of property taxes

Massachusetts's animal agriculture consumed almost 42.6 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (20.5 thousand tons)
- Turkeys (6.0 thousand tons)
- Egg-Laying Hens (5.4 thousand tons)

This report examines animal agriculture in Massachusetts over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Massachusetts, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a minor contributor to the economic well-being of the people of Massachusetts and beyond.

Massachusetts Economic Impact of Animal Agriculture

Animal agriculture is a small part of Massachusetts's economy. In 2018, Massachusetts's animal agriculture contributed the following to the economy:

- About \$189.8 million in economic output
- \$39.6 million in household earnings
- 935 jobs
- \$10.0 million in income taxes

During the last decade, contractions in Massachusetts's animal agriculture has:

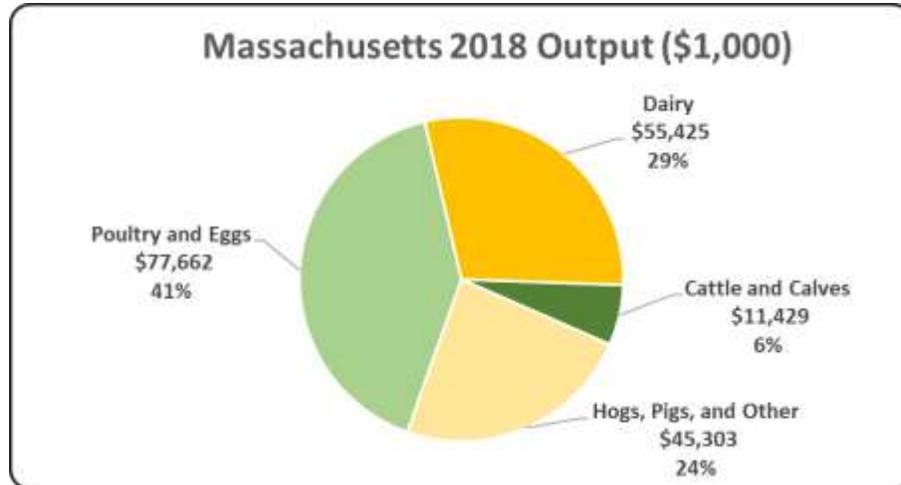
- Decreased economic output by \$16.0 million
- Reduced household earnings by \$3.5 million
- Shrunk by 43 jobs
- Paid \$900,000 less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 189,819	\$ (16,001)	-7.77%
Earnings (\$1,000)	\$ 39,624	\$ (3,474)	-8.06%
Employment (Jobs)	935	(43)	-4.41%
Income Taxes Paid (\$1,000)	\$ 10,025	\$ (879)	-8.06%
Property Taxes Paid in 2017 (\$1,000)	\$ 40,078		

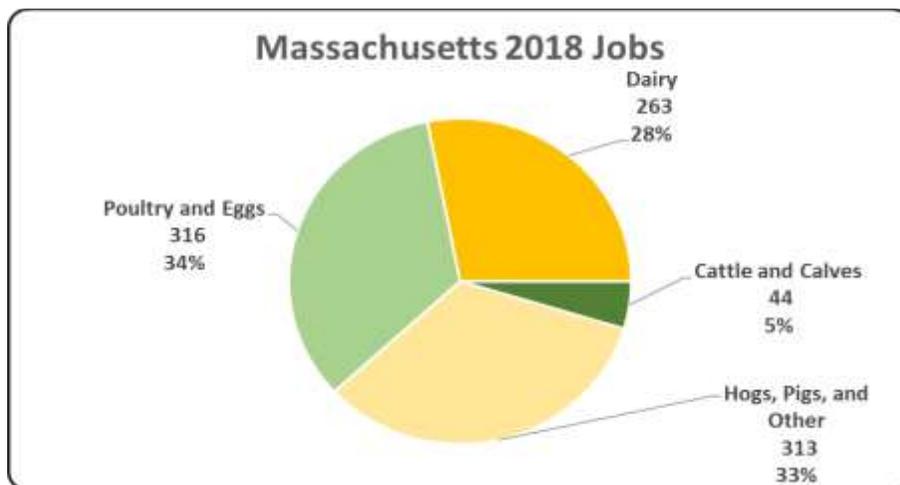
Massachusetts Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Massachusetts economy. Animal agriculture’s impact on Massachusetts total economic output is about \$189.8 million.



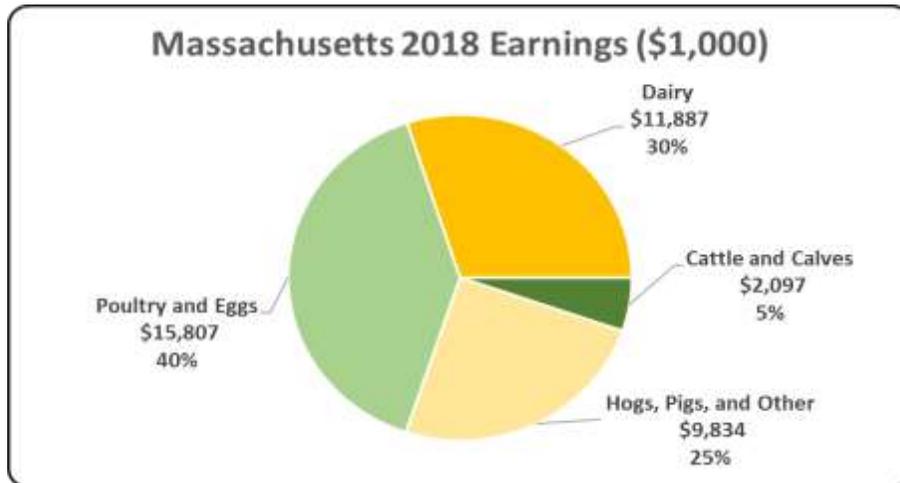
Massachusetts Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Massachusetts in terms of animal agriculture jobs. As shown, animal agriculture contributes 935 jobs within and outside of animal agriculture.



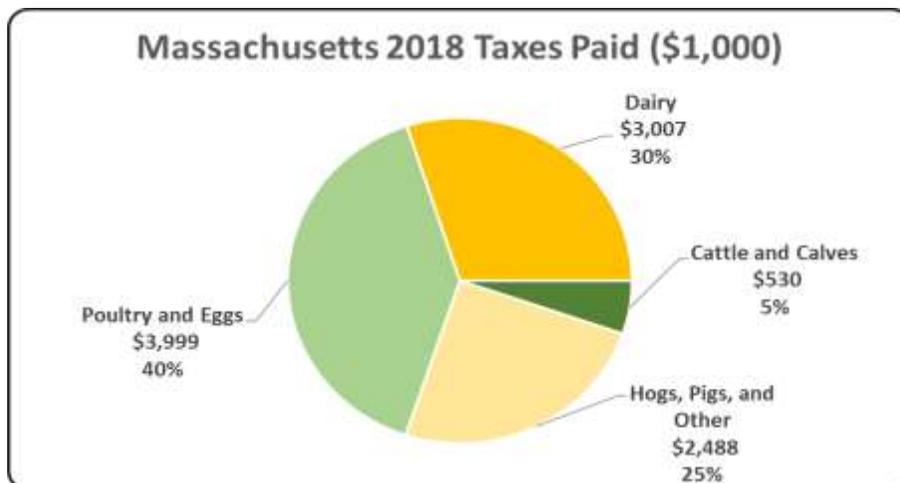
Massachusetts Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Massachusetts economy in terms of earnings. Massachusetts’s animal agriculture contributed about \$39.6 million to household earnings in 2018.



Massachusetts Taxes Paid by Animal Agriculture

Massachusetts’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$10.0 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$40.1 million in property taxes paid by all of Massachusetts agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



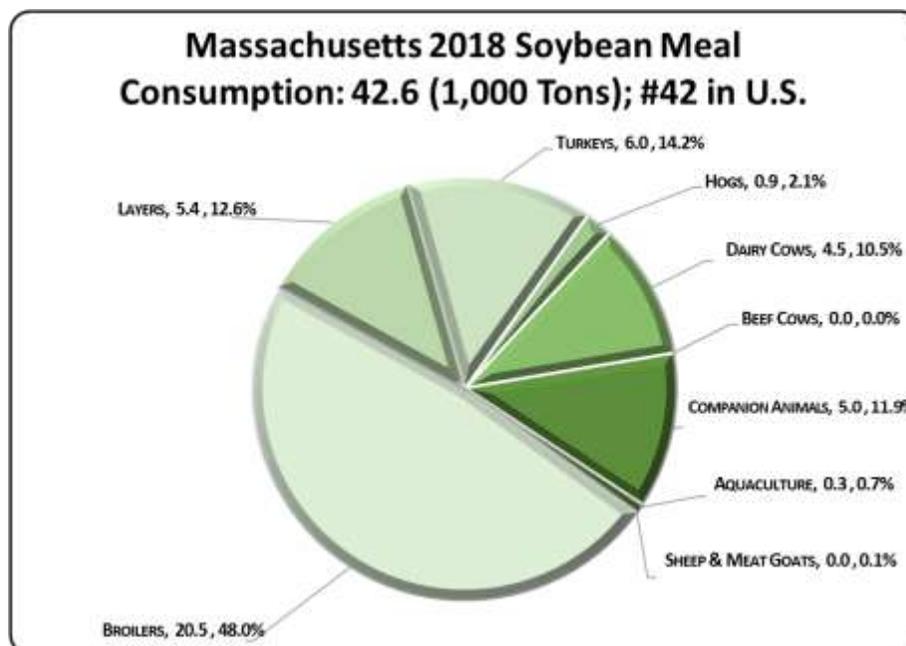
Massachusetts Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Massachusetts's animal agriculture consumed almost 42.6 thousand tons of soybean meal in 2018, placing the state as #42 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Massachusetts consumed 143 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (20.5 thousand tons)
2. Turkeys (6.0 thousand tons)
3. Egg-Laying Hens (5.4 thousand tons)

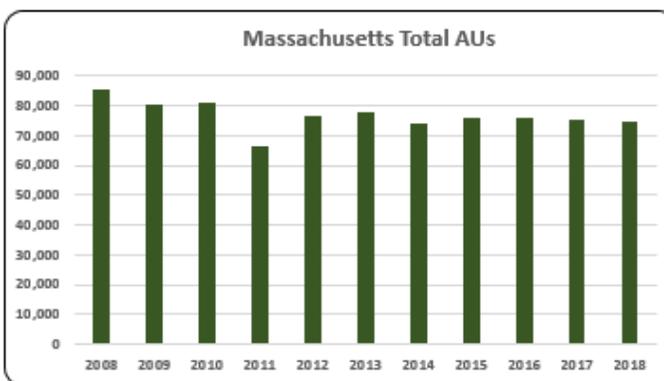
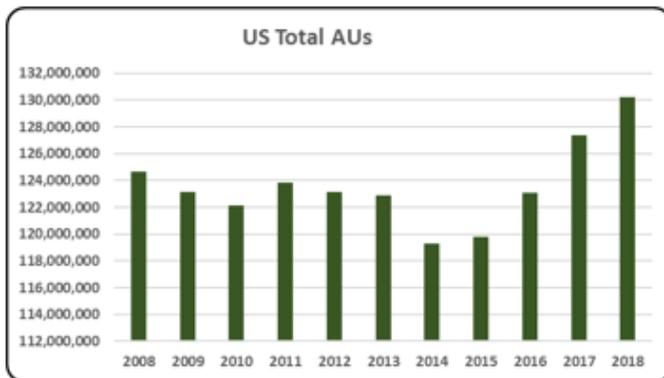


Massachusetts Animal Unit (AU) Trends

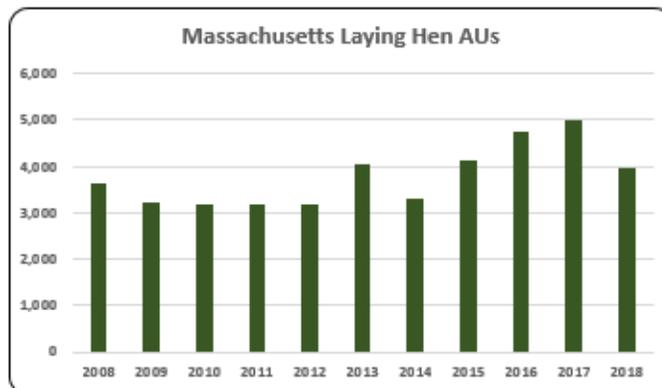
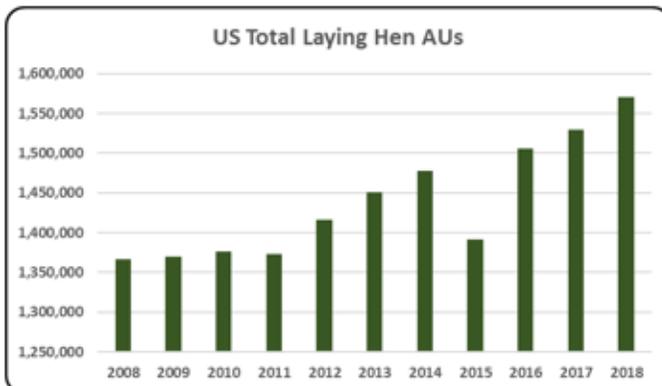
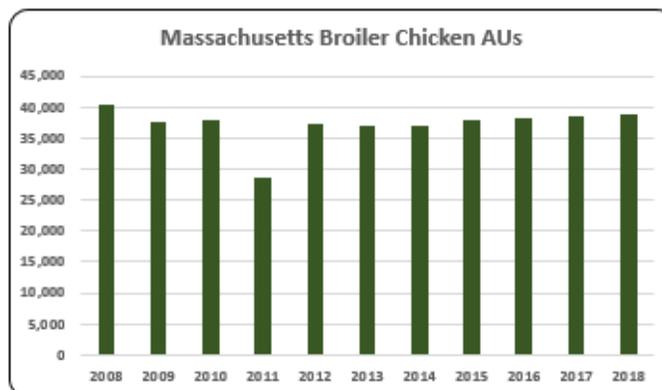
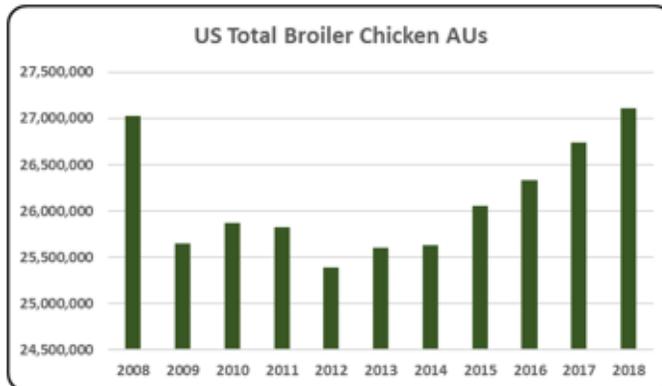
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Massachusetts. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Massachusetts and to give perspective on Massachusetts’s contribution to the nation’s animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

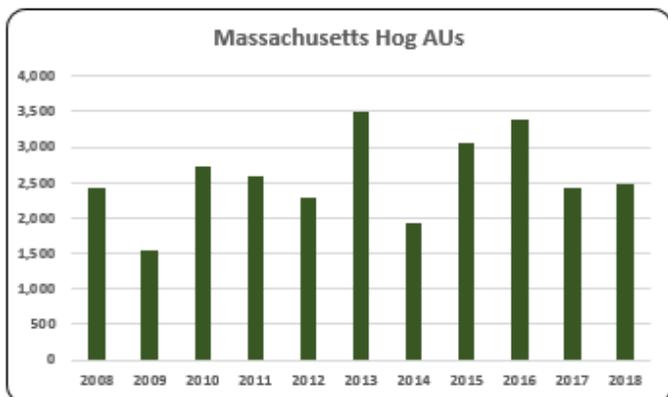
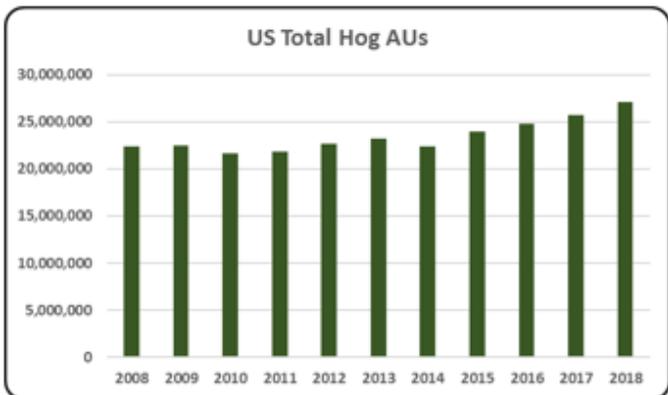
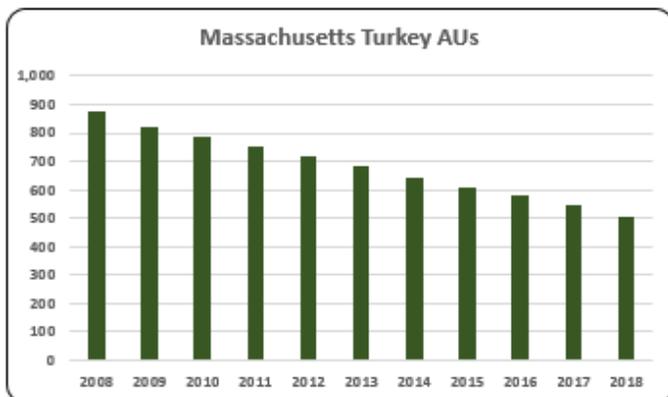
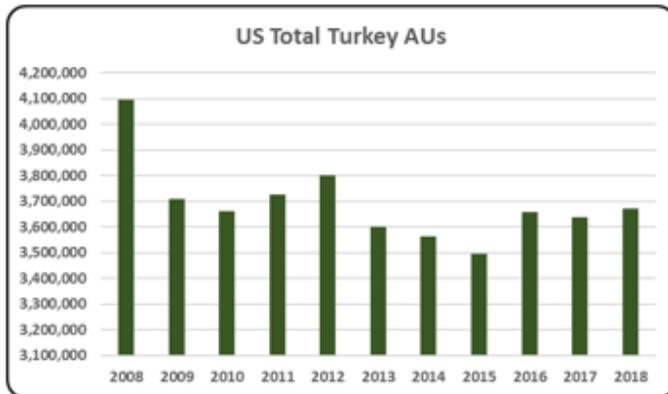
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Massachusetts, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (38,680 AUs), Dairy Cows (16,100 AUs), and Beef Cows (12,720 AUs). Total animal units in Massachusetts during 2018 were 74,444 AUs.



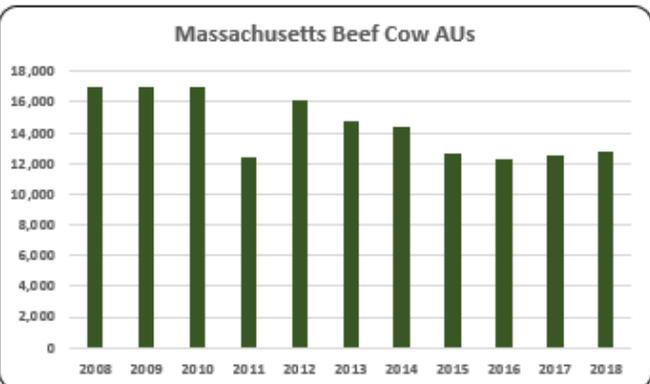
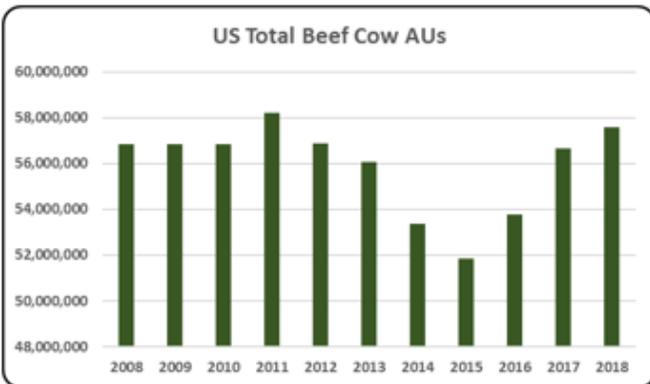
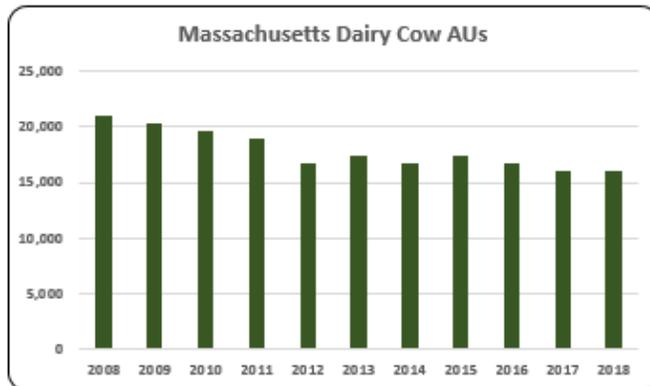
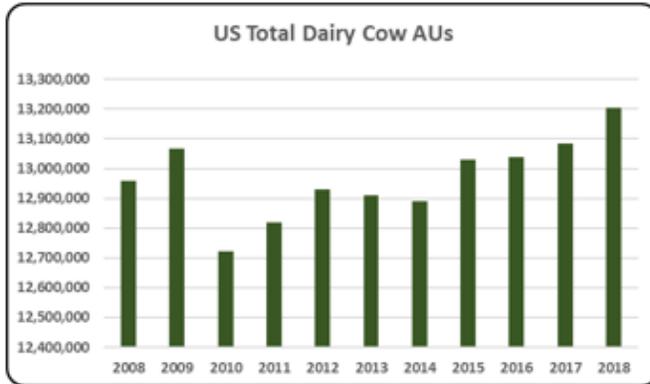
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Overall animal agriculture in Massachusetts is very small representing only 0.06% (74,444) of all AUs in the country in 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 52.0% (38,680) of all AUs in Massachusetts in 2018 were broiler AUs. Broiler numbers have increased from the low saw in 2011 (28,616 AUs).
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layer AUs dropped in 2009 to 3,203 and averaged 3,779 over the ten-year period. Record high numbers of the decade occurred in 2017 followed by a decrease in 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkeys represent less than 0.7% of the animal units in Massachusetts. Turkey numbers have been declining since the beginning of the decade from 878 turkey AUs in 2008 to 503 turkey AUs in 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs in 2018 were at 2,490 AUs. Hog numbers have not reached the levels of 2013 (3,495), the highest of the decade for Massachusetts.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Massachusetts had 16,100 dairy cow AUs in 2018, a 23.3% decrease since 2008. This was 21.6% of total statewide AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- 17.1% (12,720) of total AUs in Massachusetts were from beef cows. The average number of beef cow AUs was 14,435 during the 2008-2018 decade.

Massachusetts Additional Information and Methodology

Animal agriculture is a part of Massachusetts's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Massachusetts, of interest is the degree to which the industry impacts the Massachusetts economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Massachusetts animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Massachusetts's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Massachusetts which have occurred. As shown in this state report, Massachusetts has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Massachusetts. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Massachusetts Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Massachusetts's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Massachusetts, \$1.38 to \$1.58 million in total economic activity, \$0.26 to \$0.34 in household wages and 5 to 10 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.392	\$ 0.255	5.4
	Hogs, Pigs, and Other	\$ 1.384	\$ 0.301	9.6
	Poultry and Eggs	\$ 1.501	\$ 0.306	6.1
	Dairy	\$ 1.577	\$ 0.338	7.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	16,950	16,950	16,950	12,450	16,065	14,790	14,415	12,645	12,270	12,585	12,720
	Hog and Pig AUs	2,415	1,530	2,730	2,580	2,295	3,495	1,935	3,045	3,375	2,430	2,490
	Broiler AUs	40,304	37,473	37,977	28,616	37,215	37,085	36,874	37,826	38,109	38,655	38,680
	Turkey AUs	878	820	787	753	721	682	642	609	579	547	503
	Egg Layer AUs	3,622	3,203	3,182	3,201	3,184	4,058	3,286	4,147	4,733	4,998	3,951
	Dairy AUs	21,000	20,300	19,600	18,900	16,800	17,500	16,800	17,500	16,800	16,100	16,100
	Total Animal Units	85,170	80,277	81,226	66,501	76,280	77,610	73,952	75,772	75,866	75,314	74,444
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 6,816	\$ 5,118	\$ 5,197	\$ 7,792	\$ 10,692	\$ 11,174	\$ 12,449	\$ 15,186	\$ 9,225	\$ 10,690	\$ 8,213
	Hogs and Pigs (\$1,000)	\$ 1,296	\$ 656	\$ 1,652	\$ 1,911	\$ 1,526	\$ 2,816	\$ 2,199	\$ 2,385	\$ 2,318	\$ 1,909	\$ 1,740
	Broilers (\$1,000)	\$ 32,281	\$ 27,852	\$ 29,106	\$ 25,482	\$ 37,081	\$ 45,183	\$ 47,400	\$ 41,352	\$ 36,768	\$ 43,174	\$ 42,611
	Turkeys (\$1,000)	\$ 3,009	\$ 3,049	\$ 3,336	\$ 3,784	\$ 4,092	\$ 4,354	\$ 4,842	\$ 5,114	\$ 5,358	\$ 5,580	\$ 5,935
	Eggs (\$1,000)	\$ 3,718	\$ 2,603	\$ 2,010	\$ 2,321	\$ 2,583	\$ 3,496	\$ 3,842	\$ 5,608	\$ 1,425	\$ 2,023	\$ 3,194
	Milk (\$1,000)	\$ 51,308	\$ 35,178	\$ 43,560	\$ 48,400	\$ 43,800	\$ 50,140	\$ 60,813	\$ 40,362	\$ 38,233	\$ 39,668	\$ 35,148
	Other	\$ 15,523	\$ 17,530	\$ 19,626	\$ 21,570	\$ 23,598	\$ 24,910	\$ 26,134	\$ 27,414	\$ 28,639	\$ 29,756	\$ 30,984
	Sheep and Lambs (\$1,000)	\$ 220	\$ 240	\$ 349	\$ 306	\$ 347	\$ 429	\$ 423	\$ 472	\$ 467	\$ 354	\$ 352
	Aquaculture (\$1,000)	\$ 15,303	\$ 17,290	\$ 19,277	\$ 21,264	\$ 23,251	\$ 24,481	\$ 25,711	\$ 26,942	\$ 28,172	\$ 29,402	\$ 30,632
	Total (\$1,000)	\$ 113,950	\$ 91,986	\$ 104,487	\$ 111,260	\$ 123,373	\$ 142,072	\$ 157,679	\$ 137,422	\$ 121,965	\$ 132,800	\$ 127,825

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	337	751	620	618	
	Cattle feedlots (112112)	87	53	8	8	
	Dairy cattle and milk production (11212)	279	258	147	140	
	Hog and pig farming (1122)	72	82	135	119	
	Poultry and egg production (1123)	163	480	380	265	
	Sheep and goat farming (1124)	211	279	365	474	
	Animal aquaculture and other animal production (1125,1129)	1,312	1,776	1,887	1,621	
Value of Sales (\$1,000)	Cattle and Calves	9,612	12,444	9,503	11,147	
	Hogs and Pigs	withheld	2,108	2,898	2,098	
	Poultry and Eggs	12,107	13,207	11,748	12,194	
	Milk*			44,250	45,336	
	Aquaculture	9,481	18,548	23,251	29,402	
	Other (calculated)	76,044	28,546	6,046	11,484	
	Total	107,244	74,853	97,696	111,661	
Input Purchases	Livestock and poultry purchased	(Farms)	1,101	1,450	1,961	1,653
		\$1,000	6,482	5,819	7,275	6,764
	Breeding livestock purchased	(Farms)	373	556	637	503
		\$1,000	2,703	1,776	2,006	1,400
	Other livestock and poultry purchased	(Farms)	816	1,064	1,612	1,379
		\$1,000	3,779	4,043	5,268	5,364
	Feed purchased	(Farms)	2,698	3,821	4,276	3,924
\$1,000		26,253	45,134	50,732	42,601	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 11,429	\$ 2,097	44	\$ 530
	Hogs, Pigs, and Other	\$ 45,303	\$ 9,834	313	\$ 2,488
	Poultry and Eggs	\$ 77,662	\$ 15,807	316	\$ 3,999
	Dairy	\$ 55,425	\$ 11,887	263	\$ 3,007
	Total	\$ 189,819	\$ 39,624	935	\$ 10,025
Change from 2008 to 2018	Cattle and Calves	\$ 94	\$ 17	0	\$ 4
	Hogs, Pigs, and Other	\$ 17,478	\$ 3,794	121	\$ 960
	Poultry and Eggs	\$ 7,691	\$ 1,565	31	\$ 396
	Dairy	\$ (41,264)	\$ (8,850)	(196)	\$ (2,239)
	Total	\$ (16,001)	\$ (3,474)	(43)	\$ (879)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.392	\$ 0.255	5.4	
	Hogs, Pigs, and Other	\$ 1.384	\$ 0.301	9.6	
	Poultry and Eggs	\$ 1.501	\$ 0.306	6.1	
	Dairy	\$ 1.577	\$ 0.338	7.5	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				5.1%
	Total				25.3%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: MICHIGAN

Michigan Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Michigan animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Michigan. The success of Michigan animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Michigan during 2018 animal agriculture contributed:

- \$6.6 billion in economic output
- 41,302 jobs
- \$1.5 billion in earnings
- \$367.3 million in income taxes paid at local, state, and federal levels
- \$250.6 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Michigan has increased economic output by over \$633.6 million, boosted household earnings by \$139.7 million, contributed 3,694 additional jobs and paid \$34.2 million in additional tax revenues.

Michigan's animal agriculture consumed almost 649.9 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (226.8 thousand tons)
- Egg-Laying Hens (137.1 thousand tons)
- Dairy Cows (109.6 thousand tons)

This report examines animal agriculture in Michigan over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Michigan, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Michigan and beyond.

Michigan Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Michigan's economy. In 2018, Michigan's animal agriculture contributed the following to the economy:

- About \$6.6 billion in economic output
- \$1.5 billion in household earnings
- 41,302 jobs
- \$367.3 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Michigan's animal agriculture has:

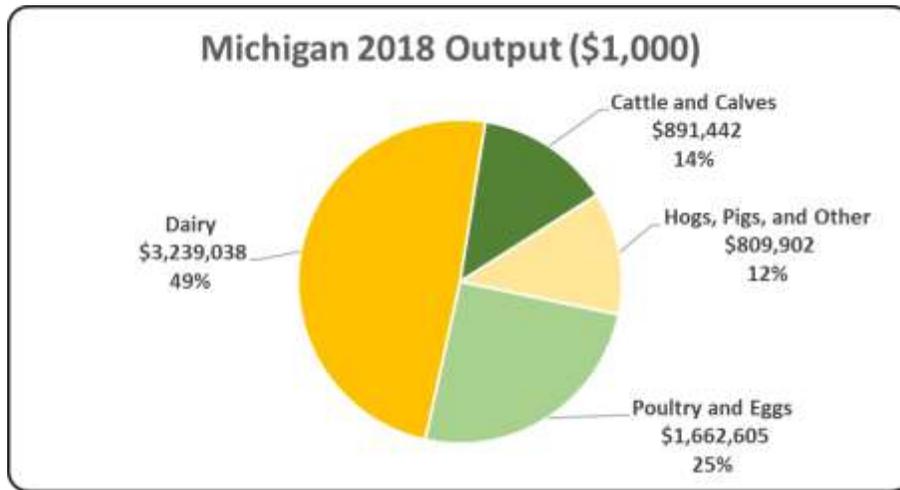
- Increased economic output by \$633.6 million
- Boosted household earnings by \$139.7 million
- Added 3,694 jobs
- Paid an additional \$34.2 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 6,602,987	\$ 633,576	10.61%
Earnings (\$1,000)	\$ 1,502,226	\$ 139,690	10.25%
Employment (Jobs)	41,302	3,694	9.82%
Income Taxes Paid (\$1,000)	\$ 367,294	\$ 34,154	10.25%
Property Taxes Paid in 2017 (\$1,000)	\$ 250,626		

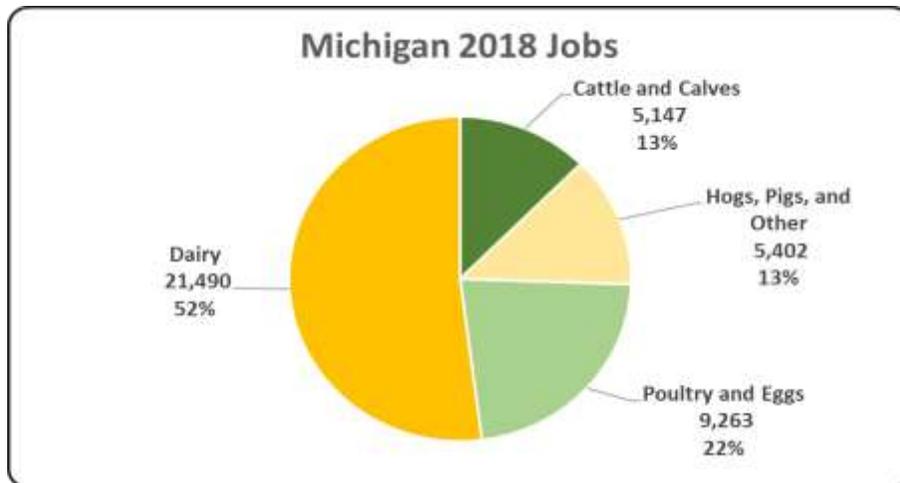
Michigan Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Michigan economy. Animal agriculture’s impact on Michigan total economic output is about \$6.6 billion.



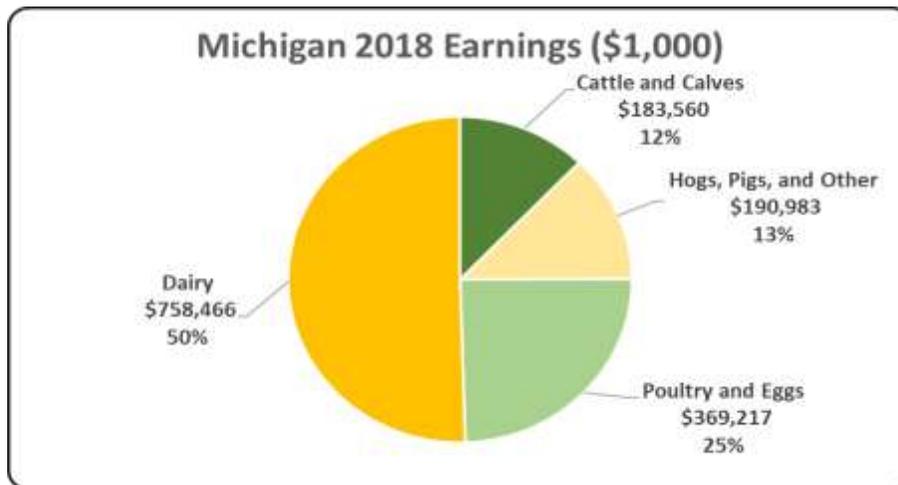
Michigan Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Michigan in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Michigan total jobs, contributing 41,302 jobs within and outside of animal agriculture.



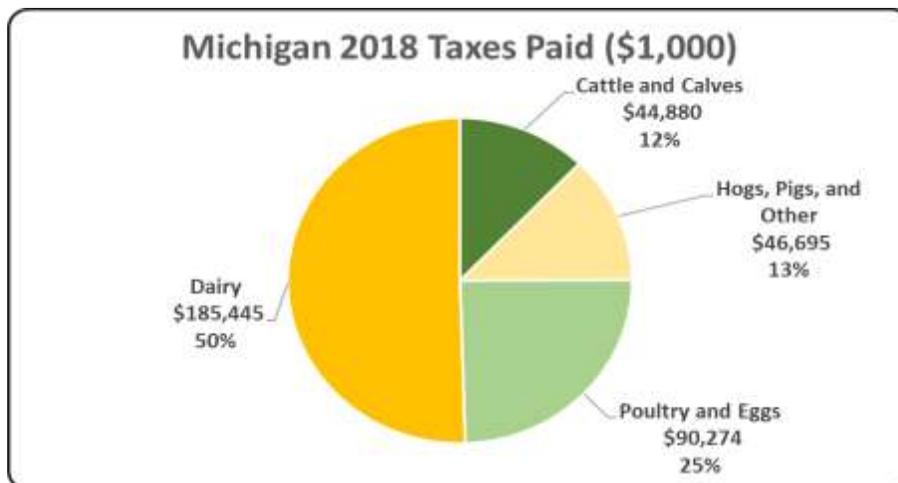
Michigan Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Michigan economy in terms of earnings. Michigan’s animal agriculture contributed about \$1.5 billion to household earnings in 2018.



Michigan Taxes Paid by Animal Agriculture

Michigan’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$367.3 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$250.6 million in property taxes paid by all of Michigan agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



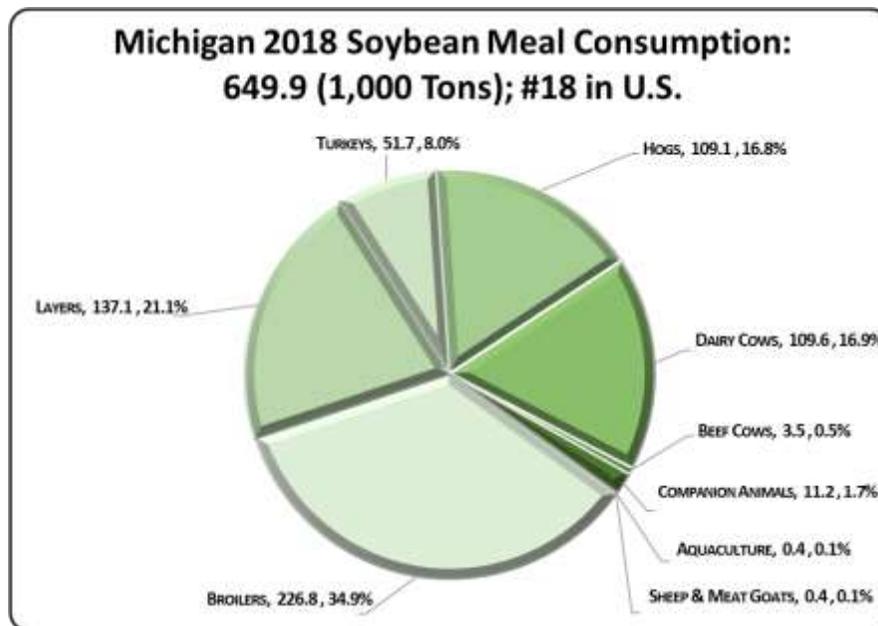
Michigan Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Michigan's animal agriculture consumed almost 649.9 thousand tons of soybean meal in 2018, placing the state as #18 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Michigan consumed 195,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (226.8 thousand tons)
2. Egg-Laying Hens (137.1 thousand tons)
3. Dairy Cows (109.6 thousand tons)

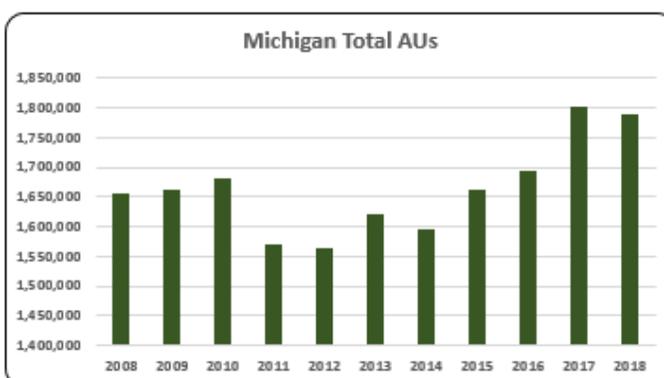
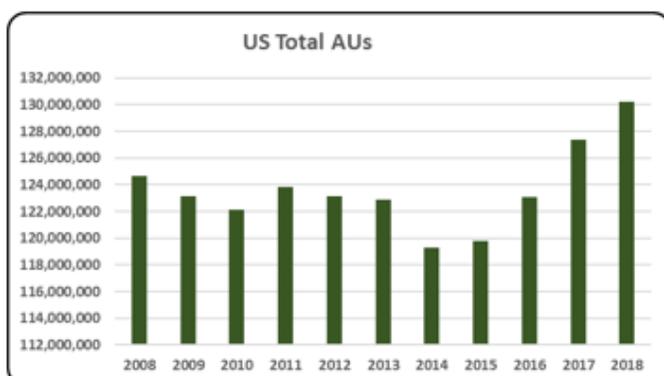


Michigan Animal Unit (AU) Trends

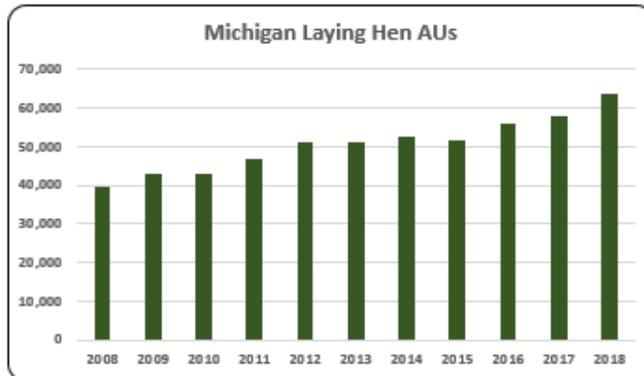
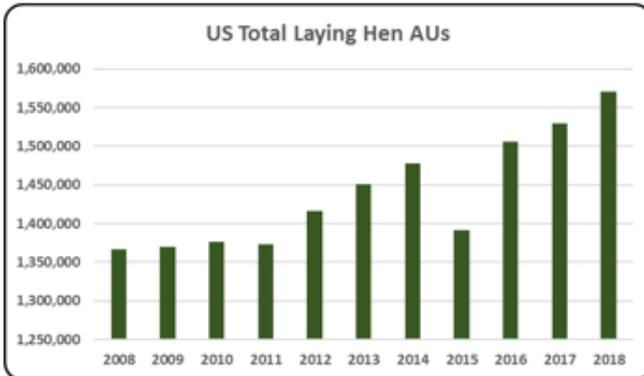
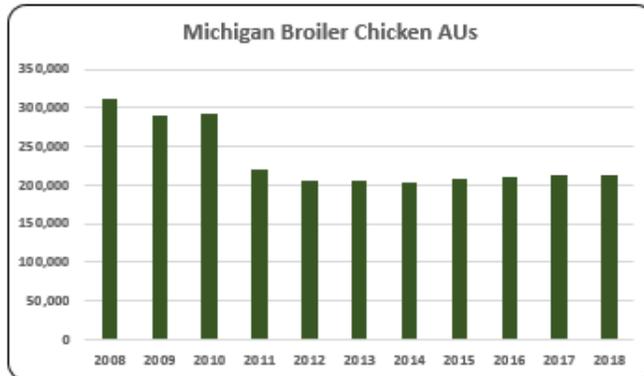
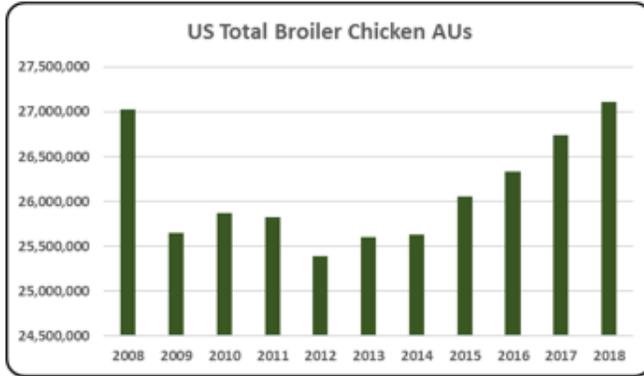
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Michigan. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Michigan and to give perspective on Michigan's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

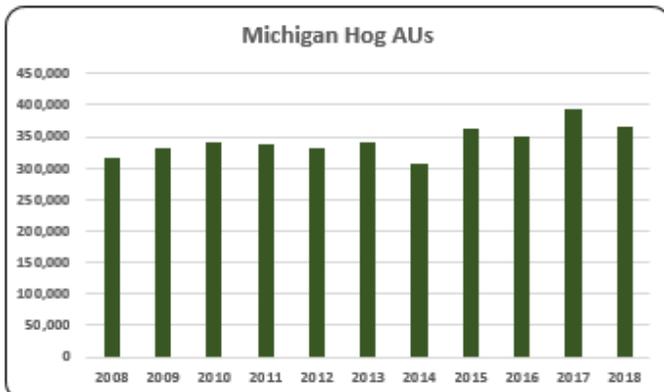
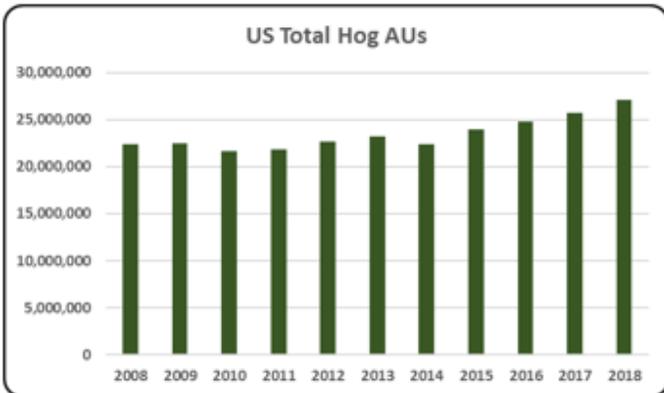
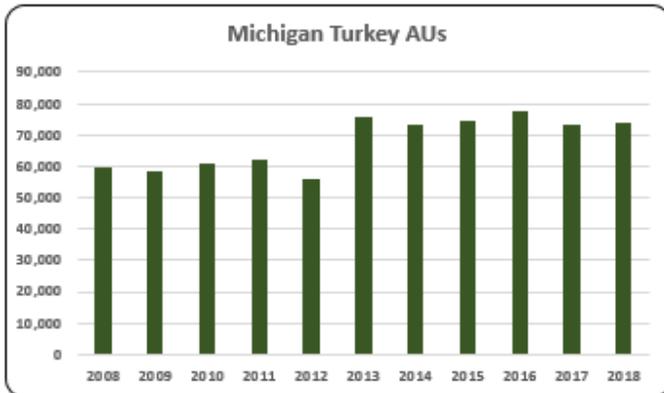
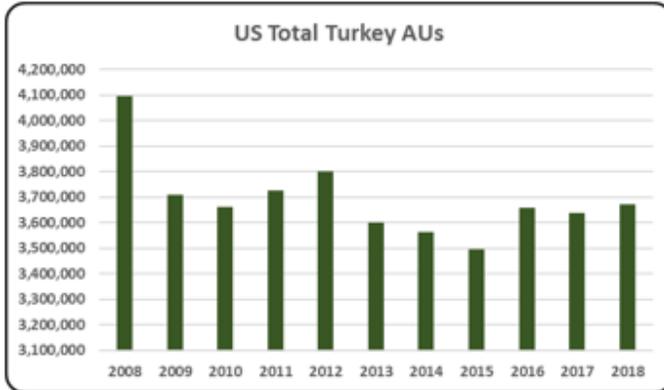
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Michigan, the largest three segments of animal agriculture in terms of AUs during 2018 were: Dairy Cows (599,200 AUs), Beef Cows (474,450 AUs), and Hogs (365,550 AUs). Total animal units in Michigan during 2018 were 1.8 million AUs.



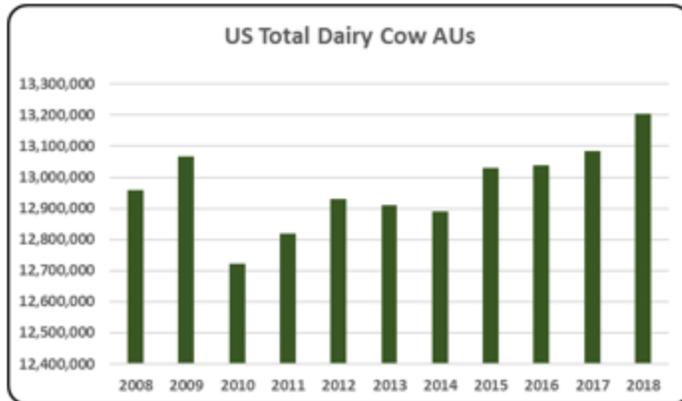
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 1.4% (1.8 million) of all AUs in the U.S. in 2018 were contributed by Michigan. The average total for Michigan in the 2008 to 2018 decade was 1.7 million AUs.



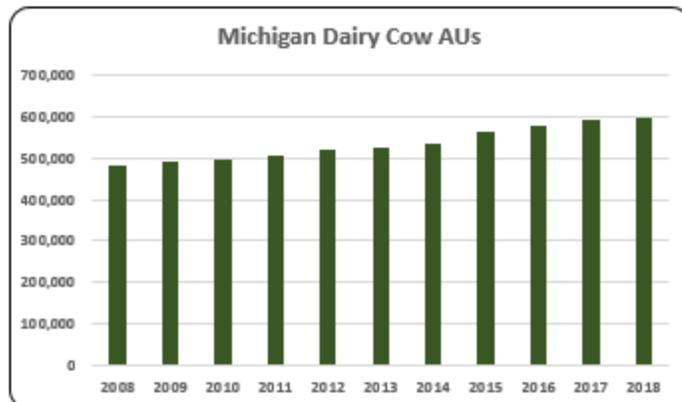
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Michigan’s broiler numbers began declining in 2009. Broiler AUs in 2018 were at 213,119.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Michigan’s laying sector substantially increased by 60.6% from 39,577 layer AUs in 2008 to 63,563 layer AUs in 2018.



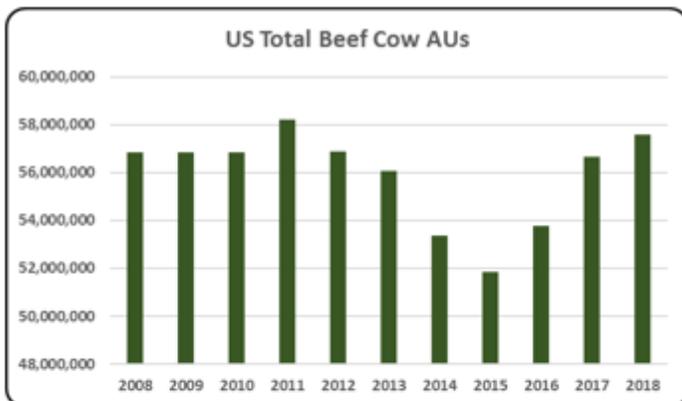
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey production in Michigan declined in the middle of the decade but has recovered in the past few years. The average of this decade is 67,661 turkey AUs.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Michigan’s hog sector represented about 20.4% (365,550) of all the state’s animal units in 2018.



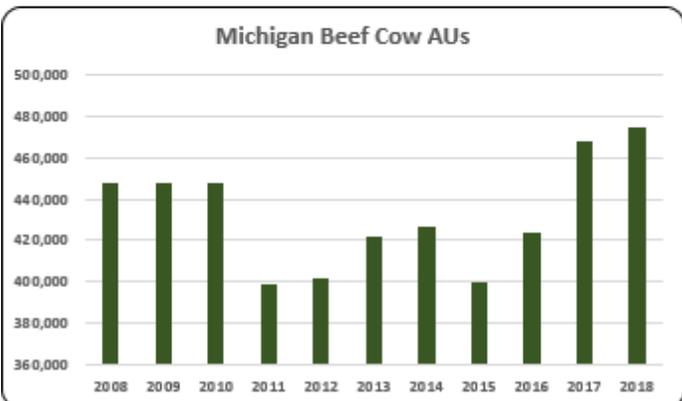
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Dairy cows made up 33.5% of the animal units in Michigan, 599,200 AUs in 2018. This is a 24.4% increase from 2008.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- There were 474,450 beef cow AUs in 2018 representing 26.5% of animal units in the state of Michigan.

Michigan Additional Information and Methodology

Animal agriculture is an important part of Michigan's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Michigan, of interest is the degree to which the industry impacts the Michigan economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Michigan animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Michigan's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Michigan which have occurred. As shown in this state report, Michigan has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Michigan. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Michigan Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Michigan's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Michigan, \$1.58 to \$1.99 million in total economic activity, \$0.37 to \$0.46 in household wages and 10 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.782	\$ 0.367	10.3
	Hogs, Pigs, and Other	\$ 1.584	\$ 0.374	10.6
	Poultry and Eggs	\$ 1.989	\$ 0.442	11.1
	Dairy	\$ 1.947	\$ 0.456	12.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	447,660	447,660	447,660	398,700	401,400	421,950	427,050	400,050	424,050	468,450	474,450
	Hog and Pig AUs	314,550	330,750	340,350	337,800	330,150	339,450	306,600	363,600	349,050	393,300	365,550
	Broiler AUs	310,857	289,024	292,912	220,712	205,045	204,329	203,169	208,414	209,971	212,980	213,119
	Turkey AUs	59,810	58,468	60,916	62,002	55,737	75,505	73,094	74,312	77,416	72,978	74,036
	Egg Layer AUs	39,577	42,928	43,076	46,612	51,270	51,145	52,403	51,772	55,693	58,010	63,563
	Dairy AUs	481,600	494,200	495,600	505,400	519,400	527,800	533,400	564,200	576,800	595,000	599,200
	Total Animal Units	1,654,054	1,663,030	1,680,514	1,571,226	1,563,001	1,620,179	1,595,716	1,662,349	1,692,980	1,800,718	1,789,918
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 334,715	\$ 284,066	\$ 348,948	\$ 418,199	\$ 464,842	\$ 518,536	\$ 621,183	\$ 603,120	\$ 505,309	\$ 519,426	\$ 500,164
	Hogs and Pigs (\$1,000)	\$ 242,596	\$ 221,066	\$ 307,177	\$ 403,124	\$ 349,236	\$ 377,604	\$ 392,522	\$ 354,219	\$ 305,666	\$ 373,297	\$ 495,817
	Broilers (\$1,000)	\$ 248,976	\$ 214,813	\$ 224,486	\$ 196,536	\$ 204,310	\$ 248,948	\$ 261,165	\$ 227,844	\$ 202,582	\$ 237,880	\$ 358,566
	Turkeys (\$1,000)	\$ 87,445	\$ 83,662	\$ 86,911	\$ 94,111	\$ 101,190	\$ 134,594	\$ 152,027	\$ 166,875	\$ 178,356	\$ 131,357	\$ 113,256
	Eggs (\$1,000)	\$ 217,526	\$ 156,701	\$ 170,763	\$ 198,496	\$ 239,603	\$ 271,400	\$ 325,518	\$ 494,947	\$ 163,234	\$ 220,346	\$ 364,078
	Milk (\$1,000)	\$ 1,490,496	\$ 1,067,712	\$ 1,416,610	\$ 1,780,380	\$ 1,699,299	\$ 1,878,620	\$ 2,315,769	\$ 1,703,326	\$ 1,642,276	\$ 1,841,884	\$ 1,664,032
	Other	\$ 7,104	\$ 7,733	\$ 8,509	\$ 8,837	\$ 10,605	\$ 10,838	\$ 12,091	\$ 12,731	\$ 13,965	\$ 15,132	\$ 15,517
	Sheep and Lambs (\$1,000)	\$ 4,027	\$ 4,430	\$ 4,980	\$ 5,081	\$ 6,623	\$ 5,886	\$ 6,168	\$ 5,838	\$ 6,101	\$ 6,298	\$ 5,713
	Aquaculture (\$1,000)	\$ 3,077	\$ 3,303	\$ 3,529	\$ 3,756	\$ 3,982	\$ 4,952	\$ 5,923	\$ 6,893	\$ 7,864	\$ 8,834	\$ 9,804
	Total (\$1,000)	\$ 2,628,858	\$ 2,035,753	\$ 2,563,405	\$ 3,099,683	\$ 3,069,085	\$ 3,440,540	\$ 4,080,275	\$ 3,563,062	\$ 3,011,388	\$ 3,339,321	\$ 3,511,430

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	4,115	5,253	6,042	5,578
	Cattle feedlots (112112)	2,232	1,481	344	388
	Dairy cattle and milk production (11212)	2,489	1,971	1,672	1,530
	Hog and pig farming (1122)	838	1,017	686	715
	Poultry and egg production (1123)	604	1,635	1,146	857
	Sheep and goat farming (1124)	942	1,241	1,419	1,721
	Animal aquaculture and other animal production (1125,1129)	7,215	6,829	6,347	5,919
Value of Sales (\$1,000)	Cattle and Calves	298,517	449,371	603,653	628,397
	Hogs and Pigs	200,027	357,495	482,177	608,555
	Poultry and Eggs	146,700	258,994	472,218	480,253
	Milk*			1,540,609	1,786,057
	Aquaculture	3,316	5,721	3,982	8,834
	Other (calculated)	63,327	66,139	39,877	64,588
	Total	711,887	1,137,720	3,142,516	3,576,684
Input Purchases	Livestock and poultry purchased	(Farms) 11,647	11,151	12,053	11,498
		\$1,000 196,578	308,543	326,573	390,358
	Breeding livestock purchased	(Farms) 5,274	4,442	4,980	4,570
		\$1,000 31,345	68,144	79,605	87,771
	Other livestock and poultry purchased	(Farms) 7,934	8,184	8,785	8,630
		\$1,000 165,233	240,399	246,968	302,587
Feed purchased	(Farms) 24,297	22,314	24,389	22,882	
	\$1,000 390,264	740,126	1,240,433	1,269,333	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 891,442	\$ 183,560	5,147	\$ 44,880
	Hogs, Pigs, and Other	\$ 809,902	\$ 190,983	5,402	\$ 46,695
	Poultry and Eggs	\$ 1,662,605	\$ 369,217	9,263	\$ 90,274
	Dairy	\$ 3,239,038	\$ 758,466	21,490	\$ 185,445
	Total	\$ 6,602,987	\$ 1,502,226	41,302	\$ 367,294
Change from 2008 to 2018	Cattle and Calves	\$ 178,520	\$ 36,760	1,031	\$ 8,988
	Hogs, Pigs, and Other	\$ 337,260	\$ 79,529	2,249	\$ 19,445
	Poultry and Eggs	\$ 345,898	\$ 76,814	1,927	\$ 18,781
	Dairy	\$ (228,101)	\$ (53,413)	(1,513)	\$ (13,060)
	Total	\$ 633,576	\$ 139,690	3,694	\$ 34,154
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.782	\$ 0.367	10.3	
	Hogs, Pigs, and Other	\$ 1.584	\$ 0.374	10.6	
	Poultry and Eggs	\$ 1.989	\$ 0.442	11.1	
	Dairy	\$ 1.947	\$ 0.456	12.9	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.3%
	Total				24.5%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: MINNESOTA

Minnesota Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Minnesota animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Minnesota. The success of Minnesota animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Minnesota during 2018 animal agriculture contributed:

- \$16.6 billion in economic output
- 76,329 jobs
- \$3.6 billion in earnings
- \$11.0 billion in income taxes paid at local, state, and federal levels
- \$403.3 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Minnesota has increased economic output by over \$1.0 billion, boosted household earnings by \$183.6 million, contributed 4,032 additional jobs and paid \$51.0 million in additional tax revenues.

Minnesota's animal agriculture consumed almost 1.6 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (837.2 thousand tons)
- Turkeys (398.7 thousand tons)
- Broilers (129.2 thousand tons)

This report examines animal agriculture in Minnesota over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Minnesota, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Minnesota and beyond.

Minnesota Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Minnesota's economy. In 2018, Minnesota's animal agriculture contributed the following to the economy:

- About \$16.6 billion in economic output
- \$3.6 billion in household earnings
- 76,329 jobs
- \$1.0 billion in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Minnesota's animal agriculture has:

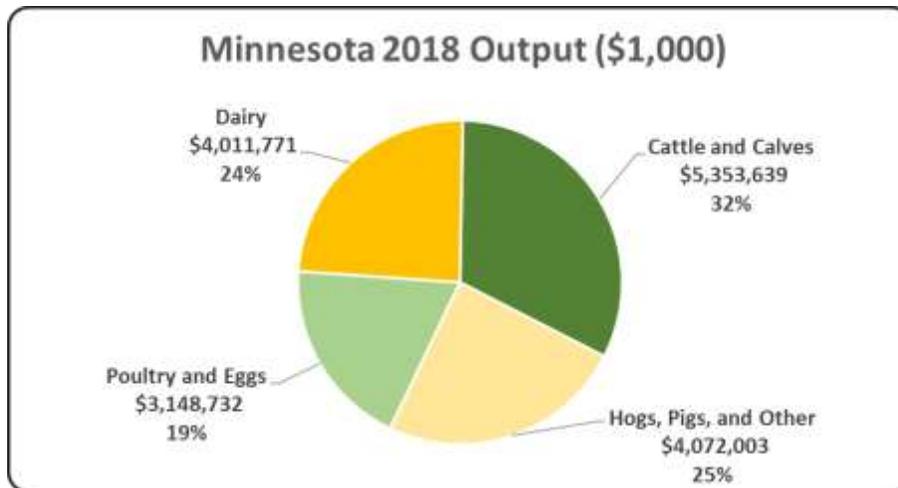
- Increased economic output by \$1.0 billion
- Boosted household earnings by \$183.6 million
- Added 4,032 jobs
- Paid an additional \$51.0 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 16,586,145	\$ 1,024,011	6.58%
Earnings (\$1,000)	\$ 3,622,775	\$ 183,625	5.34%
Employment (Jobs)	76,329	4,032	5.58%
Income Taxes Paid (\$1,000)	\$ 1,007,131	\$ 51,048	5.34%
Property Taxes Paid in 2017 (\$1,000)	\$ 403,333		

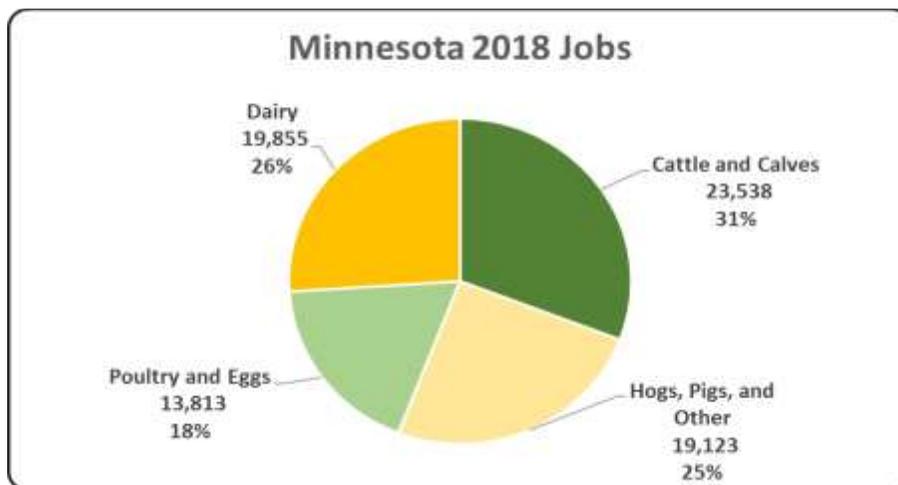
Minnesota Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Minnesota economy. Animal agriculture’s impact on Minnesota total economic output is about \$16.6 billion.



Minnesota Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Minnesota in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Minnesota total jobs, contributing 76,329 jobs within and outside of animal agriculture.



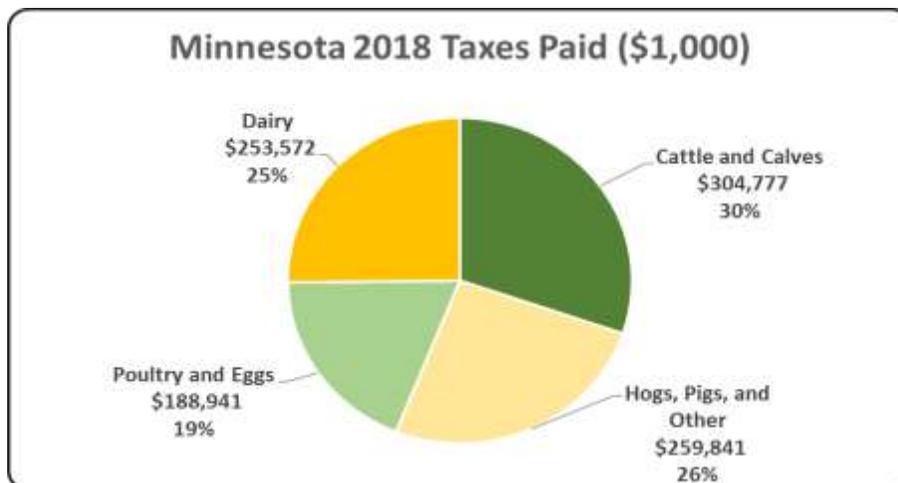
Minnesota Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Minnesota economy in terms of earnings. Minnesota’s animal agriculture contributed about \$3.6 billion to household earnings in 2018.



Minnesota Taxes Paid by Animal Agriculture

Minnesota’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$1.0 billion in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$403.3 million in property taxes paid by all of Minnesota agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



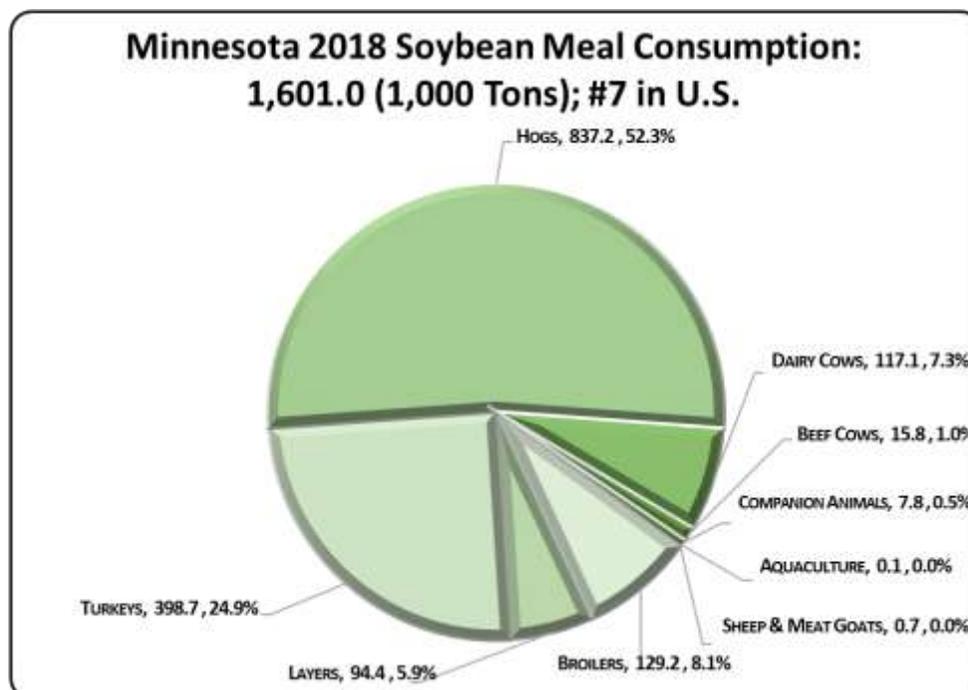
Minnesota Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Minnesota's animal agriculture consumed almost 1.6 million tons of soybean meal in 2018, placing the state as #7 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Minnesota consumed 196.5 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (837.2 thousand tons)
2. Turkeys (398.7 thousand tons)
3. Broilers (129.2 thousand tons)

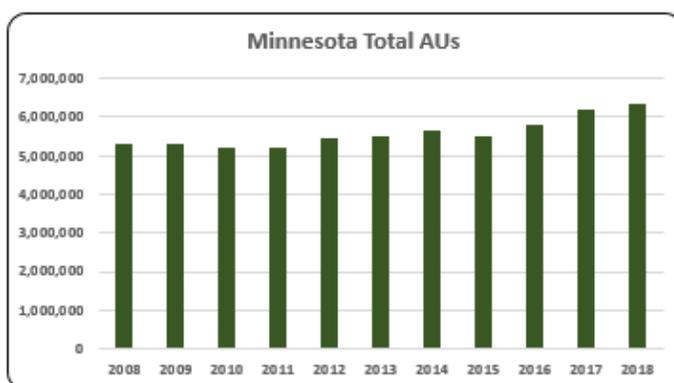
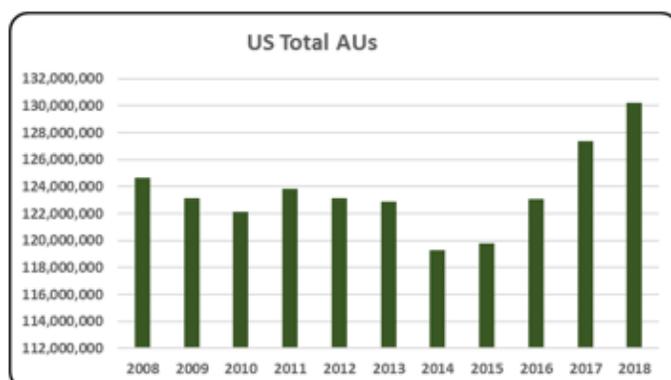


Minnesota Animal Unit (AU) Trends

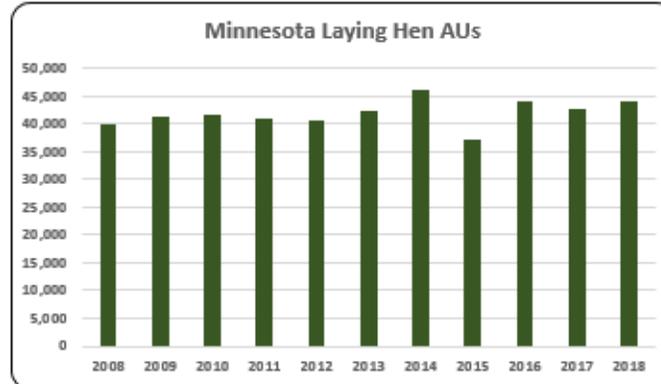
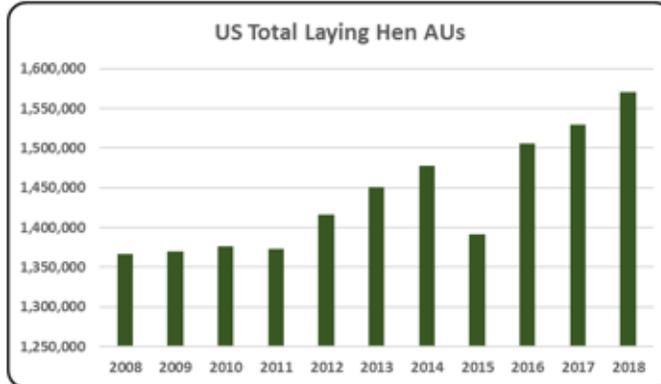
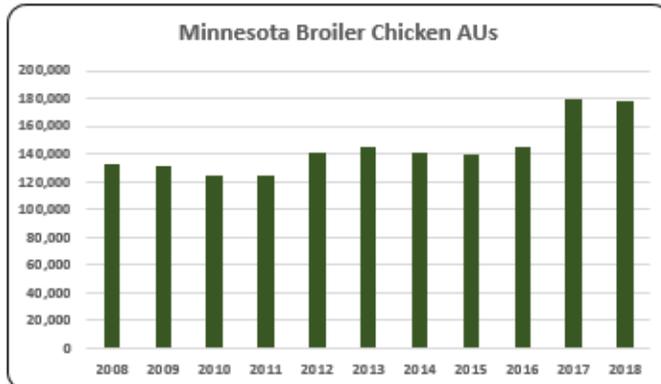
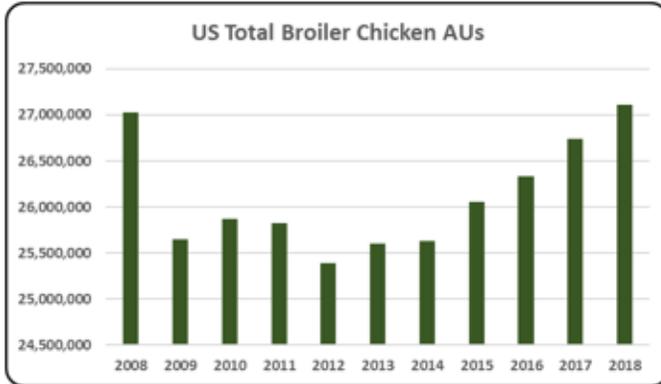
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Minnesota. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Minnesota and to give perspective on Minnesota's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

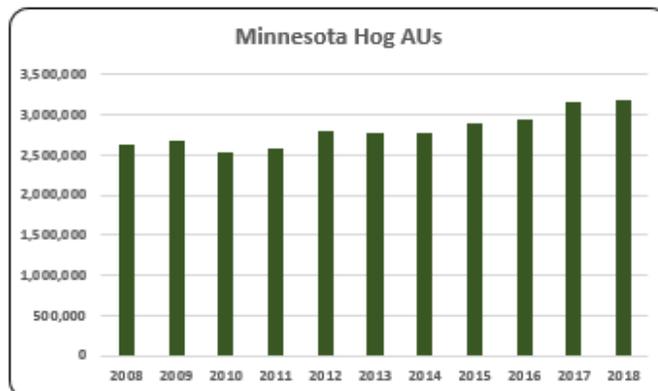
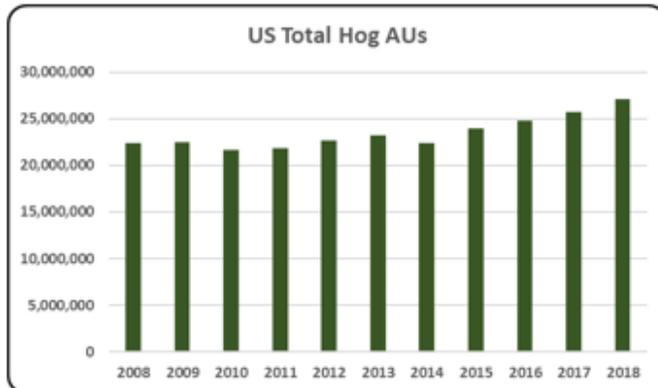
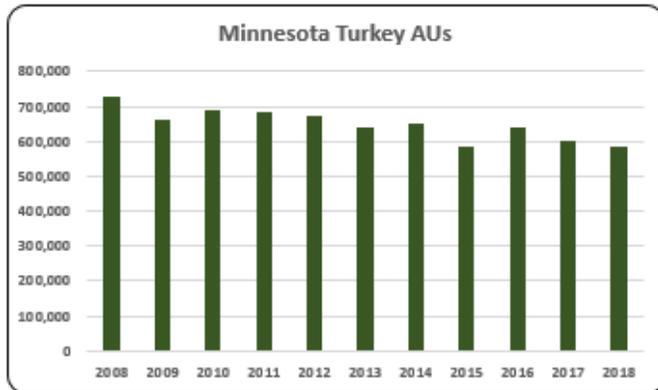
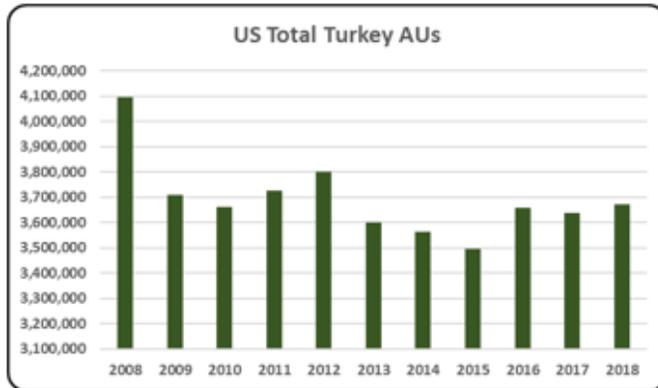
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Minnesota, the largest three segments of animal agriculture in terms of AUs during 2018 were: Hogs (3.2 million AUs), Beef Cows (1,712,625 AUs), and Dairy Cows (637,000 AUs). Total animal units in Minnesota during 2018 were 6.3 million AUs.



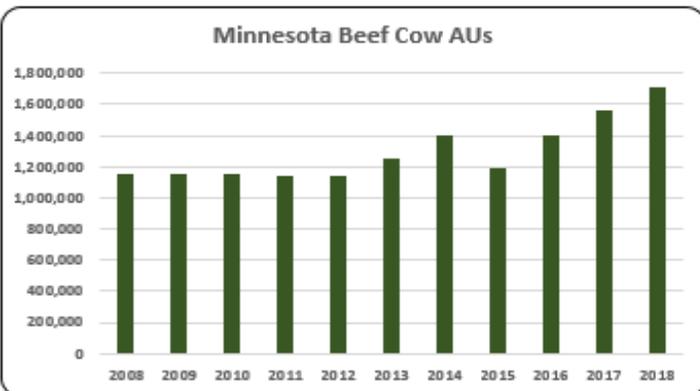
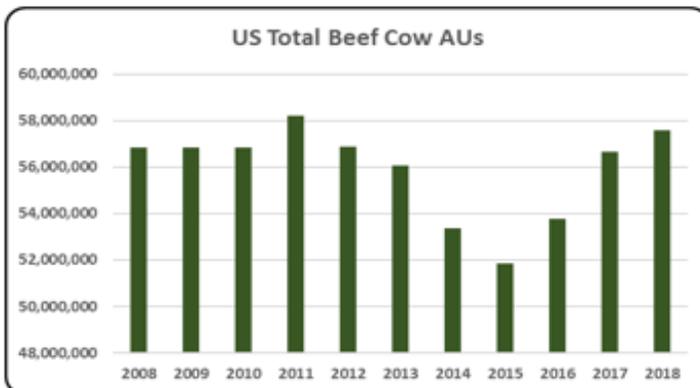
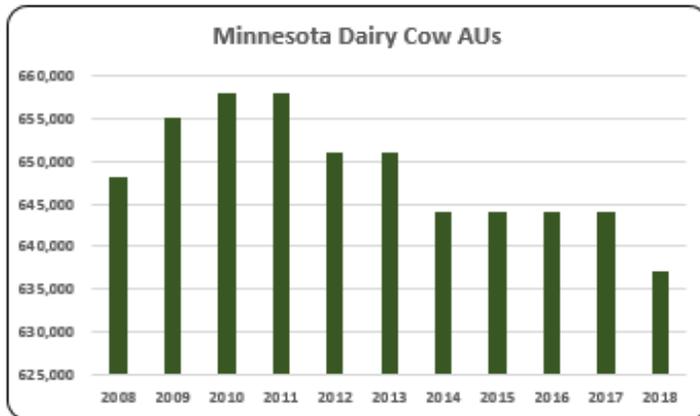
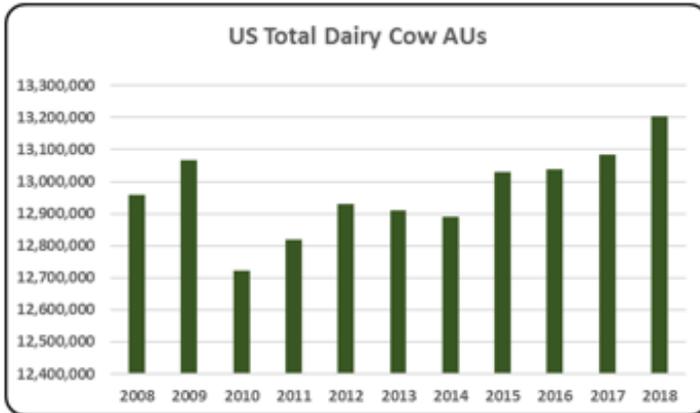
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- At the national level, Minnesota is the number one turkey producer. AUs in Minnesota increased steadily over the last decade. There were 6.3 million AUs in the state in 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler numbers increased 34.2% from 132,392 AUs in 2008 to 177,616 AUs in 2018. Broiler AUs averaged 143,751 from 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Minnesota was home to 44,102 laying hen AUs in 2018. Laying hen numbers varied during the decade with 2014 (46,280) being a record high. The 2015 decline is due to avian influenza.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- There were 586,697 turkey AUs in Minnesota in 2018 representing 16.0% of all turkey AUs in the country. The 2015 drop is due to avian influenza.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- About 50.1% (3.2 million) of Minnesota’s AUs in 2018 came from hogs. Hog numbers have increased 21.3% since 2008 and the overall trend during the decade has been positive.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- The dairy cow industry in Minnesota contributed 10.1% (637,000) of all animal units in the state in 2018. Dairy cow numbers in 2018 decreased by 7,000 from 2017.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- In 2018, there were 1.8 million beef cow AUs in Minnesota. Beef cow AUs during the decade have been increasing going back to 2015 with 2018 being the highest in the past decade.

Minnesota Additional Information and Methodology

Animal agriculture is an important part of Minnesota's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Minnesota, of interest is the degree to which the industry impacts the Minnesota economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Minnesota animal agriculture are presented in this report.

Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Minnesota's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Minnesota which have occurred. As shown in this state report, Minnesota has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Minnesota. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Minnesota Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Minnesota's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Minnesota, \$1.86 to \$3.05 million in total economic activity, \$0.43 to \$0.66 in household wages and 9 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.619	\$ 0.536	11.5
	Hogs, Pigs, and Other	\$ 1.856	\$ 0.426	8.7
	Poultry and Eggs	\$ 3.052	\$ 0.659	13.4
	Dairy	\$ 2.464	\$ 0.560	12.2

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	1,158,300	1,158,300	1,158,300	1,147,500	1,141,500	1,250,100	1,396,500	1,191,450	1,407,225	1,560,675	1,712,625	
	Hog and Pig AUs	2,614,500	2,668,350	2,522,700	2,580,600	2,797,800	2,770,950	2,765,250	2,884,950	2,942,100	3,160,950	3,171,750	
	Broiler AUs	132,392	131,820	123,892	124,988	140,671	144,872	140,659	139,459	145,467	179,427	177,616	
	Turkey AUs	726,759	661,611	690,023	681,656	674,192	638,884	652,113	585,925	637,964	600,995	586,697	
	Egg Layer AUs	39,815	41,324	41,796	40,868	40,608	42,366	46,280	37,113	43,934	42,715	44,102	
	Dairy AUs	648,200	655,200	658,000	658,000	651,000	651,000	644,000	644,000	644,000	644,000	644,000	637,000
	Total Animal Units	5,319,966	5,316,605	5,194,711	5,233,612	5,445,771	5,498,173	5,644,801	5,482,897	5,820,690	6,188,763	6,329,790	
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 892,142	\$ 800,217	\$ 957,961	\$ 1,020,618	\$ 1,209,861	\$ 1,287,089	\$ 1,781,873	\$ 1,680,115	\$ 1,397,785	\$ 1,461,927	\$ 2,044,232	
	Hogs and Pigs (\$1,000)	\$ 1,757,315	\$ 1,246,087	\$ 1,848,944	\$ 2,296,476	\$ 2,410,425	\$ 2,522,978	\$ 2,923,230	\$ 2,516,237	\$ 2,314,426	\$ 2,613,480	\$ 2,162,512	
	Broilers (\$1,000)	\$ 109,480	\$ 112,605	\$ 111,390	\$ 110,757	\$ 135,700	\$ 172,631	\$ 178,870	\$ 149,779	\$ 141,106	\$ 194,861	\$ 201,520	
	Turkeys (\$1,000)	\$ 716,447	\$ 519,680	\$ 648,384	\$ 755,984	\$ 811,296	\$ 719,882	\$ 871,676	\$ 804,806	\$ 908,993	\$ 674,761	\$ 567,630	
	Eggs (\$1,000)	\$ 237,237	\$ 165,025	\$ 167,922	\$ 185,335	\$ 199,865	\$ 214,011	\$ 266,139	\$ 366,897	\$ 126,454	\$ 173,204	\$ 262,646	
	Milk (\$1,000)	\$ 1,677,362	\$ 1,208,546	\$ 1,465,422	\$ 1,822,450	\$ 1,778,308	\$ 1,864,152	\$ 2,263,496	\$ 1,665,312	\$ 1,623,888	\$ 1,755,792	\$ 1,628,220	
	Other	\$ 25,334	\$ 24,729	\$ 28,985	\$ 29,696	\$ 37,640	\$ 29,348	\$ 32,018	\$ 36,139	\$ 31,559	\$ 32,314	\$ 31,573	
	Sheep and Lambs (\$1,000)	\$ 15,094	\$ 13,879	\$ 17,526	\$ 17,627	\$ 24,962	\$ 16,911	\$ 19,822	\$ 24,183	\$ 19,845	\$ 20,840	\$ 20,340	
	Aquaculture (\$1,000)	\$ 10,240	\$ 10,850	\$ 11,459	\$ 12,069	\$ 12,678	\$ 12,437	\$ 12,196	\$ 11,956	\$ 11,715	\$ 11,474	\$ 11,233	
	Total (\$1,000)	\$ 5,415,317	\$ 4,076,889	\$ 5,229,008	\$ 6,221,315	\$ 6,583,095	\$ 6,810,091	\$ 8,317,302	\$ 7,219,285	\$ 6,544,212	\$ 6,906,338	\$ 6,898,333	

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	8,917	9,921	8,083	8,636	
	Cattle feedlots (112112)	3,290	2,421	1,048	1,312	
	Dairy cattle and milk production (11212)	5,520	4,385	3,746	2,808	
	Hog and pig farming (1122)	3,051	2,462	1,442	1,636	
	Poultry and egg production (1123)	978	1,643	1,085	1,068	
	Sheep and goat farming (1124)	1,181	1,310	1,088	1,486	
	Animal aquaculture and other animal production (1125,1129)	6,006	5,105	4,245	3,985	
Value of Sales (\$1,000)	Cattle and Calves	873,074	1,385,740	1,639,634	1,886,939	
	Hogs and Pigs	1,398,234	2,139,877	2,783,049	3,165,075	
	Poultry and Eggs	750,088	1,045,674	1,230,625	1,285,951	
	Milk*			1,645,911	1,737,886	
	Aquaculture	8,991	12,492	12,678	11,474	
	Other (calculated)	50,604	71,842	73,874	116,547	
	Total	3,080,991	4,655,625	7,385,771	8,203,872	
Input Purchases	Livestock and poultry purchased	(Farms)	20,375	17,464	18,527	16,345
		\$1,000	836,490	1,304,042	1,301,768	1,649,648
	Breeding livestock purchased	(Farms)	9,757	8,243	9,241	7,659
		\$1,000	75,727	115,218	163,055	141,885
	Other livestock and poultry purchased	(Farms)	12,945	11,354	11,859	11,036
		\$1,000	760,762	1,188,825	1,138,713	1,507,763
Feed purchased	(Farms)	37,871	30,806	32,486	29,902	
	\$1,000	1,271,172	1,944,488	2,961,840	2,668,319	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 5,353,639	\$ 1,096,322	23,538	\$ 304,777
	Hogs, Pigs, and Other	\$ 4,072,003	\$ 934,680	19,123	\$ 259,841
	Poultry and Eggs	\$ 3,148,732	\$ 679,644	13,813	\$ 188,941
	Dairy	\$ 4,011,771	\$ 912,129	19,855	\$ 253,572
	Total	\$ 16,586,145	\$ 3,622,775	76,329	\$ 1,007,131

Change from 2008 to 2018	Cattle and Calves	\$ 2,561,487	\$ 524,543	11,262	\$ 145,823
	Hogs, Pigs, and Other	\$ 118,277	\$ 27,149	555	\$ 7,547
	Poultry and Eggs	\$ (728,558)	\$ (157,257)	(3,196)	\$ (43,717)
	Dairy	\$ (927,194)	\$ (210,810)	(4,589)	\$ (58,605)
	Total	\$ 1,024,011	\$ 183,625	4,032	\$ 51,048

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.619	\$ 0.536	11.5
	Hogs, Pigs, and Other	\$ 1.856	\$ 0.426	8.7
	Poultry and Eggs	\$ 3.052	\$ 0.659	13.4
	Dairy	\$ 2.464	\$ 0.560	12.2

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	7.6%
	Total	27.8%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: MISSISSIPPI

Mississippi Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Mississippi animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Mississippi. The success of Mississippi animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Mississippi during 2018 animal agriculture contributed:

- \$8.9 billion in economic output
- 40,050 jobs
- \$1.9 billion in earnings
- \$448.1 million in income taxes paid at local, state, and federal levels
- \$97.6 million in the form of property taxes

Mississippi's animal agriculture consumed almost 1.4 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (1.2 million tons)
- Aquaculture (80.7 thousand tons)
- Hogs (52.4 thousand tons)

This report examines animal agriculture in Mississippi over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Mississippi, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Mississippi and beyond.

Mississippi Economic Impact of Animal Agriculture

Animal agriculture is an important but shrinking part of Mississippi's economy. In 2018, Mississippi's animal agriculture contributed the following to the economy:

- About \$8.9 billion in economic output
- \$1.9 billion in household earnings
- 40,050 jobs
- \$448.1 million in income taxes

During the last decade Mississippi's animal agriculture has:

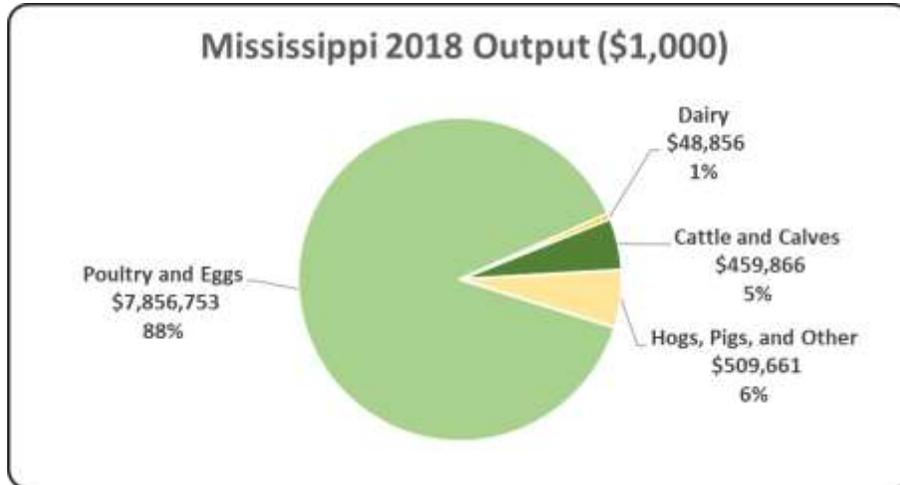
- Decreased in economic output by \$280.3 million
- Reduced household earnings by \$62.2 million
- Shrunk by 1,377 jobs
- Paid \$15.0 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 8,875,136	\$ (280,260)	-3.06%
Earnings (\$1,000)	\$ 1,851,783	\$ (62,186)	-3.25%
Employment (Jobs)	40,050	(1,377)	-3.32%
Income Taxes Paid (\$1,000)	\$ 448,131	\$ (15,049)	-3.25%
Property Taxes Paid in 2017 (\$1,000)	\$ 97,596		

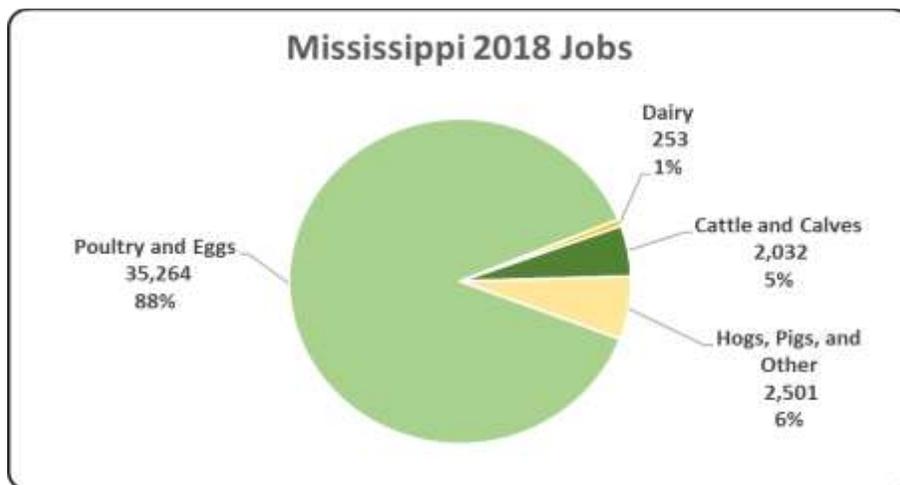
Mississippi Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Mississippi economy. Animal agriculture’s impact on Mississippi total economic output is about \$8.9 billion.



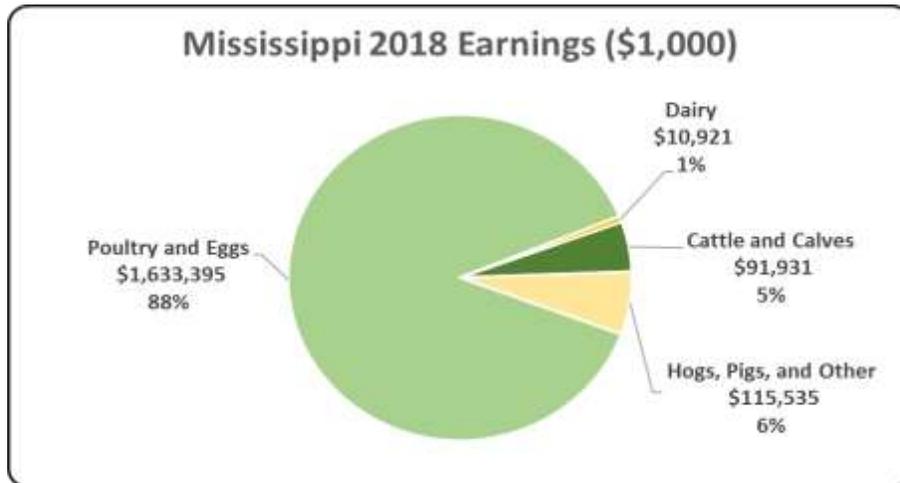
Mississippi Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Mississippi in terms of animal agriculture jobs. As shown, animal agriculture contributes 40,050 jobs within and outside of animal agriculture.



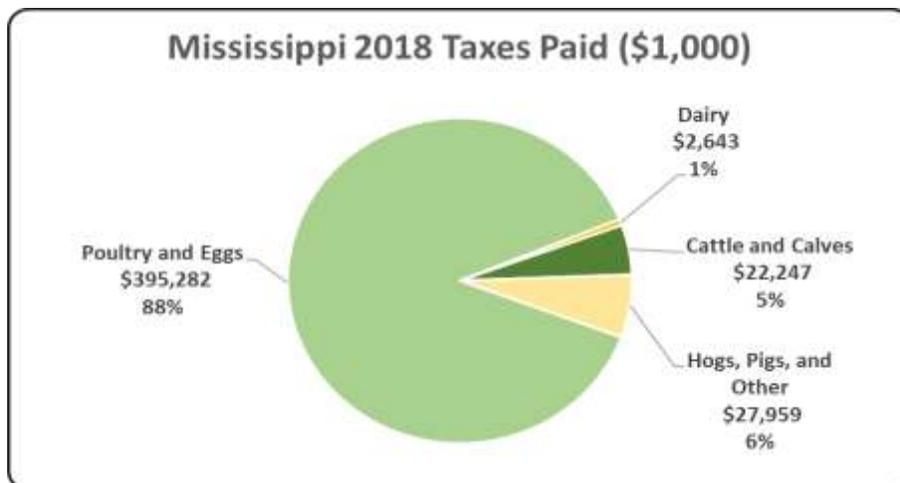
Mississippi Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Mississippi economy in terms of earnings. Mississippi’s animal agriculture contributed about \$1.9 billion to household earnings in 2018.



Mississippi Taxes Paid by Animal Agriculture

Mississippi’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$448.1 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$97.6 million in property taxes paid by all of Mississippi agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



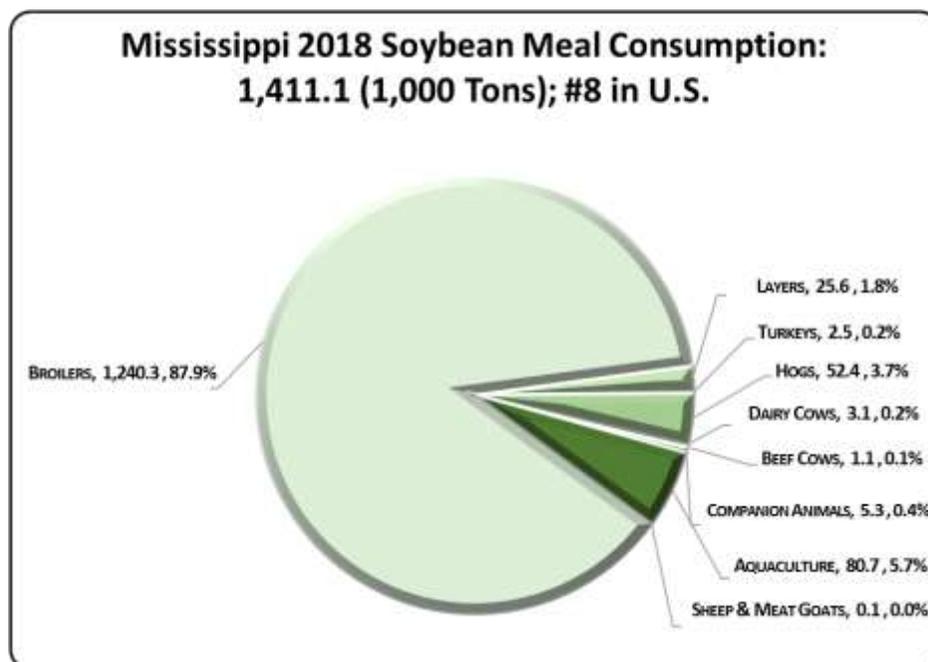
Mississippi Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Mississippi's animal agriculture consumed almost 1.4 million tons of soybean meal in 2018, placing the state as #8 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Mississippi consumed 5,800 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (1.2 million tons)
2. Aquaculture (80.7 thousand tons)
3. Hogs (52.4 thousand tons)

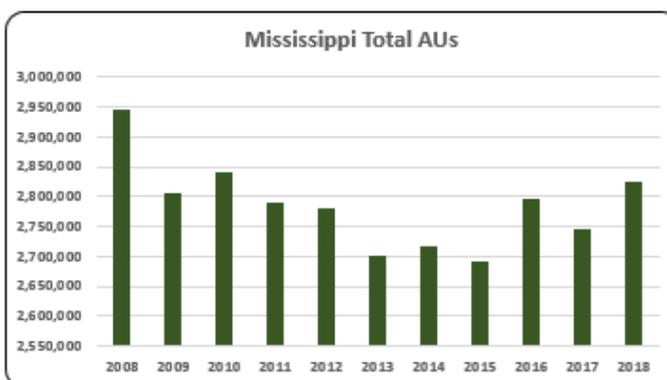
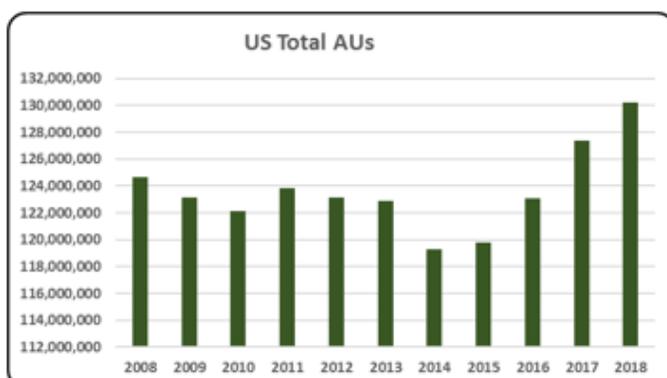


Mississippi Animal Unit (AU) Trends

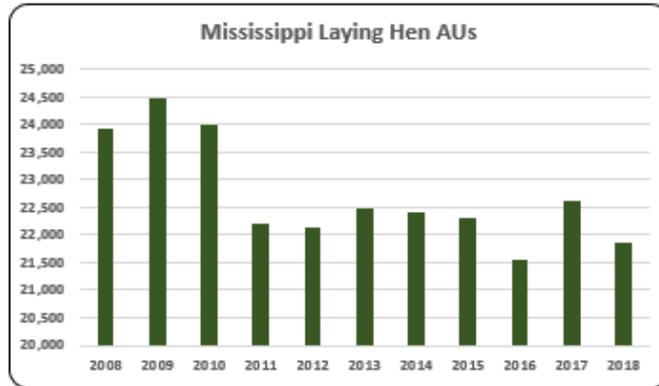
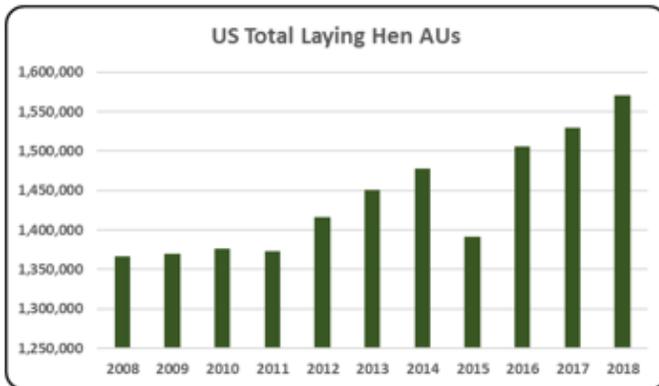
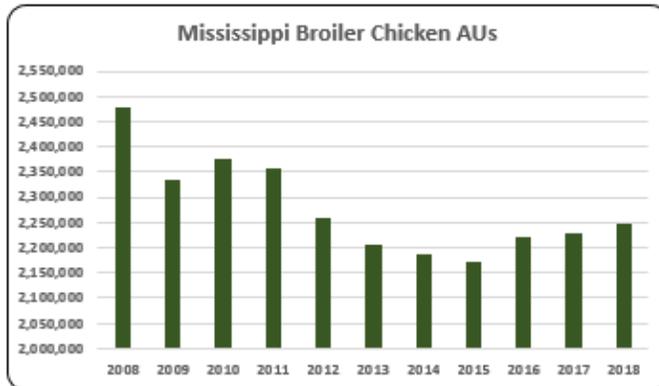
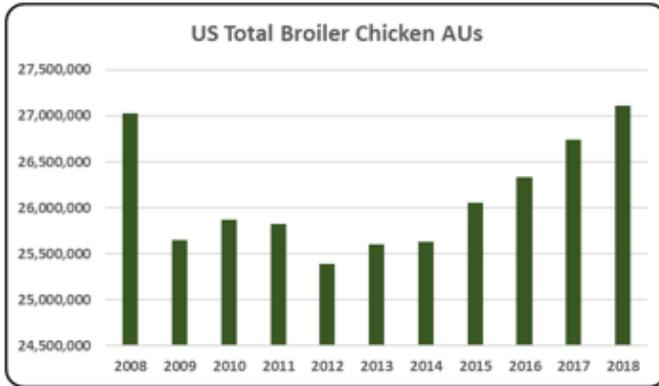
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Mississippi. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Mississippi and to give perspective on Mississippi's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

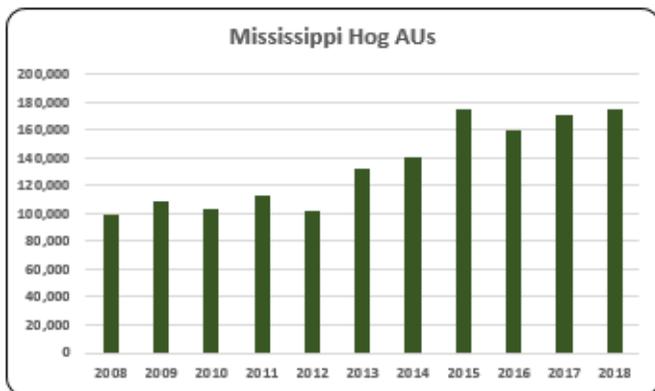
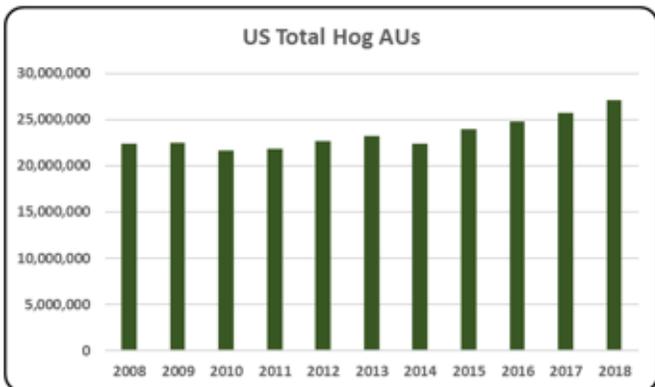
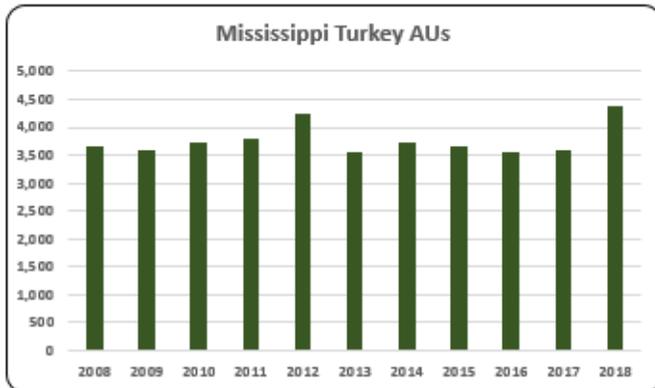
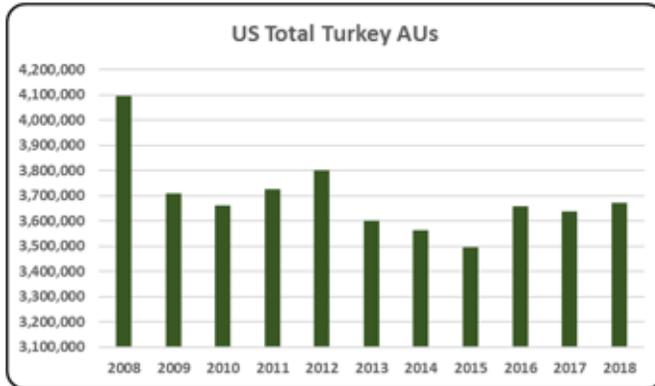
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Mississippi, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (2.2 million AUs), Beef Cows (363,750 AUs), and Hogs (174,900 AUs). Total animal units in Mississippi during 2018 were 2.8 million AUs.



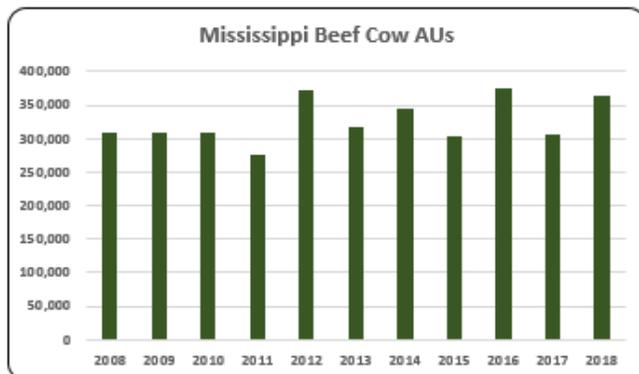
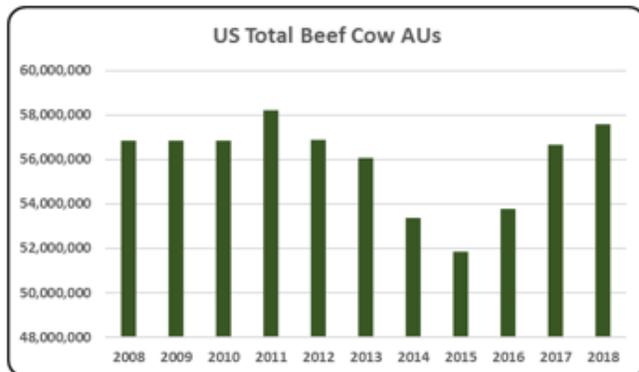
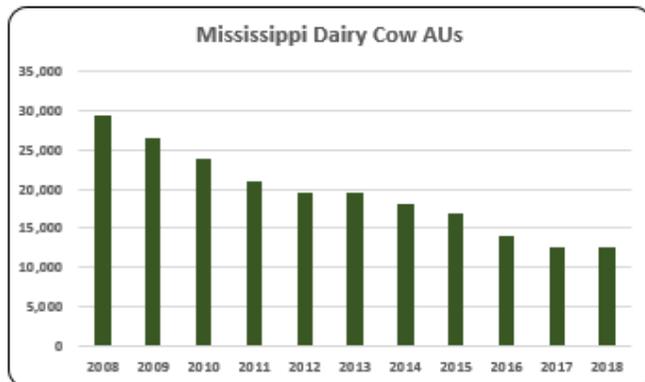
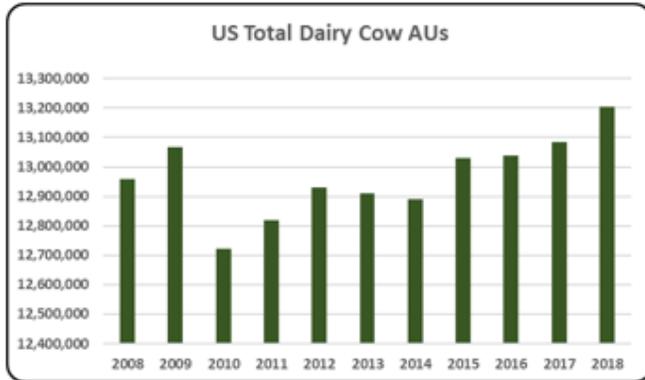
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- AUs in Mississippi have declined during the last decade from 2.9 million in 2008 to 2.8 million in 2018. Mississippi makes up 2.2% of total U.S. AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 79.6% (2.2 million AUs) of Mississippi’s animal units in 2018 were broilers. This was 9.3% lower than in 2008 when Mississippi had 2.5 million AUs.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In 2018 laying hens represented 0.8% (21,871) of all animal units in the state of Mississippi. Numbers have declined 8.6% from 2008 to 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- The smallest animal sector in Mississippi in terms of animal units is turkeys. In 2018 only 0.2% (4,380 AUs) of all AUs in the state were turkeys. Turkey AUs have increased 19.3% since 2008 in Mississippi.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- 174,900 of Mississippi’s animal units in 2018 came from hogs. Hog AUs in Mississippi have increased 75.9% since 2008.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cow numbers fell 57.1% from 2008 to 2018. Dairy cow AUs remained the same in 2018 as 2017 at 12,600 AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- In 2018, Mississippi had 363,750 beef cow AUs. This was a 17.89% increase from a decade earlier and 12.9% of the state's total AUs.

Mississippi Additional Information and Methodology

Animal agriculture is an important part of Mississippi's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Mississippi, of interest is the degree to which the industry impacts the Mississippi economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Mississippi animal agriculture are presented in this report.

Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Mississippi's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Mississippi which have occurred. As shown in this state report, Mississippi has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Mississippi. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Mississippi Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Mississippi's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Mississippi, \$1.70 to \$2.74 million in total economic activity, \$0.39 to \$0.57 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.198	\$ 0.439	9.7
	Hogs, Pigs, and Other	\$ 1.701	\$ 0.386	8.3
	Poultry and Eggs	\$ 2.740	\$ 0.570	12.3
	Dairy	\$ 2.215	\$ 0.495	11.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	308,550	308,550	308,550	274,650	372,750	317,700	345,750	303,600	375,900	307,200	363,750
	Hog and Pig AUs	99,450	108,450	103,725	113,325	102,075	131,850	139,800	174,600	159,900	170,400	174,900
	Broiler AUs	2,478,880	2,334,508	2,377,200	2,355,549	2,258,248	2,206,446	2,185,624	2,171,530	2,222,279	2,227,362	2,247,402
	Turkey AUs	3,673	3,590	3,740	3,807	4,243	3,557	3,733	3,649	3,561	3,578	4,380
	Egg Layer AUs	23,915	24,460	24,008	22,216	22,139	22,485	22,413	22,296	21,564	22,630	21,871
	Dairy AUs	29,400	26,600	23,800	21,000	19,600	19,600	18,200	16,800	14,000	12,600	12,600
	Total Animal Units	2,943,868	2,806,158	2,841,024	2,790,547	2,779,055	2,701,638	2,715,520	2,692,475	2,797,204	2,743,770	2,824,903
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 156,693	\$ 145,491	\$ 148,407	\$ 186,283	\$ 216,224	\$ 218,211	\$ 269,220	\$ 288,222	\$ 185,559	\$ 210,863	\$ 209,268
	Hogs and Pigs (\$1,000)	\$ 75,408	\$ 69,416	\$ 80,222	\$ 105,084	\$ 102,135	\$ 124,425	\$ 117,555	\$ 106,326	\$ 86,737	\$ 84,460	\$ 59,456
	Broilers (\$1,000)	\$ 2,243,006	\$ 2,102,977	\$ 2,297,212	\$ 2,123,150	\$ 2,253,900	\$ 2,718,146	\$ 2,871,978	\$ 2,448,868	\$ 2,226,620	\$ 2,580,192	\$ 2,633,505
	Turkeys (\$1,000)	\$ 14,301	\$ 13,553	\$ 7,349	\$ 5,779	\$ 6,213	\$ 4,504	\$ 2,980	\$ 3,383	\$ 3,825	\$ 2,590	\$ 2,924
	Eggs (\$1,000)	\$ 179,075	\$ 158,710	\$ 179,794	\$ 196,486	\$ 208,357	\$ 222,415	\$ 235,306	\$ 248,230	\$ 221,704	\$ 211,033	\$ 230,685
	Milk (\$1,000)	\$ 60,528	\$ 35,750	\$ 41,032	\$ 45,492	\$ 40,198	\$ 40,734	\$ 50,384	\$ 32,010	\$ 24,768	\$ 25,893	\$ 22,059
	Other	\$ 222,235	\$ 213,041	\$ 203,911	\$ 194,671	\$ 185,491	\$ 194,645	\$ 203,736	\$ 212,867	\$ 221,958	\$ 231,076	\$ 240,168
	Sheep and Lambs (\$1,000)	\$ 158	\$ 173	\$ 252	\$ 221	\$ 250	\$ 309	\$ 305	\$ 341	\$ 337	\$ 360	\$ 357
	Aquaculture (\$1,000)	\$ 222,077	\$ 212,868	\$ 203,659	\$ 194,450	\$ 185,241	\$ 194,336	\$ 203,431	\$ 212,526	\$ 221,621	\$ 230,716	\$ 239,811
	Total (\$1,000)	\$ 2,951,246	\$ 2,738,938	\$ 2,957,927	\$ 2,856,944	\$ 3,012,519	\$ 3,523,080	\$ 3,751,158	\$ 3,339,905	\$ 2,971,171	\$ 3,346,107	\$ 3,398,065

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	17,456	15,018	13,041	13,213
	Cattle feedlots (112112)	124	-	8	1
	Dairy cattle and milk production (11212)	388	187	144	86
	Hog and pig farming (1122)	252	228	117	181
	Poultry and egg production (1123)	2,420	2,449	2,071	1,646
	Sheep and goat farming (1124)	421	704	796	1,247
	Animal aquaculture and other animal production (1125,1129)	5,316	5,114	4,118	3,700
Value of Sales (\$1,000)	Cattle and Calves	228,346	323,621	332,491	392,643
	Hogs and Pigs	83,498	129,424	141,139	126,754
	Poultry and Eggs	1,490,748	2,438,690	2,744,048	3,106,344
	Milk*			42,690	30,132
	Aquaculture	207,181	237,883	185,241	230,716
	Other (calculated)	13,182	16,260	11,829	17,490
	Total	2,022,955	3,145,878	3,457,438	3,904,079
Input Purchases	Livestock and poultry purchased	(Farms) 9,917	7,762	8,434	8,793
		\$1,000 380,748	469,684	576,540	630,963
	Breeding livestock purchased	(Farms) 5,128	4,012	4,798	5,517
		\$1,000 18,496	31,192	53,038	118,140
	Other livestock and poultry purchased	(Farms) 5,894	4,616	4,690	4,715
		\$1,000 362,251	438,492	523,503	512,823
	Feed purchased	(Farms) 26,071	21,203	22,292	22,338
	\$1,000 804,106	1,468,308	1,715,141	1,039,134	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 459,866	\$ 91,931	2,032	\$ 22,247
	Hogs, Pigs, and Other	\$ 509,661	\$ 115,535	2,501	\$ 27,959
	Poultry and Eggs	\$ 7,856,753	\$ 1,633,395	35,264	\$ 395,282
	Dairy	\$ 48,856	\$ 10,921	253	\$ 2,643
	Total	\$ 8,875,136	\$ 1,851,783	40,050	\$ 448,131
Change from 2008 to 2018	Cattle and Calves	\$ 48,371	\$ 9,670	214	\$ 2,340
	Hogs, Pigs, and Other	\$ (95,383)	\$ (21,622)	(468)	\$ (5,233)
	Poultry and Eggs	\$ (121,900)	\$ (25,343)	(547)	\$ (6,133)
	Dairy	\$ (111,349)	\$ (24,891)	(576)	\$ (6,024)
	Total	\$ (280,260)	\$ (62,186)	(1,377)	\$ (15,049)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.198	\$ 0.439	9.7	
	Hogs, Pigs, and Other	\$ 1.701	\$ 0.386	8.3	
	Poultry and Eggs	\$ 2.740	\$ 0.570	12.3	
	Dairy	\$ 2.215	\$ 0.495	11.5	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.0%	
	Total			24.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: MISSOURI

Missouri Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Missouri animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Missouri. The success of Missouri animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Missouri during 2018 animal agriculture contributed:

- \$11.3 billion in economic output
- 64,545 jobs
- \$2.3 billion in earnings
- \$554.6 million in income taxes paid at local, state, and federal levels
- \$234.5 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Missouri has increased economic output by over \$1.6 billion, boosted household earnings by \$311.8 million, contributed 8,094 additional jobs and paid \$74.7 million in additional tax revenues.

Missouri's animal agriculture consumed almost 1.3 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (636.9 thousand tons)
- Hogs (373.0 thousand tons)
- Turkeys (162.4 thousand tons)

This report examines animal agriculture in Missouri over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Missouri, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Missouri and beyond.

Missouri Economic Impact of Animal Agriculture

Animal agriculture is an important part of Missouri's economy. In 2018, Missouri's animal agriculture contributed the following to the economy:

- About \$11.3 billion in economic output
- \$2.3 billion in household earnings
- 64,545 jobs
- \$554.6 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Missouri's animal agriculture has:

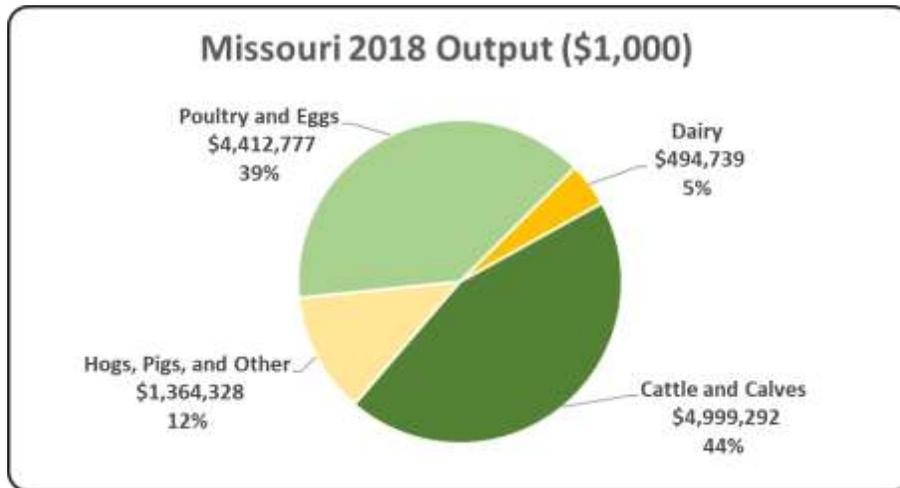
- Increased economic output by \$1.6 billion
- Boosted household earnings by \$311.8 million
- Added 8,094 jobs
- Paid an additional \$74.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 11,271,137	\$ 1,604,602	16.60%
Earnings (\$1,000)	\$ 2,315,791	\$ 311,826	15.56%
Employment (Jobs)	64,545	8,094	14.34%
Income Taxes Paid (\$1,000)	\$ 554,632	\$ 74,682	15.56%
Property Taxes Paid in 2017 (\$1,000)	\$ 234,502		

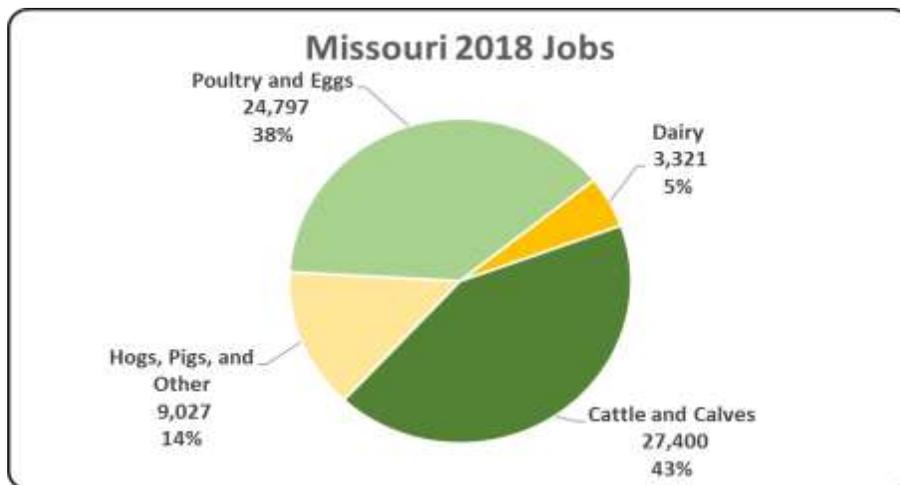
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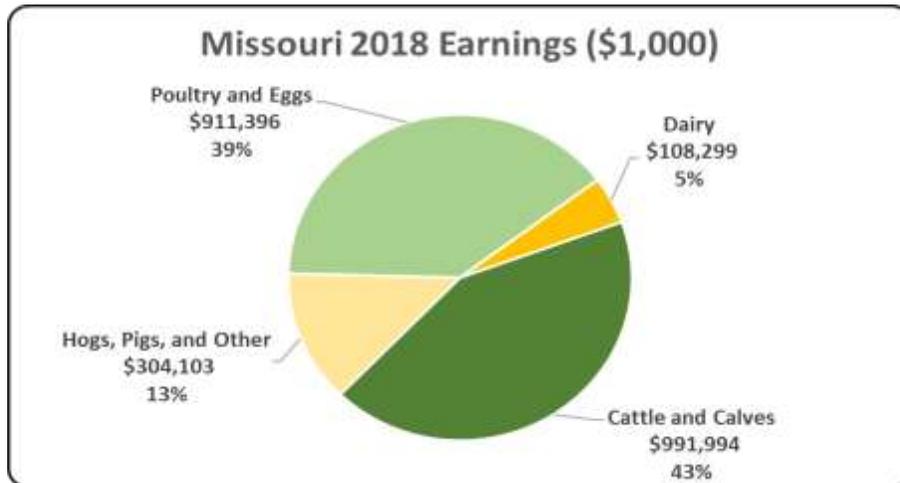
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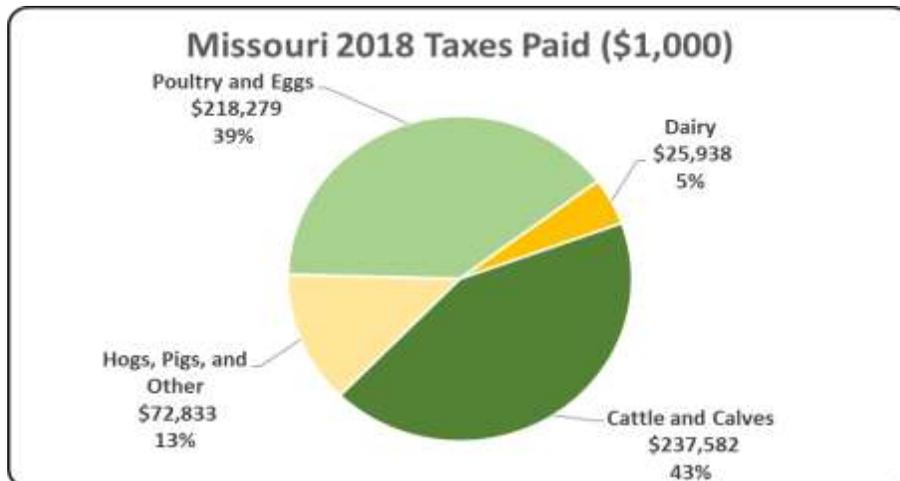
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Missouri’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$554.6 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$234.5 million in property taxes paid by all of Missouri agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



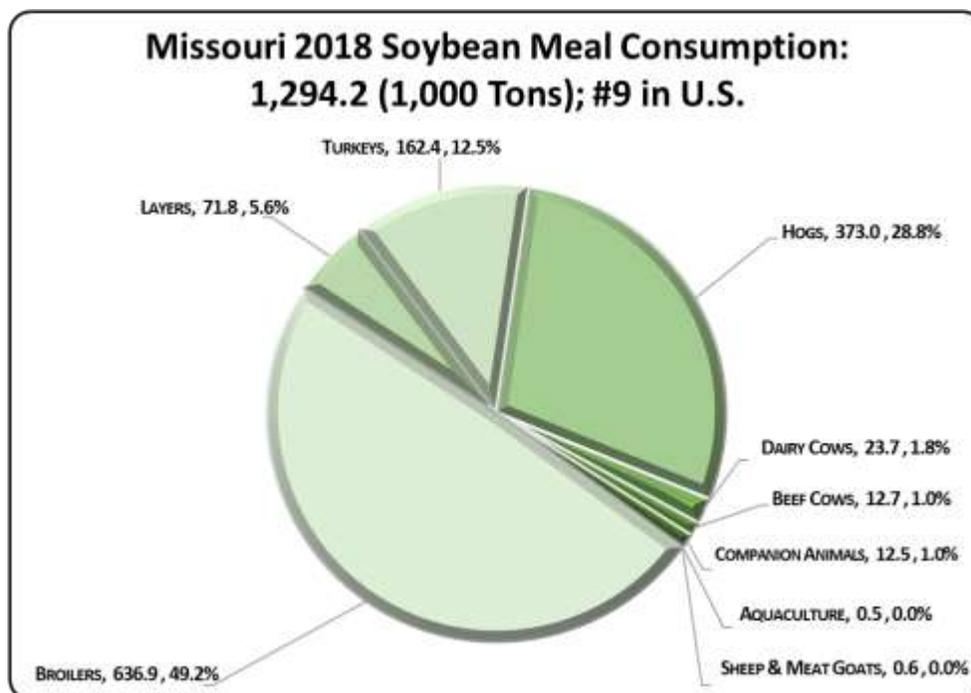
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3. Turkeys (162.4 thousand tons)

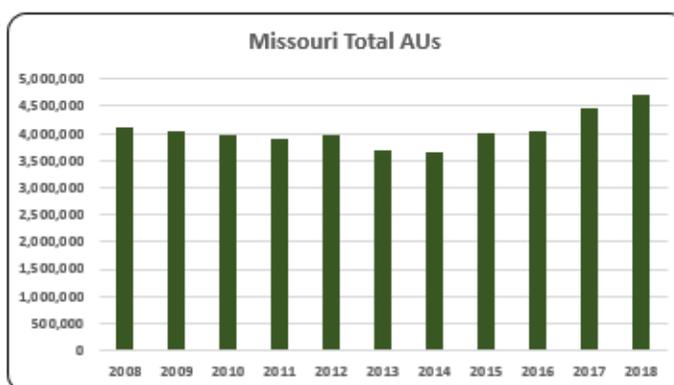
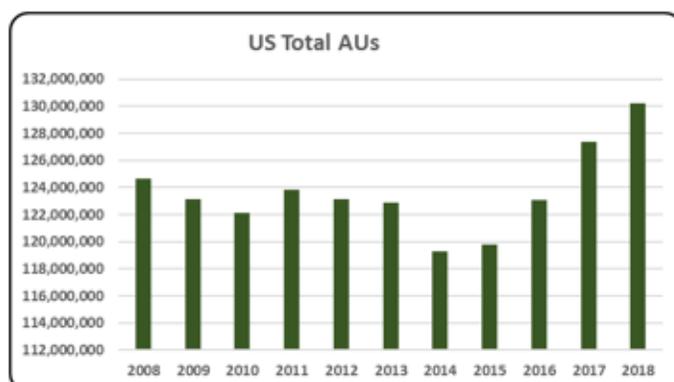


Missouri Animal Unit (AU) Trends

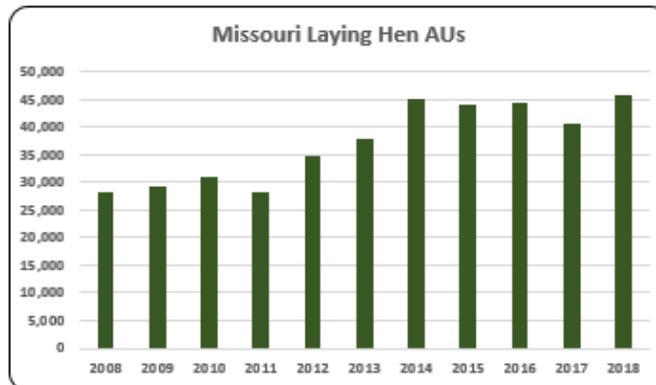
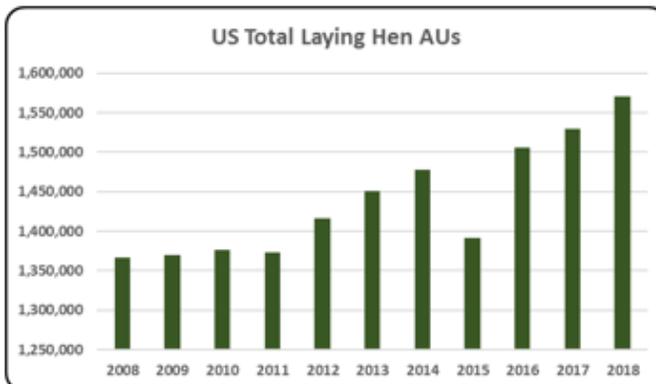
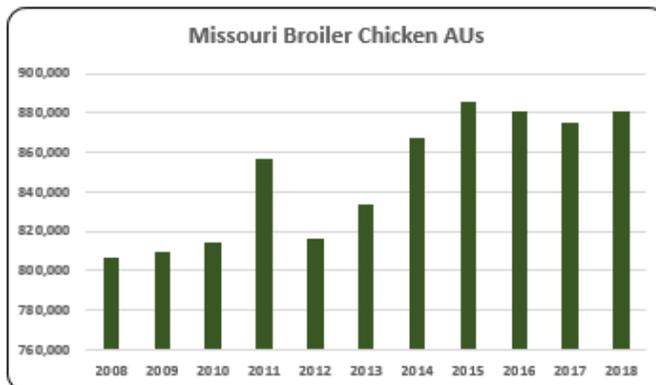
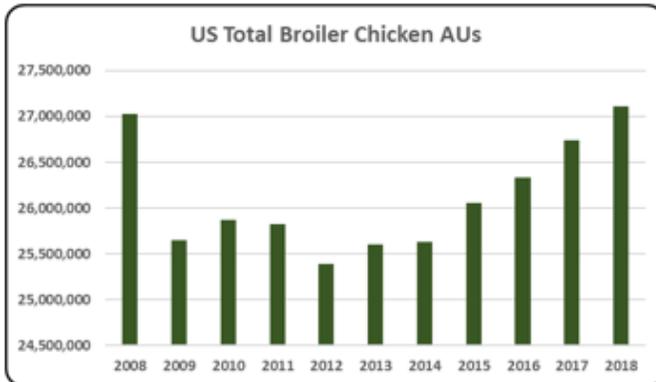
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Missouri. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Missouri and to give perspective on Missouri's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

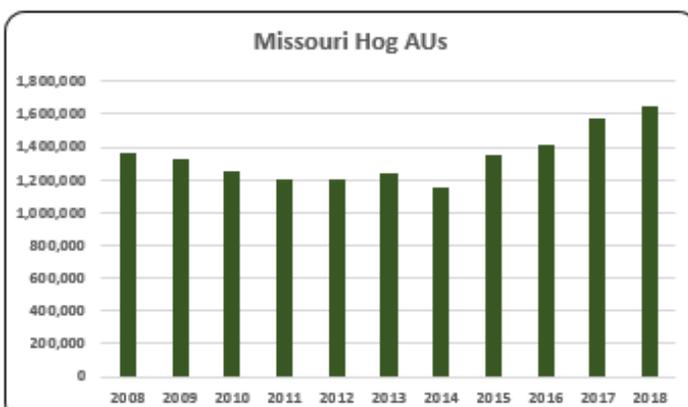
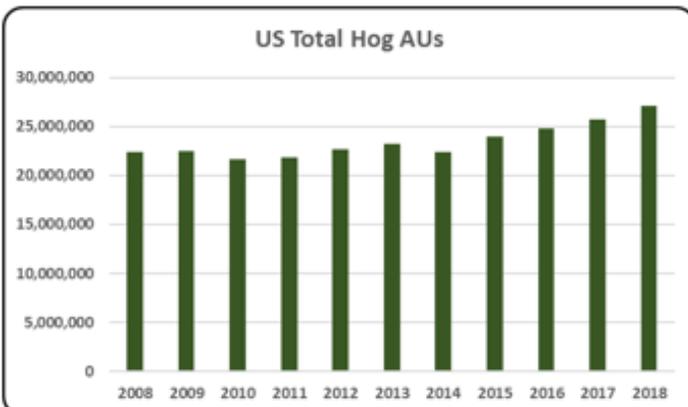
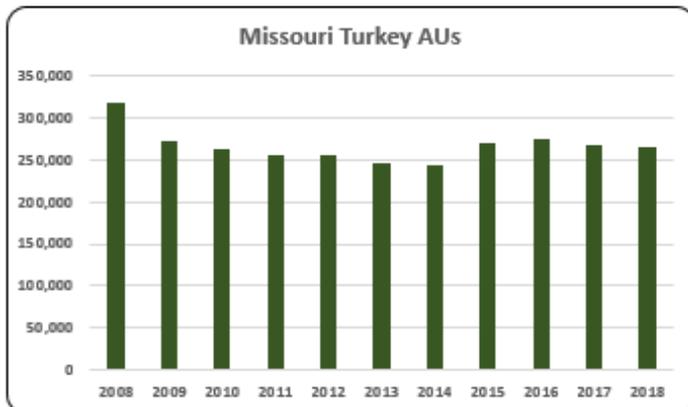
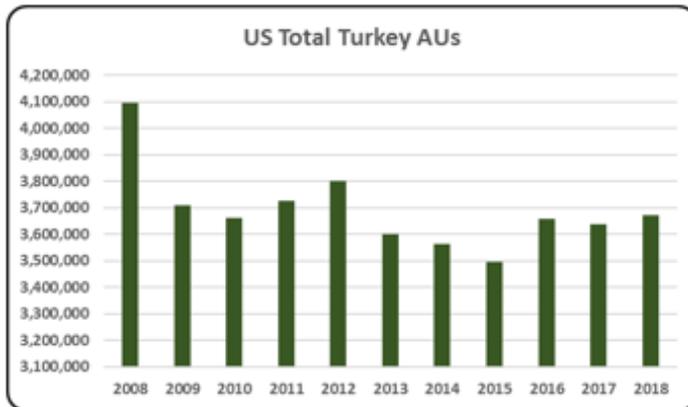
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Missouri, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (1.8 million AUs), Hogs (1,651,050 AUs), and Broilers (880,868 AUs). Total animal units in Missouri during 2018 were 4.7 million AUs.



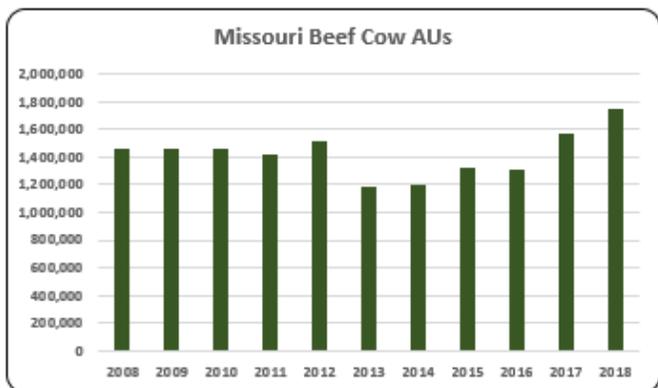
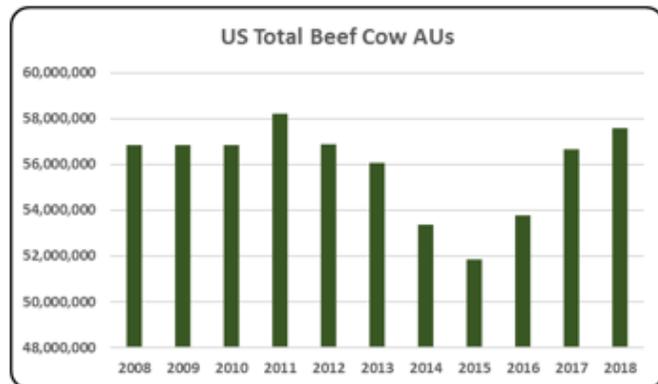
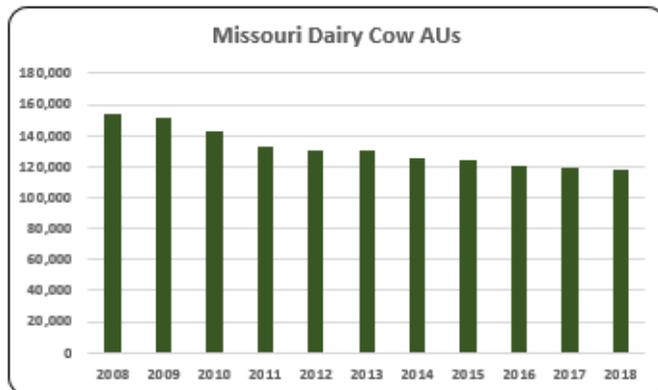
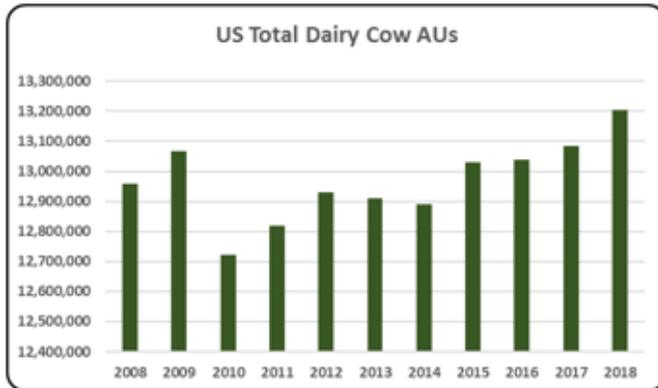
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- The total AUs in Missouri in 2018 were 4.7 million. 37.2% of those AUs were from beef cows and about 35.0% were from hogs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- In 2018, there were 880,868 broiler AUs in Missouri. This is an increase of 9.2% since 2008. 3.25% of all broiler AUs in the U.S. were in Missouri in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens represented 1.0% of animal units in Missouri in 2018. Layer numbers have grown 62.74% from 2008 to 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey numbers had been decreasing throughout the decade but in 2015 and 2016 there was an increase in AUs, however AUs fell again in 2018 (265,411). 7.2% of all turkey AUs in the country were in Missouri in 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs increased 21.3% from the beginning of the decade to 1.7 million hog AUs in 2018 and established a new record high hog AU level in Missouri.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- The average number of dairy cow AUs during 2008-2018 was 131,727. In general, Missouri dairy cow numbers have trended downward during the decade to 117,600 in 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- There were 1.8 million beef cow AUs in 2018. Beef cow AUs have increased 20.2% since the beginning of the decade in 2008.

Missouri Additional Information and Methodology

Animal agriculture is an important part of Missouri's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Missouri, of interest is the degree to which the industry impacts the Missouri economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Missouri animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Missouri's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Missouri which have occurred. As shown in this state report, Missouri has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Missouri. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Missouri Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Missouri’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Missouri, \$1.83 to \$3.06 million in total economic activity, \$0.41 to \$0.63 in household wages and 12 to 17 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.530	\$ 0.502	13.9
	Hogs, Pigs, and Other	\$ 1.831	\$ 0.408	12.1
	Poultry and Eggs	\$ 3.057	\$ 0.631	17.2
	Dairy	\$ 2.452	\$ 0.537	16.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	1,456,950	1,456,950	1,456,950	1,425,450	1,522,500	1,183,050	1,205,850	1,325,850	1,304,550	1,573,800	1,751,100
	Hog and Pig AUs	1,360,800	1,329,600	1,249,290	1,208,100	1,201,575	1,238,025	1,153,125	1,347,225	1,410,180	1,570,500	1,651,050
	Broiler AUs	806,764	809,692	814,422	856,891	816,372	833,767	867,096	885,443	880,616	874,896	880,868
	Turkey AUs	317,957	271,995	264,264	256,537	256,486	246,842	243,647	271,526	275,256	269,017	265,411
	Egg Layer AUs	28,160	29,176	30,840	28,112	34,825	37,833	45,239	44,068	44,550	40,645	45,828
	Dairy AUs	154,000	151,200	142,800	133,000	130,200	130,200	126,000	124,600	120,400	119,000	117,600
	Total Animal Units	4,124,631	4,048,614	3,958,566	3,908,090	3,961,958	3,669,717	3,640,957	3,998,713	4,035,552	4,447,858	4,711,857
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,275,340	\$ 1,166,923	\$ 1,249,386	\$ 1,573,612	\$ 1,592,860	\$ 1,569,300	\$ 2,050,542	\$ 2,035,443	\$ 1,666,622	\$ 1,864,098	\$ 1,976,083
	Hogs and Pigs (\$1,000)	\$ 759,846	\$ 674,301	\$ 698,685	\$ 934,293	\$ 905,013	\$ 960,080	\$ 1,213,765	\$ 936,086	\$ 881,665	\$ 915,948	\$ 723,335
	Broilers (\$1,000)	\$ 351,426	\$ 428,727	\$ 510,928	\$ 628,371	\$ 651,850	\$ 808,221	\$ 882,118	\$ 760,786	\$ 686,265	\$ 775,962	\$ 819,215
	Turkeys (\$1,000)	\$ 357,236	\$ 273,268	\$ 327,095	\$ 367,587	\$ 404,642	\$ 347,670	\$ 403,644	\$ 489,025	\$ 515,546	\$ 397,920	\$ 326,553
	Eggs (\$1,000)	\$ 173,788	\$ 133,665	\$ 160,143	\$ 173,429	\$ 173,312	\$ 225,228	\$ 302,887	\$ 421,325	\$ 189,889	\$ 201,090	\$ 297,684
	Milk (\$1,000)	\$ 305,235	\$ 203,840	\$ 239,870	\$ 287,316	\$ 264,704	\$ 276,545	\$ 340,218	\$ 252,525	\$ 212,940	\$ 231,880	\$ 201,786
	Other	\$ 13,662	\$ 14,700	\$ 16,785	\$ 16,881	\$ 17,734	\$ 18,500	\$ 17,951	\$ 19,261	\$ 19,704	\$ 20,659	\$ 21,833
	Sheep and Lambs (\$1,000)	\$ 5,184	\$ 5,778	\$ 7,418	\$ 7,069	\$ 7,478	\$ 7,743	\$ 6,693	\$ 7,502	\$ 7,444	\$ 7,898	\$ 8,571
	Aquaculture (\$1,000)	\$ 8,478	\$ 8,922	\$ 9,367	\$ 9,811	\$ 10,256	\$ 10,757	\$ 11,258	\$ 11,759	\$ 12,260	\$ 12,761	\$ 13,262
	Total (\$1,000)	\$ 3,236,533	\$ 2,895,425	\$ 3,202,892	\$ 3,981,489	\$ 4,010,114	\$ 4,205,544	\$ 5,211,125	\$ 4,914,451	\$ 4,172,631	\$ 4,407,557	\$ 4,366,489

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	48,441	44,336	40,724	41,949	
	Cattle feedlots (112112)	3,029	1,300	730	638	
	Dairy cattle and milk production (11212)	2,664	1,705	1,153	944	
	Hog and pig farming (1122)	1,469	1,056	689	992	
	Poultry and egg production (1123)	1,362	2,245	1,645	1,597	
	Sheep and goat farming (1124)	922	1,595	2,086	2,646	
	Animal aquaculture and other animal production (1125,1129)	8,047	9,216	7,265	6,485	
Value of Sales (\$1,000)	Cattle and Calves	1,285,288	1,676,632	1,968,617	1,869,893	
	Hogs and Pigs	570,551	725,738	882,526	1,272,599	
	Poultry and Eggs	784,986	1,265,166	1,441,676	1,626,134	
	Milk*			246,358	221,909	
	Aquaculture	11,107	9,506	10,256	12,761	
	Other (calculated)	38,417	38,262	25,866	46,327	
	Total	2,690,349	3,715,304	4,575,299	5,049,623	
Input Purchases	Livestock and poultry purchased	(Farms)	30,120	25,620	27,112	28,043
		\$1,000	546,196	761,333	906,474	858,466
	Breeding livestock purchased	(Farms)	19,512	17,469	18,367	20,421
		\$1,000	97,217	142,362	209,880	248,613
	Other livestock and poultry purchased	(Farms)	14,508	11,591	12,517	11,651
		\$1,000	448,979	618,971	696,594	609,853
Feed purchased	(Farms)	69,368	59,938	63,616	63,851	
	\$1,000	1,136,939	1,383,506	1,989,225	1,629,153	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 4,999,292	\$ 991,994	27,400	\$ 237,582
	Hogs, Pigs, and Other	\$ 1,364,328	\$ 304,103	9,027	\$ 72,833
	Poultry and Eggs	\$ 4,412,777	\$ 911,396	24,797	\$ 218,279
	Dairy	\$ 494,739	\$ 108,299	3,321	\$ 25,938
	Total	\$ 11,271,137	\$ 2,315,791	64,545	\$ 554,632
Change from 2008 to 2018	Cattle and Calves	\$ 1,143,484	\$ 226,898	6,267	\$ 54,342
	Hogs, Pigs, and Other	\$ (328,120)	\$ (73,137)	(2,171)	\$ (17,516)
	Poultry and Eggs	\$ 1,188,845	\$ 245,539	6,681	\$ 58,807
	Dairy	\$ (399,607)	\$ (87,474)	(2,682)	\$ (20,950)
	Total	\$ 1,604,602	\$ 311,826	8,094	\$ 74,682
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.530	\$ 0.502	13.9	
	Hogs, Pigs, and Other	\$ 1.831	\$ 0.408	12.1	
	Poultry and Eggs	\$ 3.057	\$ 0.631	17.2	
	Dairy	\$ 2.452	\$ 0.537	16.5	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.8%	
	Total			24.0%	
Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.					

2008-2018 Animal Agriculture: MONTANA

Montana Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Montana animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Montana. The success of Montana animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Montana during 2018 animal agriculture contributed:

- \$3.3 billion in economic output
- 21,262 jobs
- \$675.4 million in earnings
- \$163.1 million in income taxes paid at local, state, and federal levels
- \$147.9 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Montana has increased economic output by over \$410.1 million, boosted household earnings by \$83.2 million, contributed 2,630 additional jobs and paid \$20.1 million in additional tax revenues.

Montana's animal agriculture consumed almost 64.6 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (23.9 thousand tons)
- Broilers (13.2 thousand tons)
- Egg-Laying Hens (9.4 thousand tons)

This report examines animal agriculture in Montana over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Montana, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Montana and beyond.

Montana Economic Impact of Animal Agriculture

Animal agriculture is an important part of Montana's economy. In 2018, Montana's animal agriculture contributed the following to the economy:

- About \$3.3 billion in economic output
- \$675.4 million in household earnings
- 21,262 jobs
- \$163.1 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Montana's animal agriculture has:

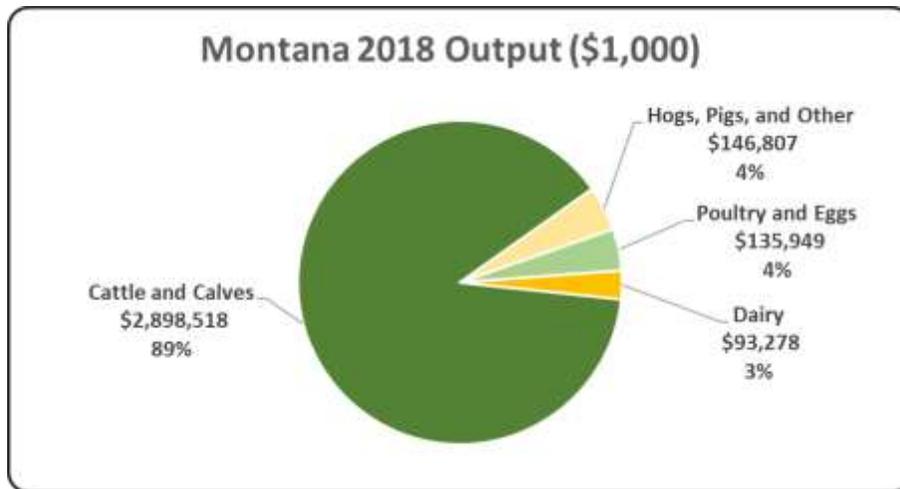
- Increased economic output by \$410.1 million
- Boosted household earnings by \$83.2 million
- Added 2,630 jobs
- Paid an additional \$20.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 3,274,552	\$ 410,065	14.32%
Earnings (\$1,000)	\$ 675,408	\$ 83,164	14.04%
Employment (Jobs)	21,262	2,630	14.11%
Income Taxes Paid (\$1,000)	\$ 163,111	\$ 20,084	14.04%
Property Taxes Paid in 2017 (\$1,000)	\$ 147,883		

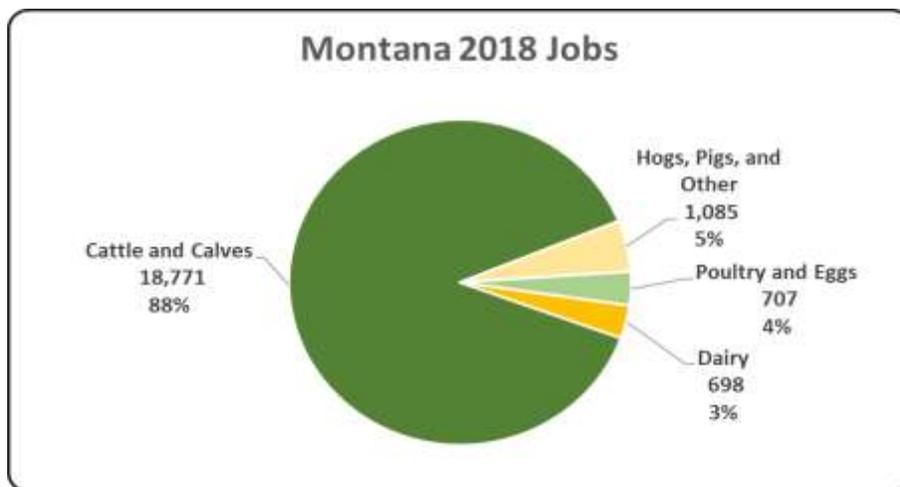
Montana Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Montana economy. Animal agriculture’s impact on Montana total economic output is about \$3.3 billion.



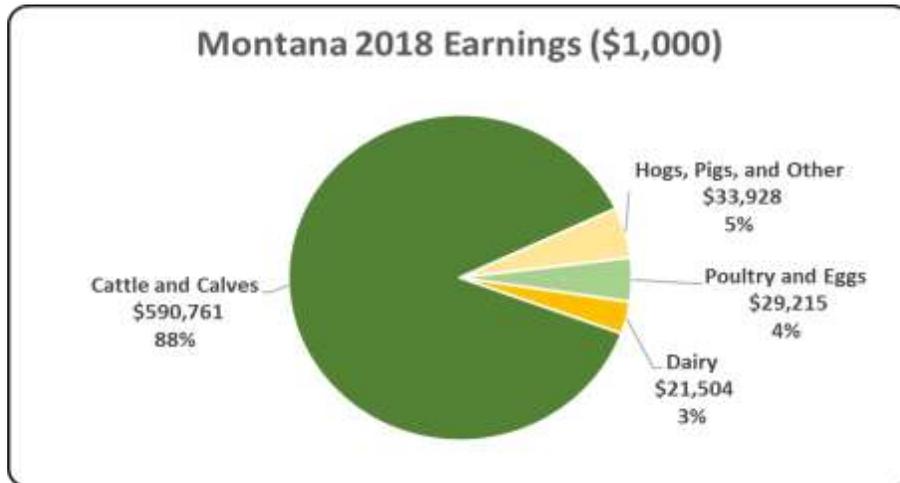
Montana Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Montana in terms of animal agriculture jobs. As shown, animal agriculture contributes 21,262 jobs within and outside of animal agriculture.



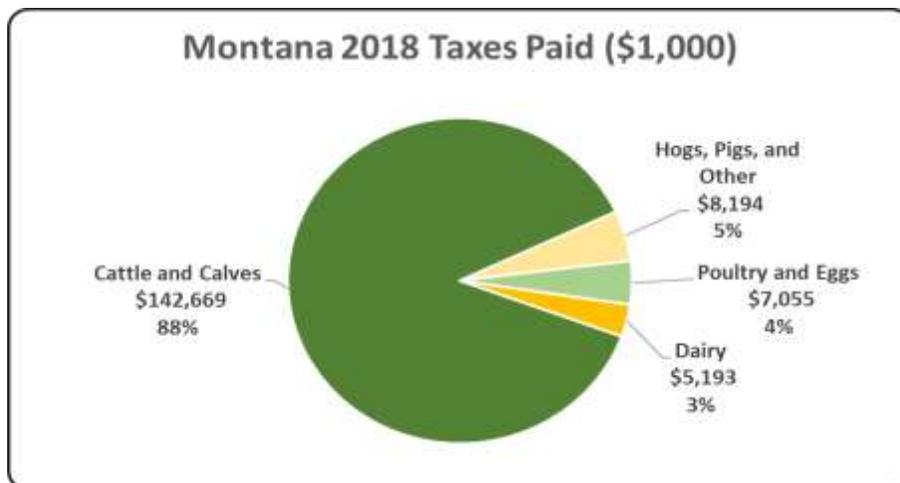
Montana Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Montana economy in terms of earnings. Montana’s animal agriculture contributed about \$675.4 million to household earnings in 2018.



Montana Taxes Paid by Animal Agriculture

Montana’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$163.1 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$147.9 million in property taxes paid by all of Montana agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



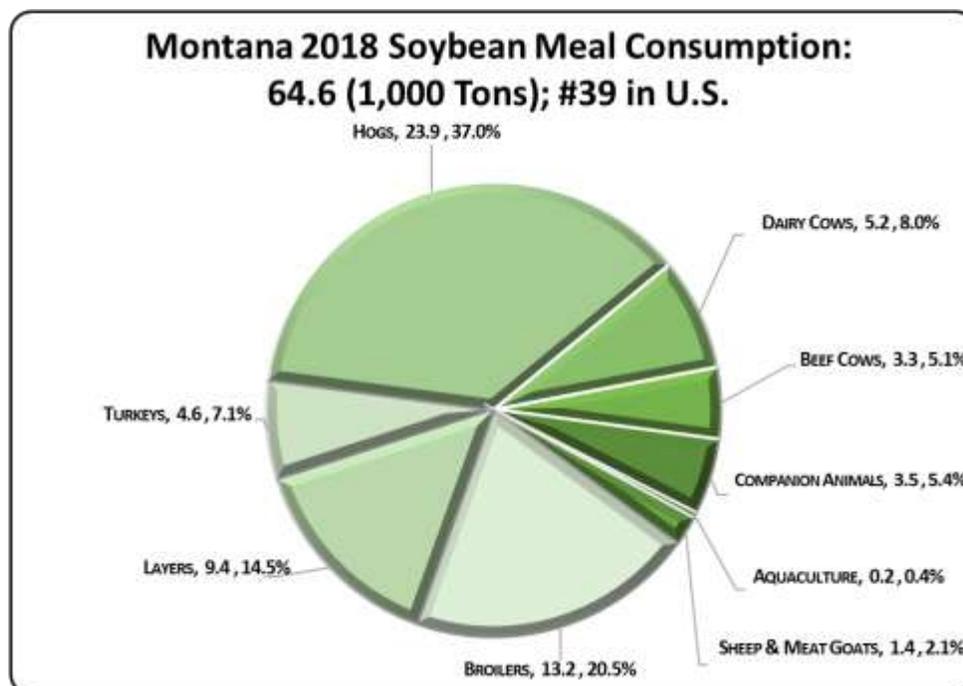
Montana Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Montana's animal agriculture consumed almost 64.6 thousand tons of soybean meal in 2018, placing the state as #39 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Montana consumed 16.7 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (23.9 thousand tons)
2. Broilers (13.2 thousand tons)
3. Egg-Laying Hens (9.4 thousand tons)

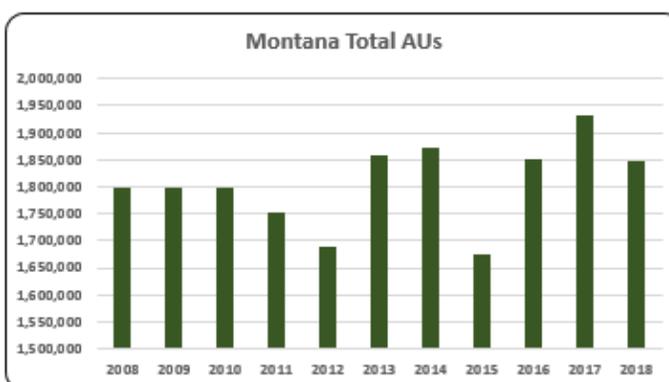
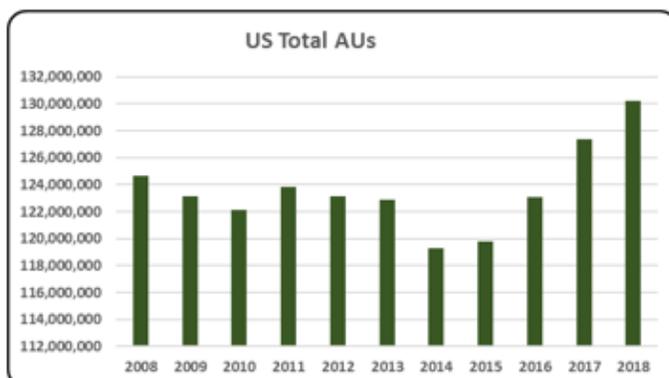


Montana Animal Unit (AU) Trends

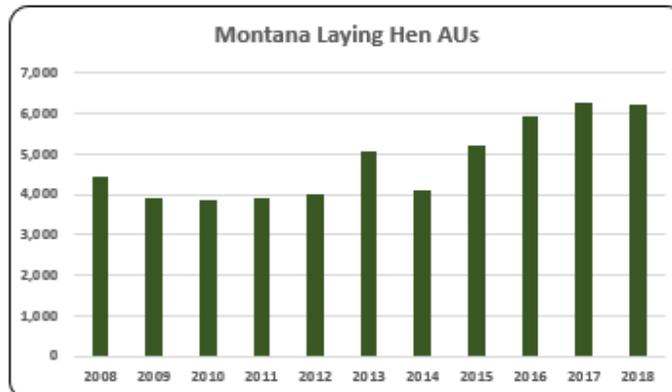
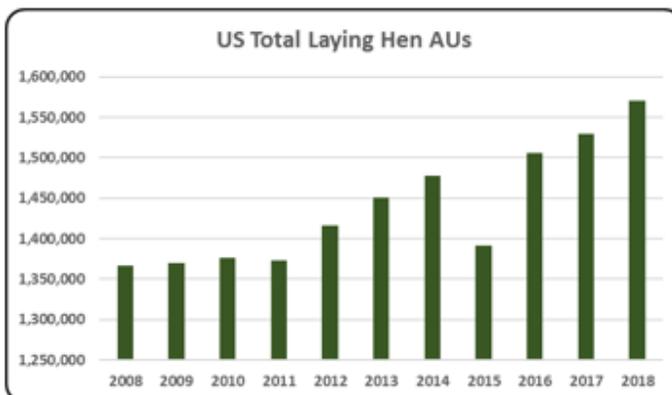
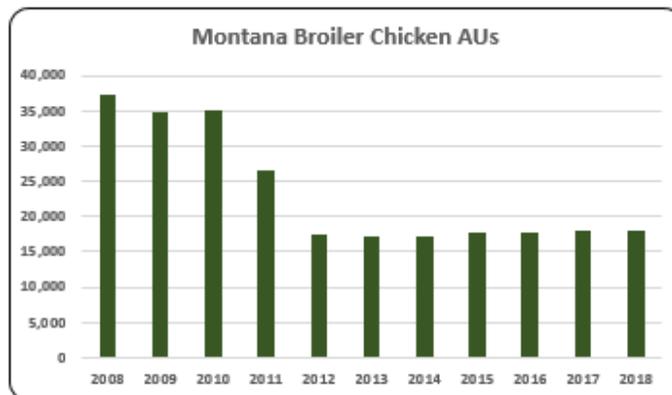
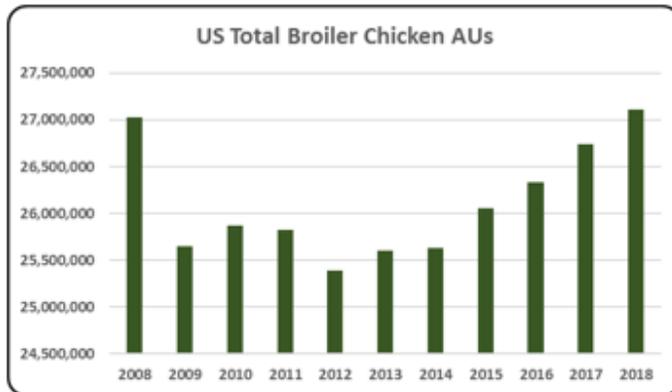
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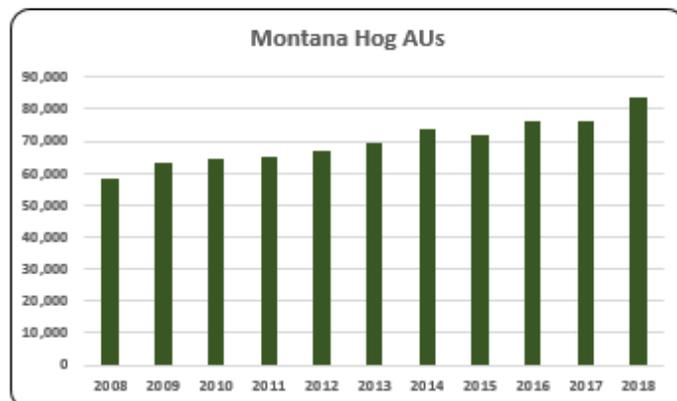
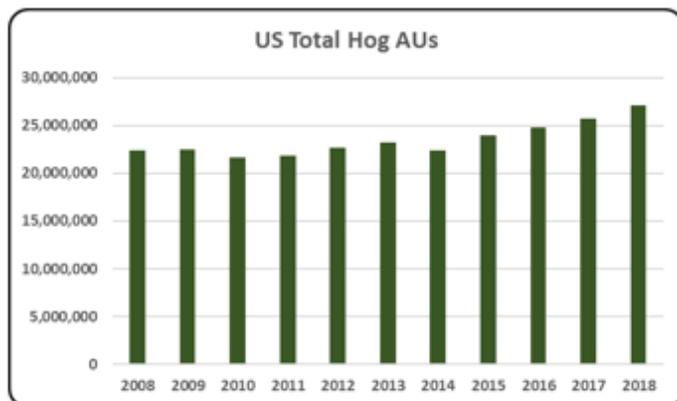
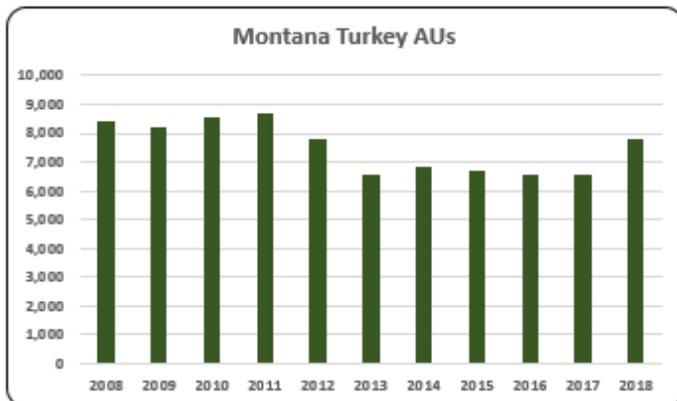
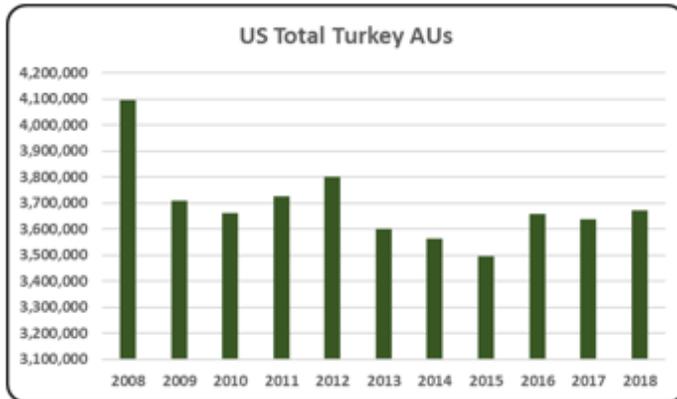
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Montana, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (1.7 million AUs), Hogs (83,400 AUs), and Dairy Cows (18,200 AUs). Total animal units in Montana during 2018 were 1.8 million AUs.



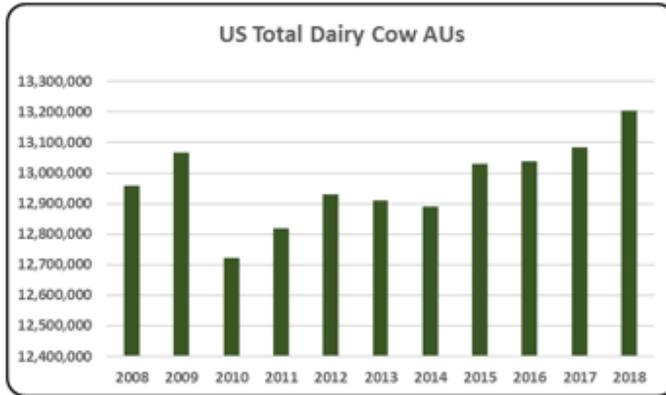
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Total AU numbers in Montana shifted irregularly during the decade with 1.8 million in 2018. This is down from 2017 which was the highest AUs measure of the decade.



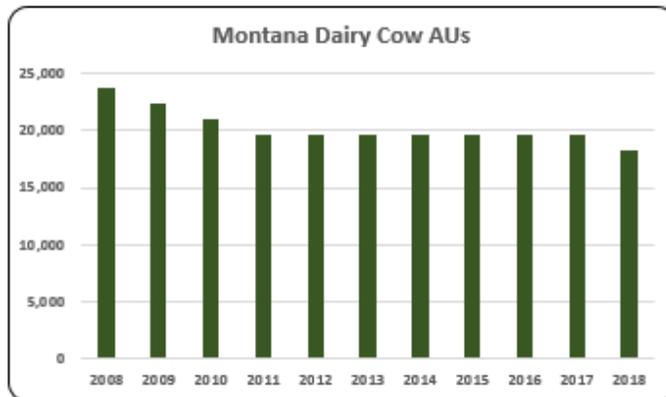
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- There has been a decline of 51.7% in broiler AUs in Montana to 18,013 broiler AUs in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Only 0.3% (6,193 AUs) of all animal units in Montana came from layers in 2018. On average from 2008 to 2018, there has been 4,799 laying hen AUs in the state.



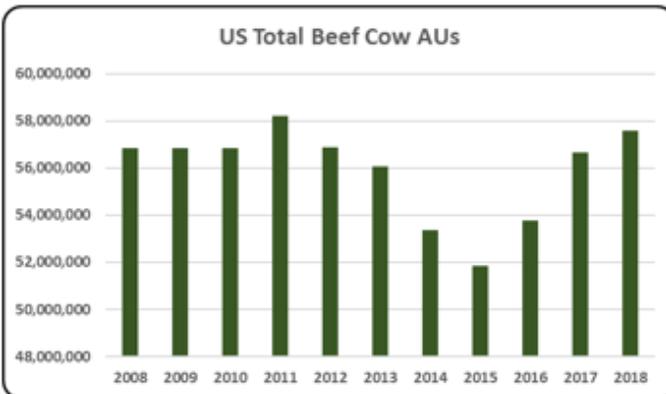
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- In 2018 there were 7,829 turkey AUs in the Montana. Going back to 2008 turkey animal units in Montana have decreased by 6.7%.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog numbers represented about 4.5% of animal units in 2018. Hog AUs increased 43.4% to 83,400 hog AUs in 2018 relative to 2008.



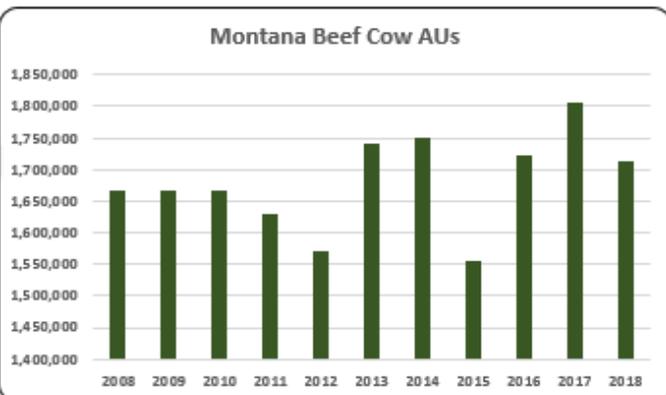
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Dairy cows in Montana have decreased to 18,200 AUs. Going back to 2008 this is a 23.5% decrease.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- About 92.8% (1.7 million) of all AUs in 2018 were beef cow AUs, making it the largest animal unit sector in the state.

Montana Additional Information and Methodology

Animal agriculture is an important part of Montana’s current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Montana, of interest is the degree to which the industry impacts the Montana economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Montana animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years’ past. Also presented are estimates of the change in how animal agriculture has impacted Montana’s economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the “Animal Unit Trends” seeks to quantify production changes in animal agriculture in Montana which have occurred. As shown in this state report, Montana has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Montana. Through in-depth conversations with many of the nation’s top nutritionists and researchers, “bottom up” estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Montana Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Montana’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Montana, \$1.65 to \$2.36 million in total economic activity, \$0.38 to \$0.49 in household wages and 11 to 16 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.364	\$ 0.482	15.3
	Hogs, Pigs, and Other	\$ 1.650	\$ 0.381	12.2
	Poultry and Eggs	\$ 2.200	\$ 0.473	11.4
	Dairy	\$ 2.128	\$ 0.491	15.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	1,666,500	1,666,500	1,666,500	1,628,550	1,571,700	1,740,000	1,750,200	1,554,525	1,723,950	1,805,625	1,712,925	
	Hog and Pig AUs	58,170	63,150	64,350	64,815	67,170	69,630	73,695	72,000	76,200	76,125	83,400	
	Broiler AUs	37,303	34,683	35,149	26,485	17,330	17,270	17,172	17,615	17,747	18,001	18,013	
	Turkey AUs	8,394	8,206	8,550	8,702	7,799	6,536	6,860	6,706	6,544	6,576	7,829	
	Egg Layer AUs	4,414	3,904	3,878	3,900	3,979	5,071	4,106	5,182	5,915	6,245	6,193	
	Dairy AUs	23,800	22,400	21,000	19,600	19,600	19,600	19,600	19,600	19,600	19,600	19,600	18,200
	Total Animal Units	1,798,581	1,798,842	1,799,427	1,752,053	1,687,578	1,858,107	1,871,632	1,675,628	1,849,956	1,932,172	1,846,559	
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 875,617	\$ 773,385	\$ 1,041,683	\$ 1,107,700	\$ 1,263,600	\$ 1,358,818	\$ 1,750,836	\$ 1,659,653	\$ 1,295,999	\$ 1,314,684	\$ 1,225,900	
	Hogs and Pigs (\$1,000)	\$ 35,785	\$ 33,794	\$ 43,709	\$ 54,381	\$ 58,332	\$ 61,604	\$ 71,353	\$ 60,010	\$ 49,679	\$ 54,303	\$ 57,950	
	Broilers (\$1,000)	\$ 29,877	\$ 25,778	\$ 26,938	\$ 23,584	\$ 17,268	\$ 21,041	\$ 22,074	\$ 19,257	\$ 17,122	\$ 20,105	\$ 22,892	
	Turkeys (\$1,000)	\$ 10,970	\$ 10,397	\$ 16,798	\$ 13,209	\$ 14,202	\$ 10,294	\$ 6,810	\$ 6,217	\$ 7,030	\$ 4,760	\$ 5,226	
	Eggs (\$1,000)	\$ 9,567	\$ 6,890	\$ 6,619	\$ 8,682	\$ 8,642	\$ 10,705	\$ 12,965	\$ 22,500	\$ 7,870	\$ 11,192	\$ 33,674	
	Milk (\$1,000)	\$ 59,470	\$ 43,654	\$ 48,841	\$ 57,312	\$ 53,820	\$ 55,726	\$ 66,220	\$ 44,551	\$ 46,610	\$ 50,400	\$ 43,840	
	Other	\$ 18,279	\$ 20,124	\$ 24,611	\$ 25,993	\$ 36,791	\$ 28,946	\$ 27,047	\$ 33,564	\$ 33,569	\$ 32,963	\$ 31,030	
	Sheep and Lambs (\$1,000)	\$ 16,747	\$ 18,182	\$ 22,259	\$ 23,231	\$ 33,619	\$ 25,783	\$ 23,893	\$ 30,418	\$ 30,433	\$ 29,835	\$ 27,910	
	Aquaculture (\$1,000)	\$ 1,532	\$ 1,942	\$ 2,352	\$ 2,762	\$ 3,172	\$ 3,163	\$ 3,154	\$ 3,146	\$ 3,137	\$ 3,128	\$ 3,119	
	Total (\$1,000)	\$ 1,039,565	\$ 914,021	\$ 1,209,199	\$ 1,290,861	\$ 1,452,655	\$ 1,547,135	\$ 1,957,306	\$ 1,845,752	\$ 1,457,880	\$ 1,488,407	\$ 1,420,512	

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	9,859	9,804	8,703	9,585
	Cattle feedlots (112112)	355	244	162	165
	Dairy cattle and milk production (11212)	136	138	75	54
	Hog and pig farming (1122)	142	118	88	110
	Poultry and egg production (1123)	131	398	206	141
	Sheep and goat farming (1124)	687	606	576	798
	Animal aquaculture and other animal production (1125,1129)	4,500	5,294	5,261	5,163
Value of Sales (\$1,000)	Cattle and Calves	1,015,169	1,368,699	1,783,908	1,715,741
	Hogs and Pigs	26,531	36,331	54,091	59,728
	Poultry and Eggs	5,243	7,975	withheld	23,239
	Milk*			44,671	45,428
	Aquaculture	4,185	3,188	3,172	3,128
	Other (calculated)	55,821	58,386	31,233	88,344
	Total	1,106,949	1,474,579	1,917,075	1,935,608
Input Purchases	Livestock and poultry purchased	(Farms) 7,935	7,287	8,619	8,151
		\$1,000 207,332	291,561	365,896	306,329
	Breeding livestock purchased	(Farms) 5,514	5,523	6,466	6,131
		\$1,000 41,400	90,394	117,977	122,237
	Other livestock and poultry purchased	(Farms) 3,700	2,996	3,507	3,276
		\$1,000 165,932	201,167	247,919	184,092
Feed purchased	(Farms) 15,381	13,716	16,861	17,316	
	\$1,000 192,619	219,242	439,672	393,577	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 2,898,518	\$ 590,761	18,771	\$ 142,669
	Hogs, Pigs, and Other	\$ 146,807	\$ 33,928	1,085	\$ 8,194
	Poultry and Eggs	\$ 135,949	\$ 29,215	707	\$ 7,055
	Dairy	\$ 93,278	\$ 21,504	698	\$ 5,193
	Total	\$ 3,274,552	\$ 675,408	21,262	\$ 163,111

Change from 2008 to 2018	Cattle and Calves	\$ 424,395	\$ 86,498	2,748	\$ 20,889
	Hogs, Pigs, and Other	\$ 40,209	\$ 9,292	297	\$ 2,244
	Poultry and Eggs	\$ 3,398	\$ 730	18	\$ 176
	Dairy	\$ (57,936)	\$ (13,356)	(434)	\$ (3,226)
	Total	\$ 410,065	\$ 83,164	2,630	\$ 20,084

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.364	\$ 0.482	15.3
	Hogs, Pigs, and Other	\$ 1.650	\$ 0.381	12.2
	Poultry and Eggs	\$ 2.200	\$ 0.473	11.4
	Dairy	\$ 2.128	\$ 0.491	15.9

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.0%
	Total	24.2%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NEBRASKA

Nebraska Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Nebraska animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Nebraska. The success of Nebraska animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Nebraska during 2018 animal agriculture contributed:

- \$15.0 billion in economic output
- 66,162 jobs
- \$3.1 billion in earnings
- \$781.1 million in income taxes paid at local, state, and federal levels
- \$686.5 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Nebraska has increased economic output by over \$309.2 million, boosted household earnings by \$57.8 million, contributed 1,258 additional jobs and paid \$14.4 million in additional tax revenues.

Nebraska's animal agriculture consumed almost 573.8 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (364.8 thousand tons)
- Beef Cows (73.2 thousand tons)
- Egg-Laying Hens (69.5 thousand tons)

This report examines animal agriculture in Nebraska over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Nebraska, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Nebraska and beyond.

Nebraska Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Nebraska's economy. In 2018, Nebraska's animal agriculture contributed the following to the economy:

- About \$15.0 billion in economic output
- \$3.1 billion in household earnings
- 66,162 jobs
- \$781.1 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Nebraska's animal agriculture has:

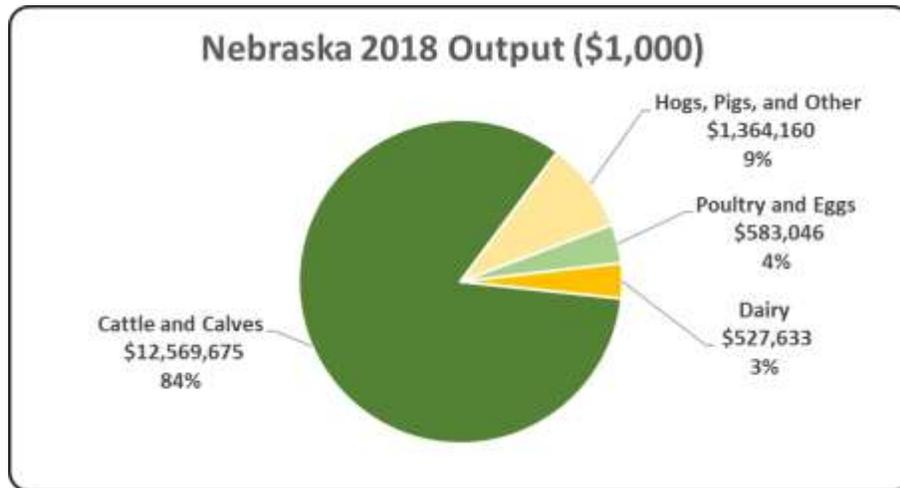
- Increased economic output by \$309.2 million
- Boosted household earnings by \$57.8 million
- Added 1,258 jobs
- Paid an additional \$14.4 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 15,044,514	\$ 309,227	2.10%
Earnings (\$1,000)	\$ 3,143,066	\$ 57,798	1.87%
Employment (Jobs)	66,162	1,258	1.94%
Income Taxes Paid (\$1,000)	\$ 781,052	\$ 14,363	1.87%
Property Taxes Paid in 2017 (\$1,000)	\$ 686,485		

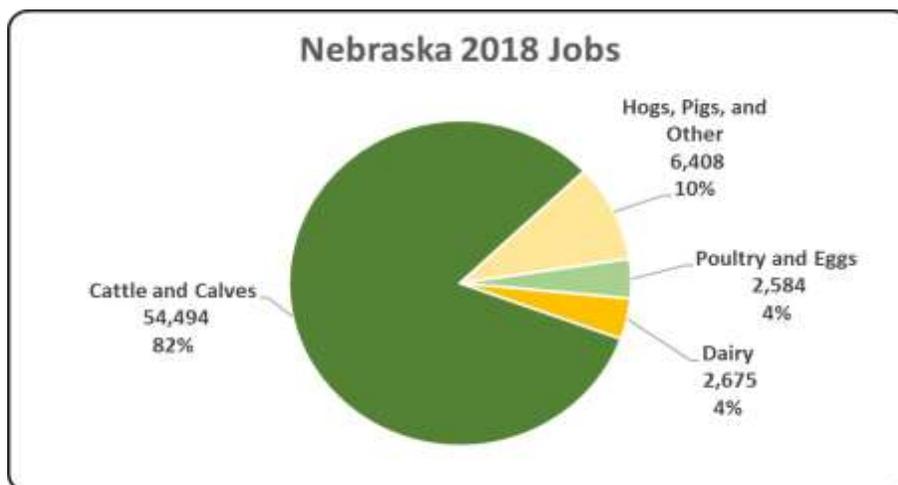
Nebraska Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Nebraska economy. Animal agriculture’s impact on Nebraska total economic output is about \$15.0 billion.



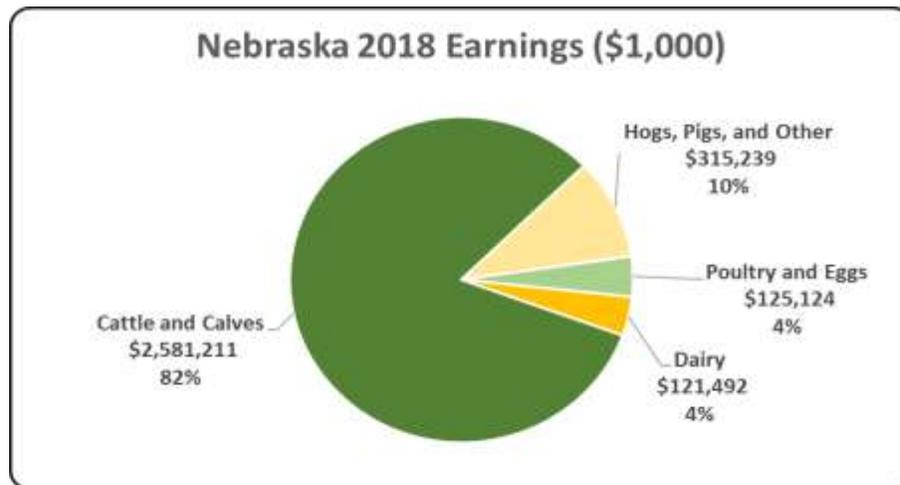
Nebraska Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Nebraska in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Nebraska total jobs, contributing 66,162 jobs within and outside of animal agriculture.



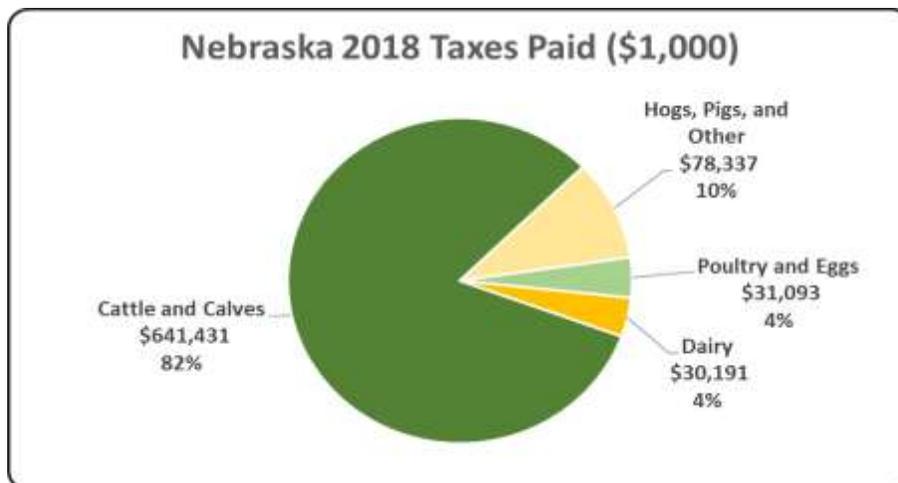
Nebraska Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Nebraska economy in terms of earnings. Nebraska’s animal agriculture contributed about \$3.1 billion to household earnings in 2018.



Nebraska Taxes Paid by Animal Agriculture

Nebraska’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$781.1 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$686.5 million in property taxes paid by all of Nebraska agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



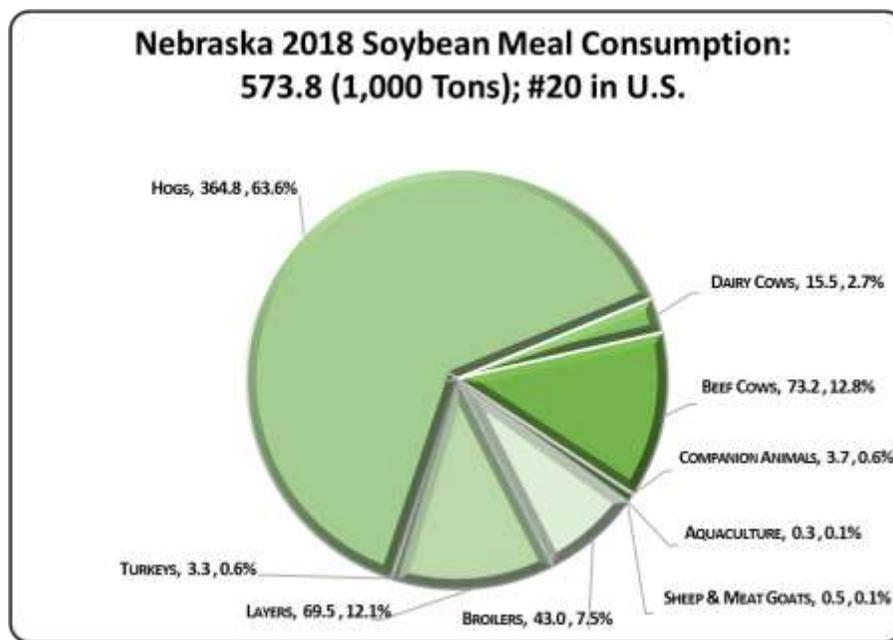
Nebraska Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Nebraska's animal agriculture consumed almost 573.8 thousand tons of soybean meal in 2018, placing the state as #20 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Nebraska consumed 374.2 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (364.8 thousand tons)
2. Beef Cows (73.2 thousand tons)
3. Egg-Laying Hens (69.5 thousand tons)

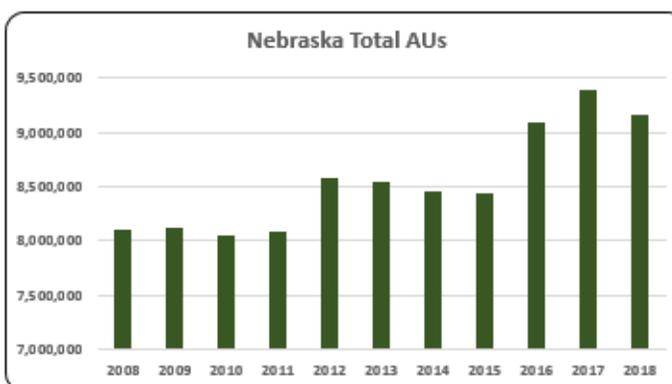
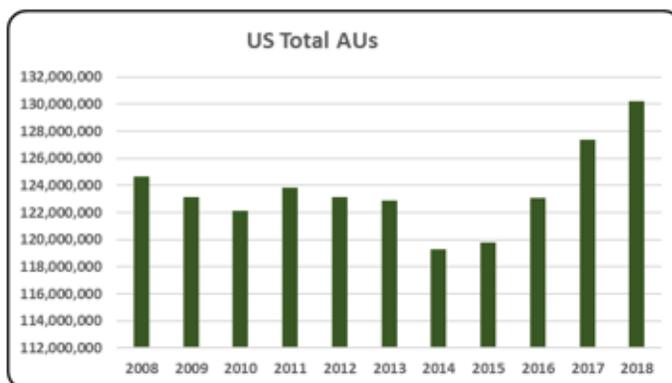


Nebraska Animal Unit (AU) Trends

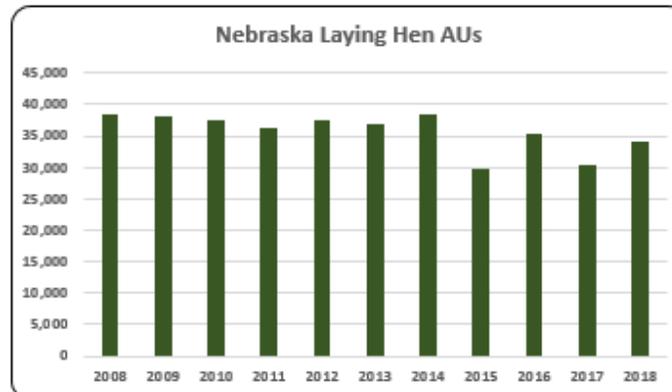
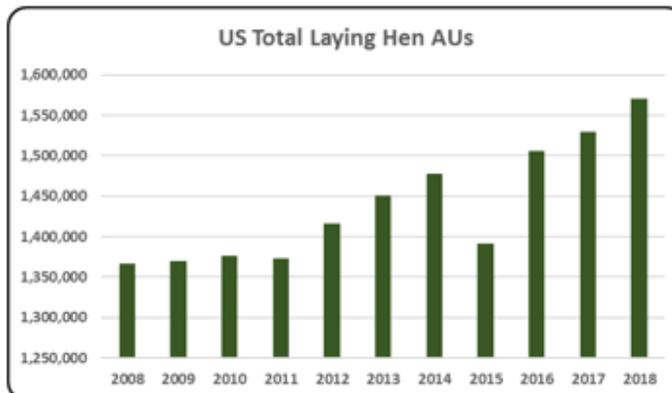
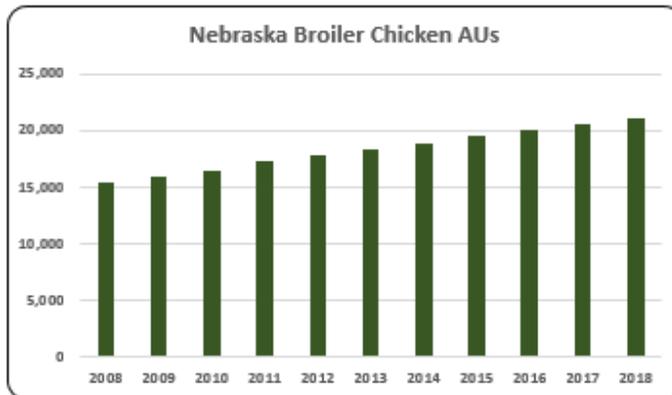
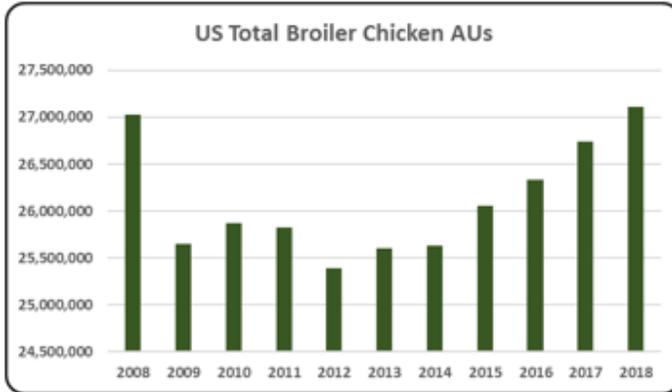
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Nebraska. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Nebraska and to give perspective on Nebraska's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

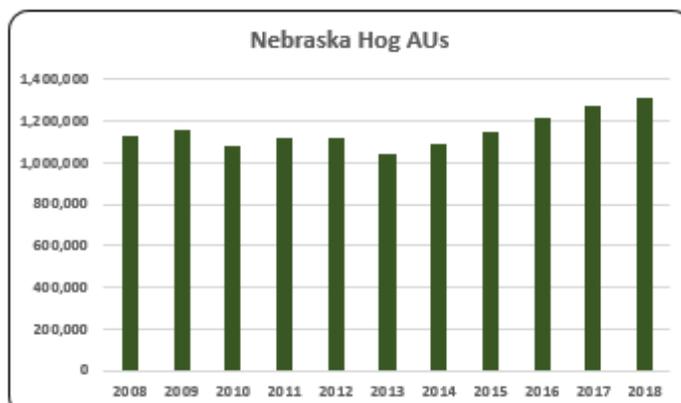
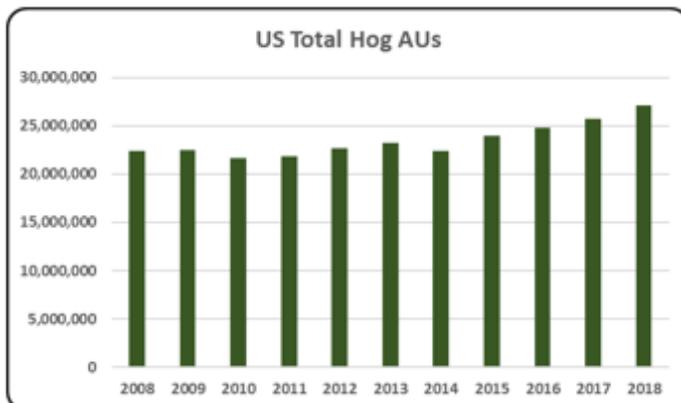
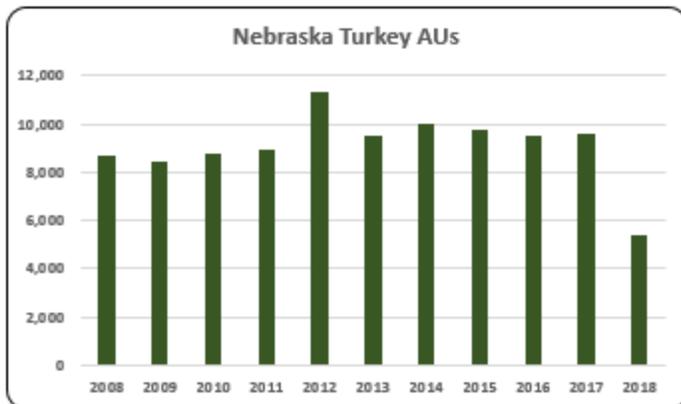
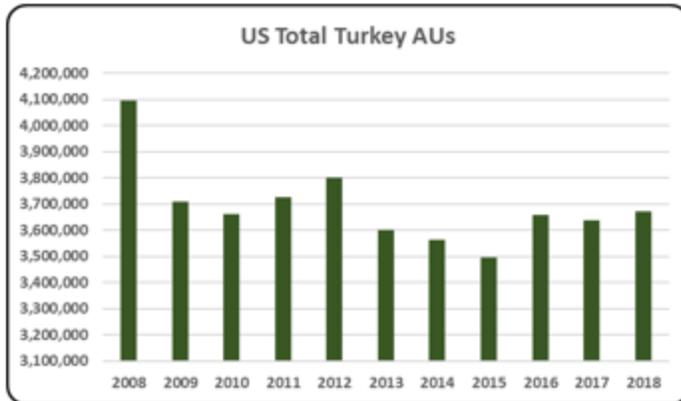
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Nebraska, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (7.7 million AUs), Hogs (1,315,050 AUs), and Dairy Cows (84,000 AUs). Total animal units in Nebraska during 2018 were 9.2 million AUs.



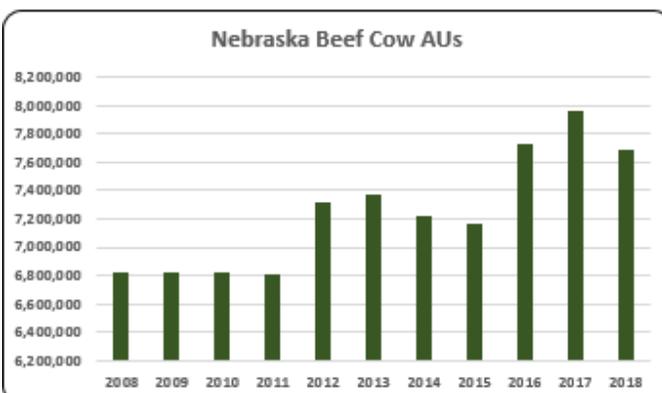
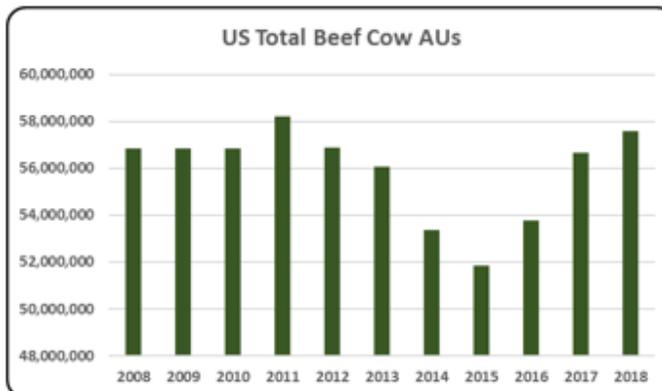
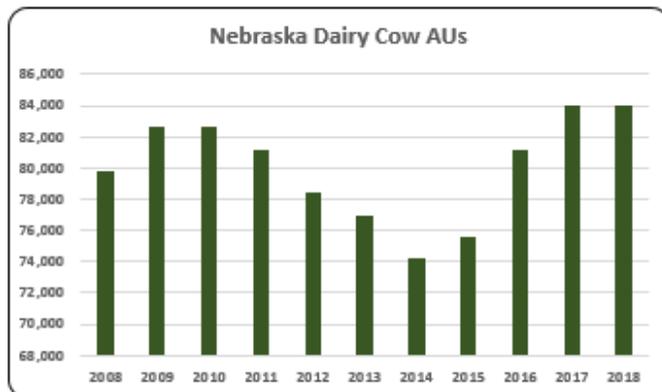
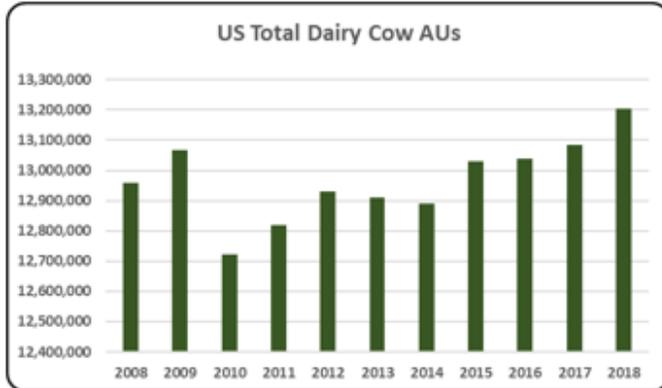
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- The number of AUs in Nebraska in 2018 was 9.2 million. AUs have risen 13.1% during the 2008-2018 period.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broilers in Nebraska represented only 0.1% (21,037 AUs) of all U.S. broiler AUs in 2018. The average broiler AUs from 2008 to 2018 was 18,244.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 0.4% (33,992 AUs) of all AUs in the state of Nebraska came from laying hens in 2018. Layer AUs have declined 11.7% since 2008.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- In 2018 Nebraska had 5,406 turkey AUs which was a 37.6% decrease from 2008. From 2008 to 2018 Nebraska averaged 9,094 turkey AUs.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- 4.9% (1.3 million AUs) of hog AUs in the U.S. came from Nebraska in 2018. Hog animal unit numbers in 2018 set a decade high in Nebraska going back to 2008.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cows represented 0.9% (84,000 AUs) of all animal units in the state in 2018. Dairy cow numbers in 2018 are the same as they were in 2017. The decade low was in 2014 with 9,800 AUs less than this year.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cows in Nebraska represented 84.1% (7.7 million AUs) in 2018. The industry has climbed 12.7% since the beginning of the decade in 2008 and represents 13.4% of U.S. beef cow AUs.

Nebraska Additional Information and Methodology

Animal agriculture is an important part of Nebraska's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Nebraska, of interest is the degree to which the industry impacts the Nebraska economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Nebraska animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Nebraska's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Nebraska which have occurred. As shown in this state report, Nebraska has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Nebraska. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Nebraska Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Nebraska's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Nebraska, \$1.72 to \$2.70 million in total economic activity, \$0.40 to \$0.58 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.369	\$ 0.487	10.3
	Hogs, Pigs, and Other	\$ 1.721	\$ 0.398	8.1
	Poultry and Eggs	\$ 2.695	\$ 0.578	11.9
	Dairy	\$ 2.262	\$ 0.521	11.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	6,827,850	6,827,850	6,827,850	6,813,900	7,318,650	7,367,100	7,220,550	7,160,550	7,726,050	7,969,800	7,695,300
	Hog and Pig AUs	1,124,700	1,153,050	1,079,550	1,122,000	1,117,650	1,040,250	1,087,050	1,147,650	1,215,000	1,268,550	1,315,050
	Broiler AUs	15,333	15,830	16,362	17,246	17,794	18,334	18,875	19,416	19,957	20,497	21,037
	Turkey AUs	8,657	8,463	8,817	8,974	11,354	9,516	9,988	9,763	9,528	9,574	5,406
	Egg Layer AUs	38,513	38,020	37,484	36,252	37,431	36,884	38,311	29,709	35,356	30,257	33,992
	Dairy AUs	79,800	82,600	82,600	81,200	78,400	77,000	74,200	75,600	81,200	84,000	84,000
	Total Animal Units	8,094,852	8,125,813	8,052,663	8,079,572	8,581,279	8,549,085	8,448,973	8,442,687	9,087,091	9,382,678	9,154,785
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 4,201,844	\$ 3,746,363	\$ 4,108,779	\$ 5,044,827	\$ 5,820,360	\$ 5,860,830	\$ 7,284,189	\$ 7,393,904	\$ 6,330,536	\$ 6,168,424	\$ 5,305,675
	Hogs and Pigs (\$1,000)	\$ 710,448	\$ 622,442	\$ 800,932	\$ 913,304	\$ 842,576	\$ 844,760	\$ 1,006,209	\$ 784,512	\$ 732,697	\$ 804,920	\$ 775,639
	Broilers (\$1,000)	\$ 9,615	\$ 5,676	\$ 3,305	\$ 13,635	\$ 14,344	\$ 14,967	\$ 15,168	\$ 14,795	\$ 14,523	\$ 15,015	\$ 14,517
	Turkeys (\$1,000)	\$ 14,888	\$ 14,110	\$ 17,323	\$ 13,621	\$ 14,646	\$ 10,616	\$ 7,023	\$ 9,051	\$ 10,235	\$ 6,930	\$ 3,608
	Eggs (\$1,000)	\$ 225,242	\$ 146,859	\$ 152,857	\$ 169,837	\$ 180,838	\$ 197,279	\$ 240,640	\$ 281,147	\$ 99,773	\$ 130,922	\$ 198,202
	Milk (\$1,000)	\$ 204,687	\$ 160,532	\$ 202,064	\$ 249,849	\$ 232,456	\$ 244,650	\$ 298,750	\$ 232,646	\$ 236,431	\$ 262,808	\$ 233,280
	Other	\$ 9,833	\$ 9,825	\$ 11,852	\$ 11,676	\$ 15,385	\$ 14,415	\$ 16,611	\$ 19,128	\$ 17,484	\$ 18,153	\$ 17,017
	Sheep and Lambs (\$1,000)	\$ 7,312	\$ 7,046	\$ 8,816	\$ 8,383	\$ 11,835	\$ 10,751	\$ 12,833	\$ 15,237	\$ 13,479	\$ 14,035	\$ 12,785
	Aquaculture (\$1,000)	\$ 2,521	\$ 2,779	\$ 3,036	\$ 3,293	\$ 3,550	\$ 3,664	\$ 3,777	\$ 3,891	\$ 4,004	\$ 4,118	\$ 4,232
	Total (\$1,000)	\$ 5,376,557	\$ 4,705,806	\$ 5,297,111	\$ 6,416,749	\$ 7,120,605	\$ 7,187,517	\$ 8,868,590	\$ 8,735,182	\$ 7,441,679	\$ 7,407,172	\$ 6,547,938

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	12,709	10,775	11,788	11,551	
	Cattle feedlots (112112)	2,511	1,534	1,083	1,093	
	Dairy cattle and milk production (11212)	507	267	247	204	
	Hog and pig farming (1122)	1,302	936	644	587	
	Poultry and egg production (1123)	173	489	282	288	
	Sheep and goat farming (1124)	464	558	837	854	
	Animal aquaculture and other animal production (1125,1129)	2,360	2,489	3,954	2,993	
Value of Sales (\$1,000)	Cattle and Calves	5,401,018	7,358,555	10,098,166	10,641,897	
	Hogs and Pigs	590,581	923,209	1,085,828	1,489,081	
	Poultry and Eggs	142,442	165,265	216,370	194,462	
	Milk*			219,724	287,974	
	Aquaculture	2,170	3,826	3,550	4,118	
	Other (calculated)	30,240	39,789	44,375	54,890	
	Total	6,166,451	8,490,644	11,668,013	12,672,422	
Input Purchases	Livestock and poultry purchased	(Farms)	16,074	13,253	16,094	14,041
		\$1,000	3,211,783	4,066,702	5,117,496	5,745,566
	Breeding livestock purchased	(Farms)	9,741	8,516	10,656	9,788
		\$1,000	90,966	175,943	251,297	297,085
	Other livestock and poultry purchased	(Farms)	9,173	6,927	8,217	6,543
		\$1,000	3,120,817	3,890,759	4,866,199	5,448,481
	Feed purchased	(Farms)	26,376	21,335	28,254	25,191
		\$1,000	1,490,523	2,045,635	3,981,917	3,245,145

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 12,569,675	\$ 2,581,211	54,494	\$ 641,431
	Hogs, Pigs, and Other	\$ 1,364,160	\$ 315,239	6,408	\$ 78,337
	Poultry and Eggs	\$ 583,046	\$ 125,124	2,584	\$ 31,093
	Dairy	\$ 527,633	\$ 121,492	2,675	\$ 30,191
	Total	\$ 15,044,514	\$ 3,143,066	66,162	\$ 781,052
Change from 2008 to 2018	Cattle and Calves	\$ 673,442	\$ 138,293	2,920	\$ 34,366
	Hogs, Pigs, and Other	\$ (117,229)	\$ (27,090)	(551)	\$ (6,732)
	Poultry and Eggs	\$ (221,357)	\$ (47,504)	(981)	\$ (11,805)
	Dairy	\$ (25,629)	\$ (5,901)	(130)	\$ (1,466)
	Total	\$ 309,227	\$ 57,798	1,258	\$ 14,363
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.369	\$ 0.487	10.3	
	Hogs, Pigs, and Other	\$ 1.721	\$ 0.398	8.1	
	Poultry and Eggs	\$ 2.695	\$ 0.578	11.9	
	Dairy	\$ 2.262	\$ 0.521	11.5	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.7%	
	Total			24.9%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NEVADA

Nevada Executive Summary

The use of soybean meal as a key feed ingredient is a modest part of Nevada animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture success in the State of Nevada. The success of Nevada animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Nevada during 2018:

- \$585.6 million in economic output
- 3,265 jobs
- \$121.6 million in earnings
- \$24.6 million in income taxes paid at local, state, and federal levels
- \$19.0 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Nevada has increased economic output by over \$51.6 million, boosted household earnings by \$9.8 million, contributed 273 additional jobs and paid \$2.0 million in additional tax revenues.

Nevada's animal agriculture consumed almost 21,700 tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (11,000 tons)
- Companion Animals (4,000 tons)
- Broilers (2,400 tons)

This report examines animal agriculture in Nevada over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Nevada, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Nevada and beyond.

Nevada Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Nevada's economy. In 2018, Nevada's animal agriculture contributed the following to the economy:

- About \$585.6 million in economic output
- \$121.6 million in household earnings
- 3,265 jobs
- \$24.6 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Nevada's animal agriculture has:

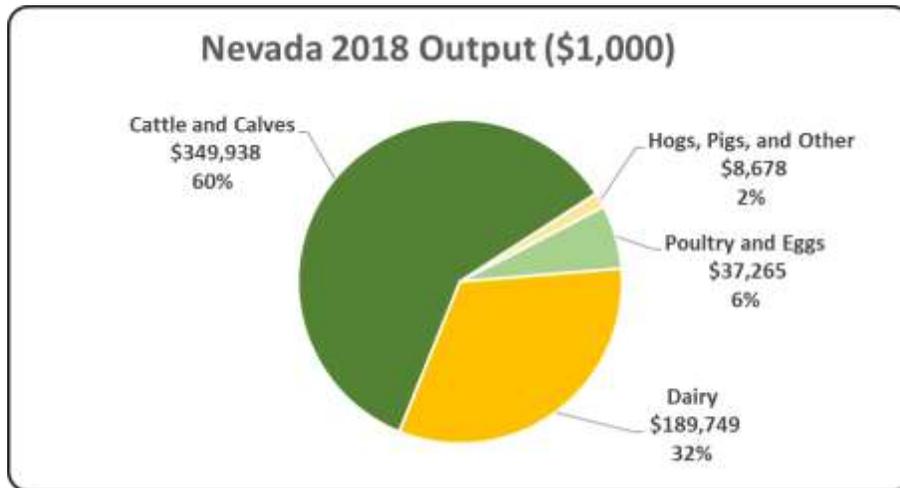
- Increased economic output by \$51.6 million
- Boosted household earnings by \$9.8 million
- Added 273 jobs
- Paid an additional \$2.0 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 585,629	\$ 51,562	9.65%
Earnings (\$1,000)	\$ 121,607	\$ 9,755	8.72%
Employment (Jobs)	3,265	273	9.12%
Income Taxes Paid (\$1,000)	\$ 24,565	\$ 1,971	8.72%
Property Taxes Paid in 2017 (\$1,000)	\$ 18,985		

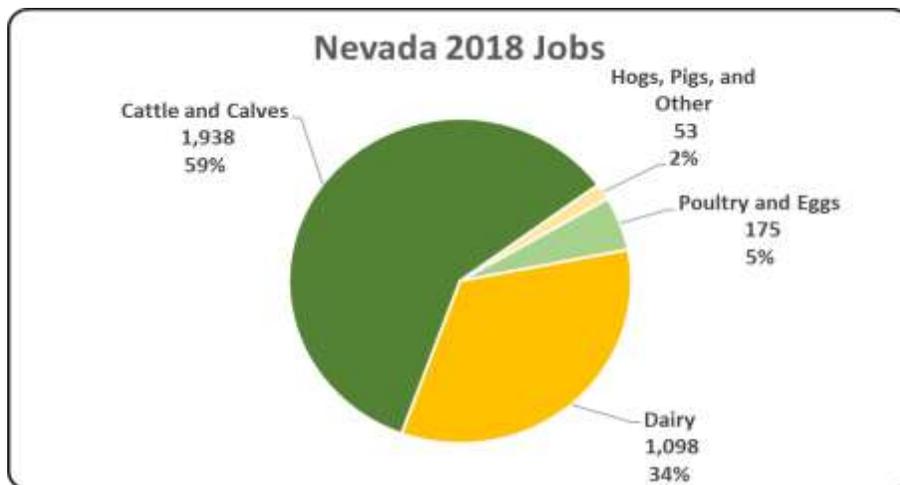
Nevada Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Nevada economy. Animal agriculture’s impact on Nevada total economic output is about \$585.6 million.



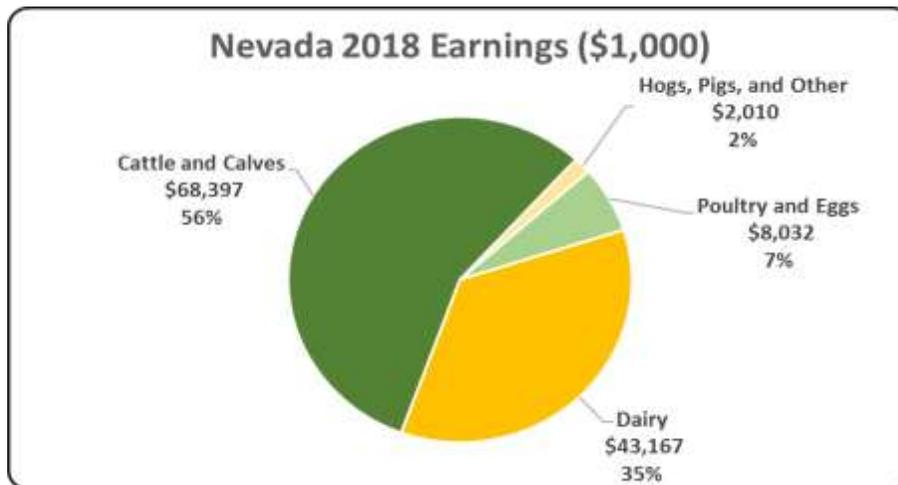
Nevada Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Nevada in terms of animal agriculture jobs. As shown, animal agriculture contributes 3,265 jobs within and outside of animal agriculture.



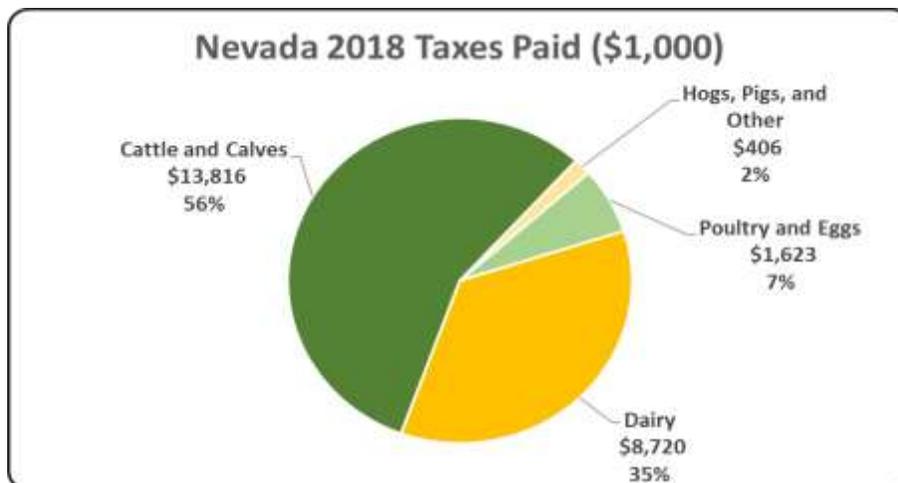
Nevada Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Nevada economy in terms of earnings. Nevada’s animal agriculture contributed about \$121.6 million to household earnings in 2018.



Nevada Taxes Paid by Animal Agriculture

Nevada’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$24.6 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$19.0 million in property taxes paid by all of Nevada agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



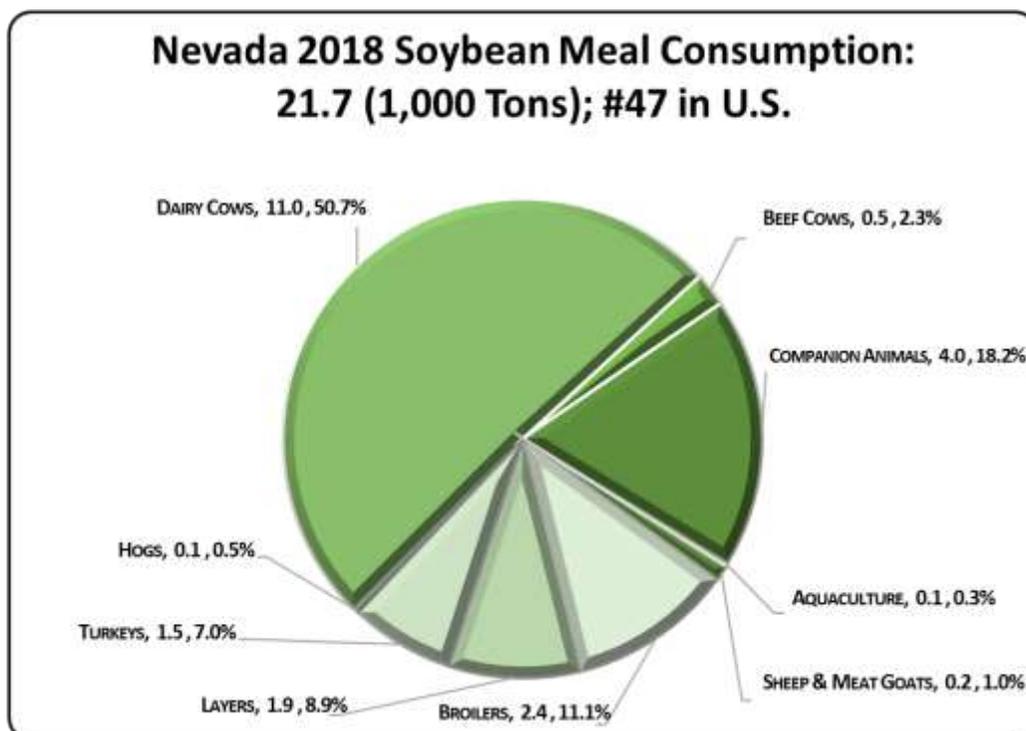
Nevada Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Nevada's animal agriculture consumed almost 21,700 tons of soybean meal in 2018, placing the state as #47 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Nevada consumed 2,900 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (11,000 tons)
2. Companion Animals (4,000 tons)
3. Broilers (2,400 tons)

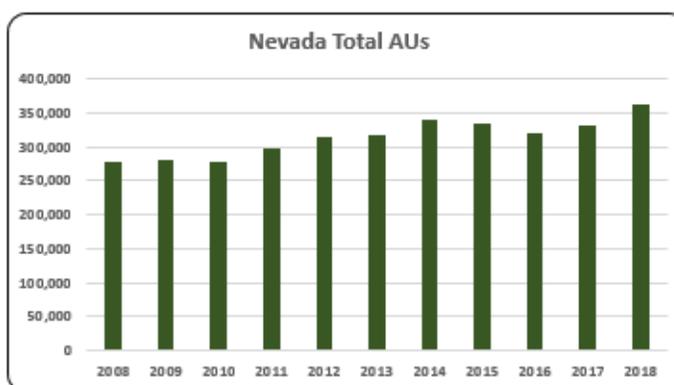
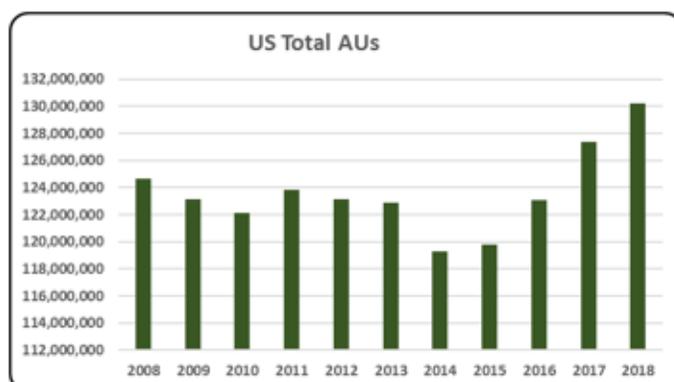


Nevada Animal Unit (AU) Trends

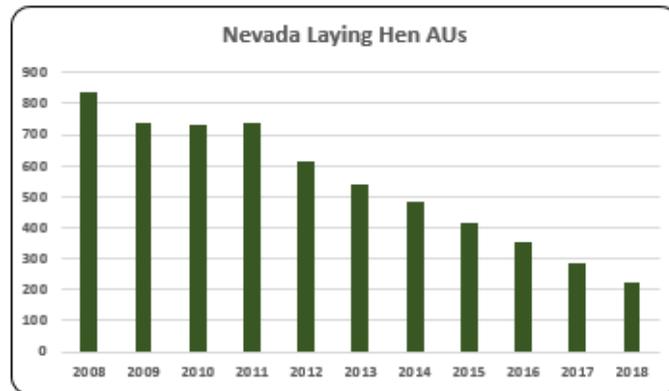
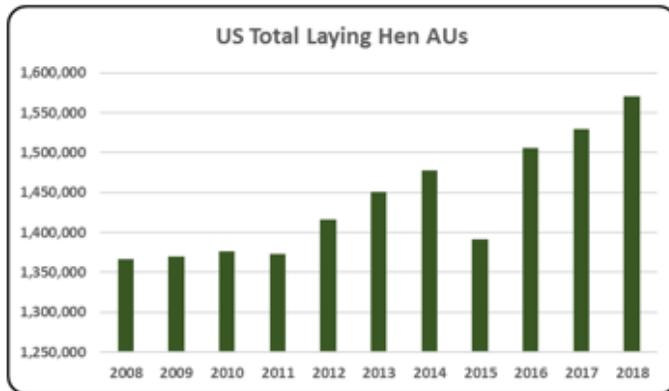
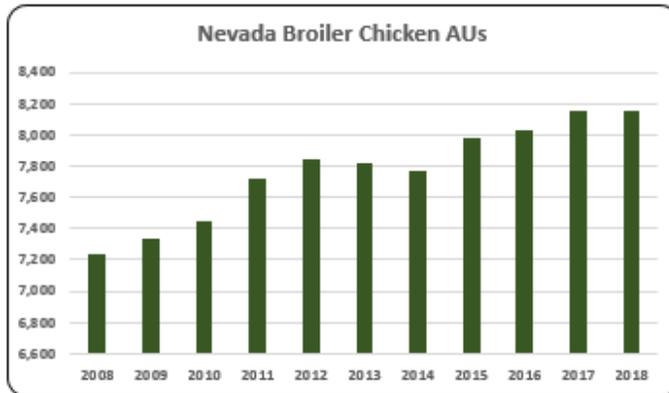
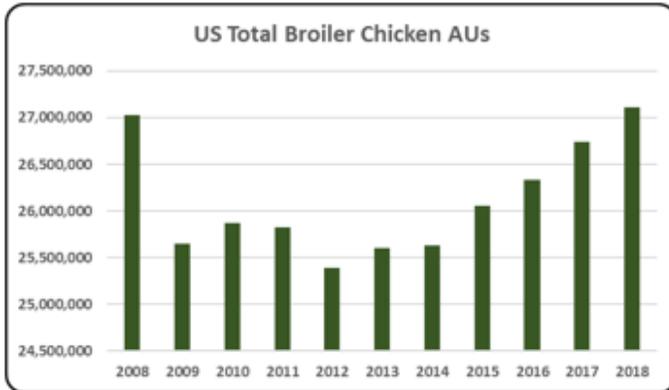
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Nevada. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Nevada and to give perspective on Nevada's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

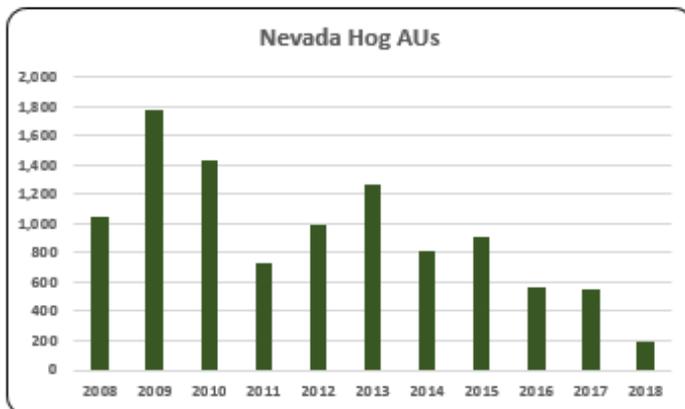
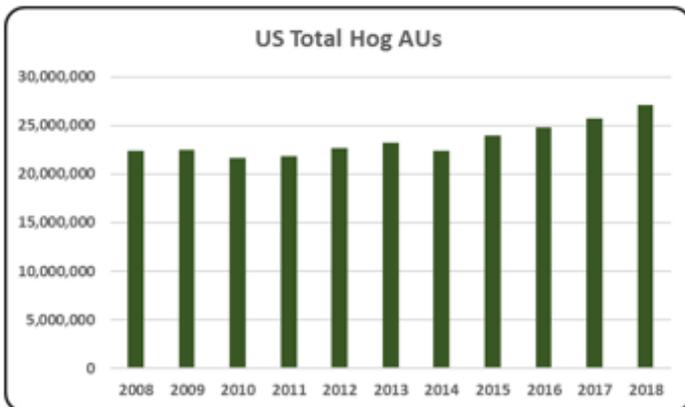
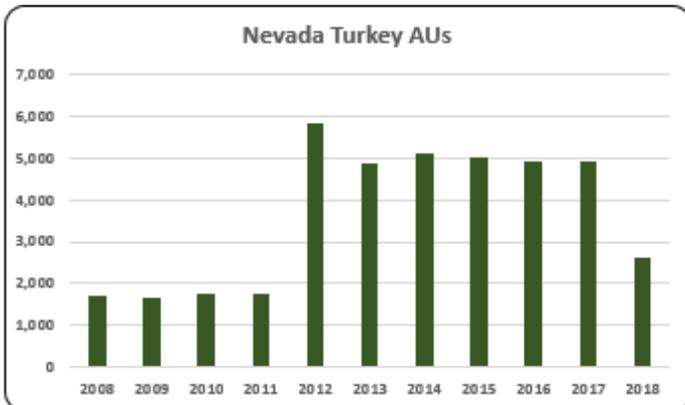
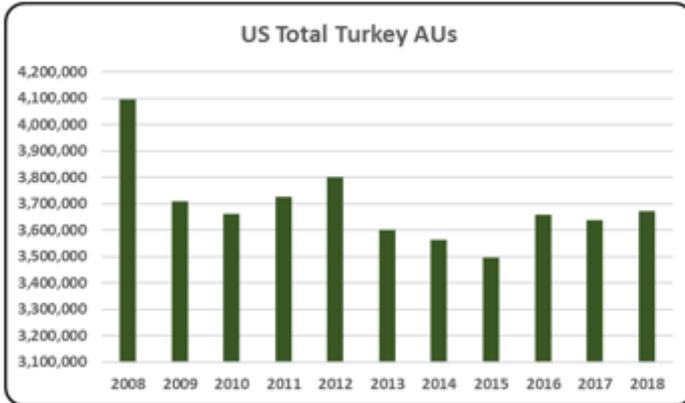
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Nevada, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (306,150 AUs), Dairy Cows (44,800 AUs), and Broilers (8,153 AUs). Total animal units in Nevada during 2018 were 362,132 AUs.



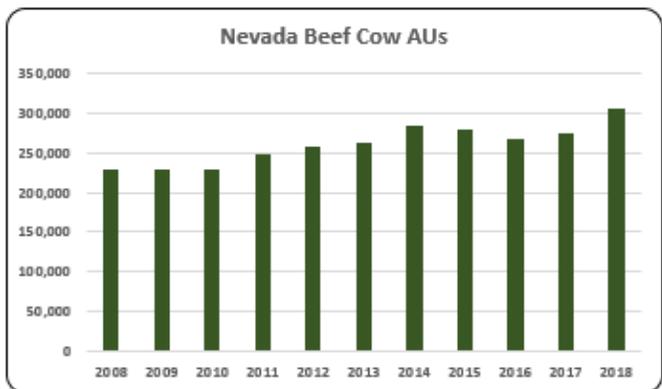
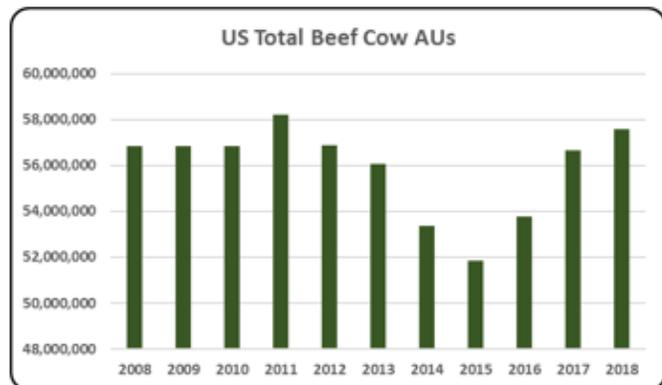
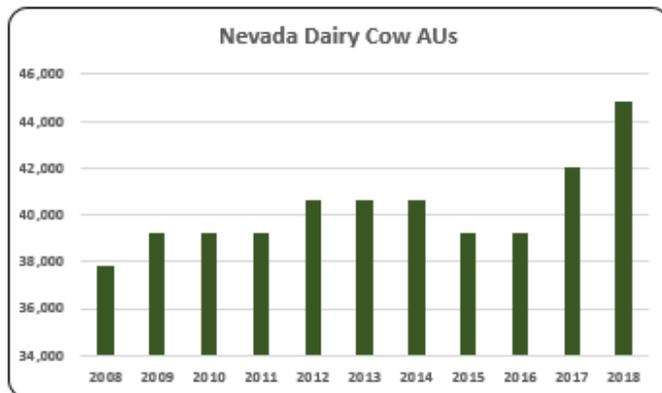
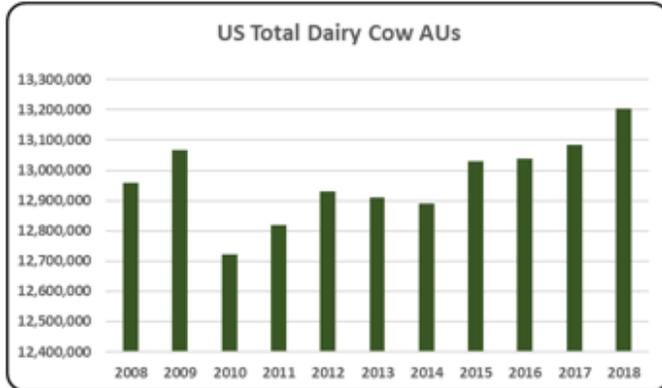
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Nevada's 362,132 AUs in 2018 represented 0.3% of all U.S. AUs. Beef cows, the largest species by AUs in Nevada, accounted for 84.5% of the AUs in Nevada.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- In Nevada there were 8,153 broiler AUs in 2018. Overall there has been an upward trend in broiler AUs in the state of Nevada and this has increased 12.7% from 2008.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 224 AUs in Nevada were from laying hens in 2018. Laying hen AUs have decreased 73.2% since 2008 (835 layer AUs).



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkeys were 0.7% (2,610 AUs) of total animal units in Nevada in 2018. Turkey numbers were up 53.1% compared to 2008 (1,705). From 2017 to 2018 Nevada turkeys decreased by 2,322 AUs.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs in Nevada were irregular from 2008 to 2018 (average 934 AUs), but the general trend has been negative. Hog AUs were 195 AUs in 2018 for Nevada the lowest of the past decade.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Overall dairy cow AUs increased throughout the decade from 37,800 dairy cow AUs in 2008 to 44,800 dairy cow AUs in 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- There were 306,150 beef cow AUs in Nevada in 2018 which was the highest for the time period. 2014 was the previous high going back to 2008 with 283,800 beef cow AUs.

Nevada Additional Information and Methodology

Animal agriculture is an important part of Nevada’s current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

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Nevada Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Nevada’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Nevada, \$1.38 to \$1.58 million in total economic activity, \$0.31 to \$0.36 in household wages and 7 to 9 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.563	\$ 0.305	8.7
	Hogs, Pigs, and Other	\$ 1.383	\$ 0.320	8.5
	Poultry and Eggs	\$ 1.456	\$ 0.314	6.8
	Dairy	\$ 1.576	\$ 0.359	9.1

Appendix

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	228,750	228,750	228,750	247,950	258,150	262,650	283,800	280,350	267,450	275,250	306,150
	Hog and Pig AUs	1,050	1,770	1,425	735	990	1,260	810	915	570	555	195
	Broiler AUs	7,232	7,333	7,449	7,723	7,844	7,817	7,772	7,973	8,033	8,148	8,153
	Turkey AUs	1,705	1,667	1,737	1,768	5,849	4,902	5,145	5,029	4,908	4,932	2,610
	Egg Layer AUs	835	738	733	738	614	541	485	414	351	287	224
	Dairy AUs	37,800	39,200	39,200	39,200	40,600	40,600	40,600	39,200	39,200	42,000	44,800
	Total Animal Units	277,372	279,458	279,294	298,113	314,047	317,770	338,613	333,881	320,512	331,172	362,132
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 156,432	\$ 148,730	\$ 171,771	\$ 205,595	\$ 220,560	\$ 230,963	\$ 288,816	\$ 293,681	\$ 219,427	\$ 243,176	\$ 223,960
	Hogs and Pigs (\$1,000)	\$ 681	\$ 992	\$ 957	\$ 725	\$ 772	\$ 936	\$ 796	\$ 828	\$ 522	\$ 589	\$ 320
	Broilers (\$1,000)	\$ 2,636	\$ 3,864	\$ 5,122	\$ 6,628	\$ 8,151	\$ 9,524	\$ 9,991	\$ 8,716	\$ 7,750	\$ 9,100	\$ 4,306
	Turkeys (\$1,000)	\$ 4,506	\$ 4,270	\$ 3,412	\$ 2,683	\$ 2,885	\$ 2,091	\$ 1,383	\$ 4,662	\$ 5,273	\$ 3,570	\$ 1,742
	Eggs (\$1,000)	\$ 8,180	\$ 5,822	\$ 6,391	\$ 7,007	\$ 7,859	\$ 8,879	\$ 14,212	\$ 23,692	\$ 9,317	\$ 12,598	\$ 19,549
	Milk (\$1,000)	\$ 110,357	\$ 69,882	\$ 112,216	\$ 137,862	\$ 125,685	\$ 129,717	\$ 171,120	\$ 118,413	\$ 107,580	\$ 126,911	\$ 120,376
	Other	\$ 3,813	\$ 4,583	\$ 5,507	\$ 6,325	\$ 8,113	\$ 7,061	\$ 7,332	\$ 7,547	\$ 6,353	\$ 6,347	\$ 5,957
	Sheep and Lambs (\$1,000)	\$ 2,086	\$ 2,280	\$ 2,628	\$ 2,871	\$ 4,083	\$ 3,257	\$ 3,753	\$ 4,194	\$ 3,225	\$ 3,445	\$ 3,280
	Aquaculture (\$1,000)	\$ 1,727	\$ 2,303	\$ 2,879	\$ 3,454	\$ 4,030	\$ 3,804	\$ 3,579	\$ 3,353	\$ 3,128	\$ 2,902	\$ 2,676
	Total (\$1,000)	\$ 286,605	\$ 238,143	\$ 305,376	\$ 366,825	\$ 374,024	\$ 389,171	\$ 493,651	\$ 457,541	\$ 356,222	\$ 402,291	\$ 376,210

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	1,093	1,067	1,242	1,247
	Cattle feedlots (112112)	81	20	12	27
	Dairy cattle and milk production (11212)	45	35	26	27
	Hog and pig farming (1122)	27	15	22	15
	Poultry and egg production (1123)	63	64	72	47
	Sheep and goat farming (1124)	157	184	340	290
	Animal aquaculture and other animal production (1125,1129)	640	717	1,177	738
Value of Sales (\$1,000)	Cattle and Calves	215,054	181,758	241,611	247,173
	Hogs and Pigs	930	withheld	516	withheld
	Poultry and Eggs	withheld	withheld	731	withheld
	Milk*			125,569	118,545
	Aquaculture	withheld	withheld	4,030	2,902
	Other (calculated)	11,201	13,644	18,174	21,061
	Total	227,185	195,402	390,631	389,681
Input Purchases	Livestock and poultry purchased	(Farms) 908	994	1,412	1,172
		\$1,000 34,954	4,470	38,987	48,929
	Breeding livestock purchased	(Farms) 574	360	943	854
		\$1,000 8,620	1,786	13,345	28,171
	Other livestock and poultry purchased	(Farms) 447	768	701	503
		\$1,000 26,335	2,684	25,641	20,758
Feed purchased	(Farms) 2,062	2,308	3,134	2,557	
	\$1,000 58,036	30,644	140,663	95,447	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 349,938	\$ 68,397	1,938	\$ 13,816
	Hogs, Pigs, and Other	\$ 8,678	\$ 2,010	53	\$ 406
	Poultry and Eggs	\$ 37,265	\$ 8,032	175	\$ 1,623
	Dairy	\$ 189,749	\$ 43,167	1,098	\$ 8,720
	Total	\$ 585,629	\$ 121,607	3,265	\$ 24,565
Change from 2008 to 2018	Cattle and Calves	\$ 57,837	\$ 11,305	320	\$ 2,284
	Hogs, Pigs, and Other	\$ 1,253	\$ 290	8	\$ 59
	Poultry and Eggs	\$ 10,609	\$ 2,287	50	\$ 462
	Dairy	\$ (18,137)	\$ (4,126)	(105)	\$ (833)
	Total	\$ 51,562	\$ 9,755	273	\$ 1,971
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.563	\$ 0.305	8.7	
	Hogs, Pigs, and Other	\$ 1.383	\$ 0.320	8.5	
	Poultry and Eggs	\$ 1.456	\$ 0.314	6.8	
	Dairy	\$ 1.576	\$ 0.359	9.1	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			0.0%	
	Total			20.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NEW HAMPSHIRE

New Hampshire Executive Summary

The use of soybean meal as a key feed ingredient is a small part of New Hampshire animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of New Hampshire. The success of New Hampshire animal agriculture in turn has a small impact on the rest of the state and regional economies. For example, in the State of New Hampshire during 2018 animal agriculture contributed:

- \$204.1 million in economic output
- 956 jobs
- \$43.8 million in earnings
- \$11.0 million in income taxes paid at local, state, and federal levels
- \$25.6 million in the form of property taxes

New Hampshire's animal agriculture consumed almost 35,300 tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (17,000 tons)
- Turkeys (7,700 tons)
- Dairy Cows (5,100 tons)

This report examines animal agriculture in New Hampshire over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in New Hampshire, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of New Hampshire and beyond.

New Hampshire Economic Impact of Animal Agriculture

Animal agriculture is a small part of New Hampshire's economy. In 2018, New Hampshire's animal agriculture contributed the following to the economy:

- About \$204.1 million in economic output
- \$43.8 million in household earnings
- 956 jobs
- \$11.0 million in income taxes

During the last decade, contractions in New Hampshire's animal agriculture has:

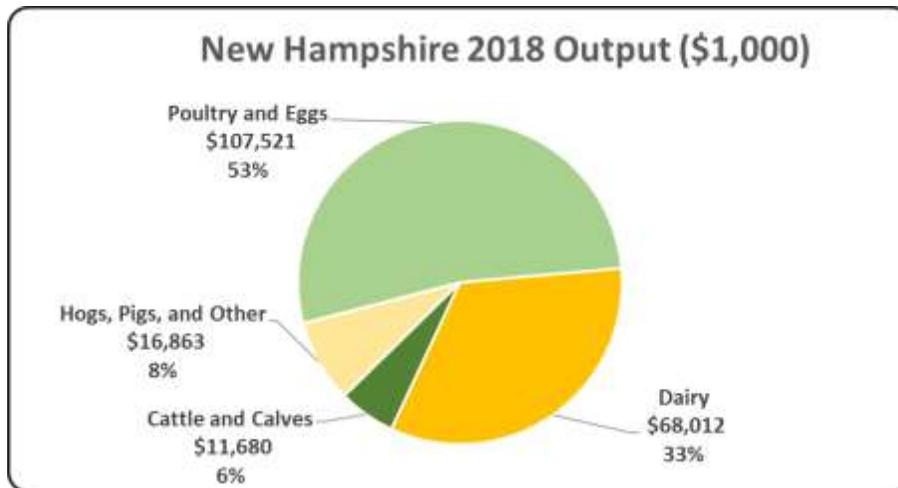
- Decreased economic output by \$5.2 million
- Reduced household earnings by \$1.5 million
- Shrunk by 52 jobs
- Paid \$369,000 less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 204,075	\$ (5,171)	-2.47%
Earnings (\$1,000)	\$ 43,773	\$ (1,463)	-3.24%
Employment (Jobs)	956	(52)	-5.20%
Income Taxes Paid (\$1,000)	\$ 11,031	\$ (369)	-3.24%
Property Taxes Paid in 2017 (\$1,000)	\$ 25,559		

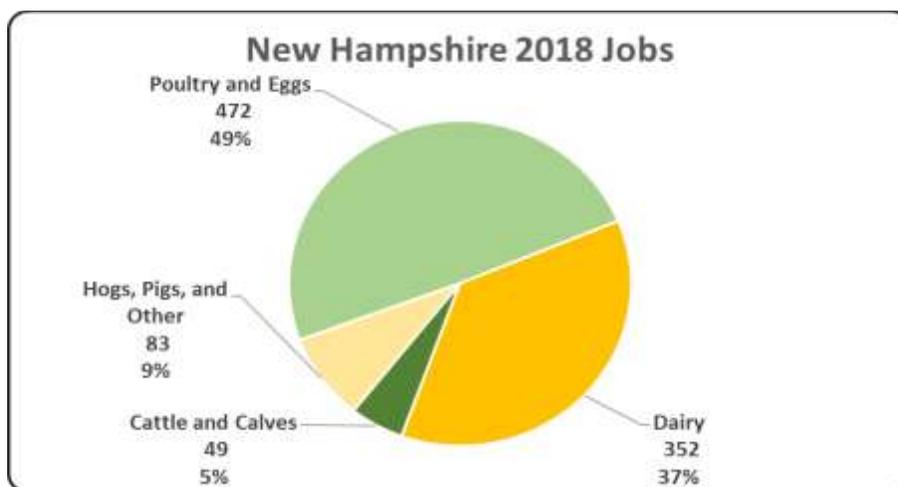
New Hampshire Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the New Hampshire economy. Animal agriculture’s impact on New Hampshire total economic output is about \$204.1 million.



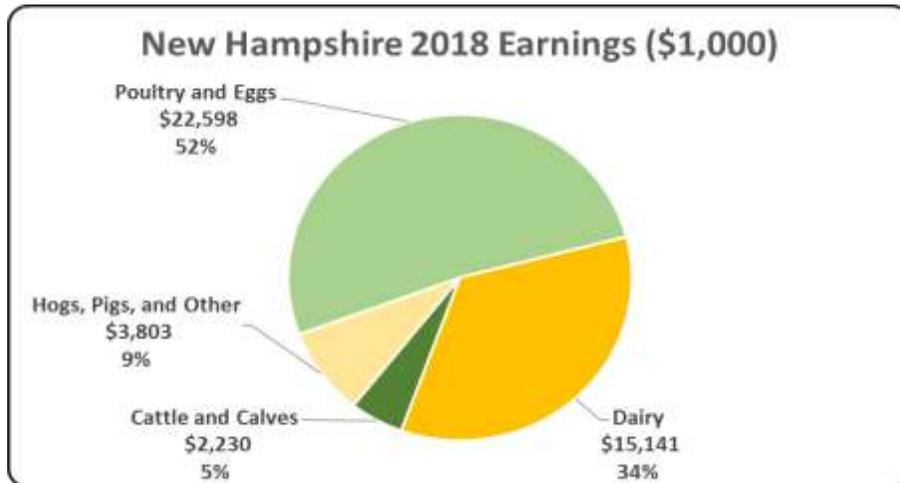
New Hampshire Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to New Hampshire in terms of animal agriculture jobs. As shown, animal agriculture contributes 956 jobs within and outside of animal agriculture.



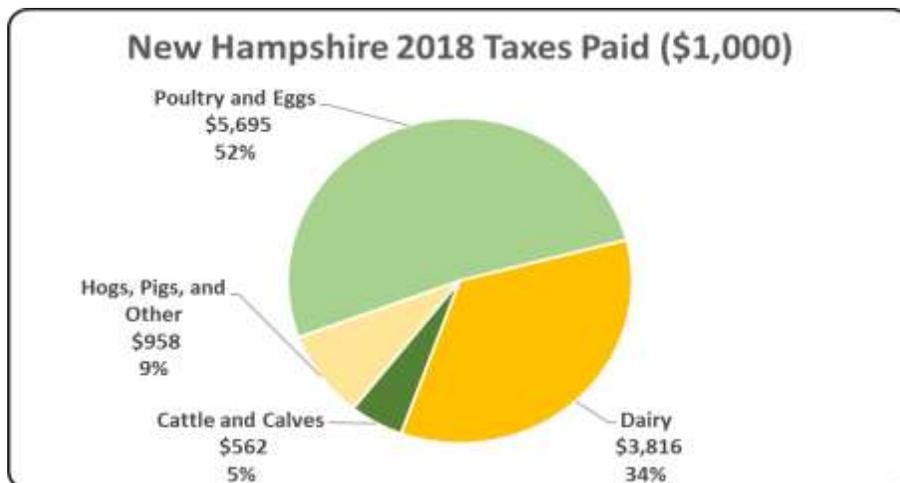
New Hampshire Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the New Hampshire economy in terms of earnings. New Hampshire’s animal agriculture contributed about \$43.8 million to household earnings in 2018.



New Hampshire Taxes Paid by Animal Agriculture

New Hampshire’s animal agriculture is also a small source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$11.0 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$25.6 million in property taxes paid by all of New Hampshire agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



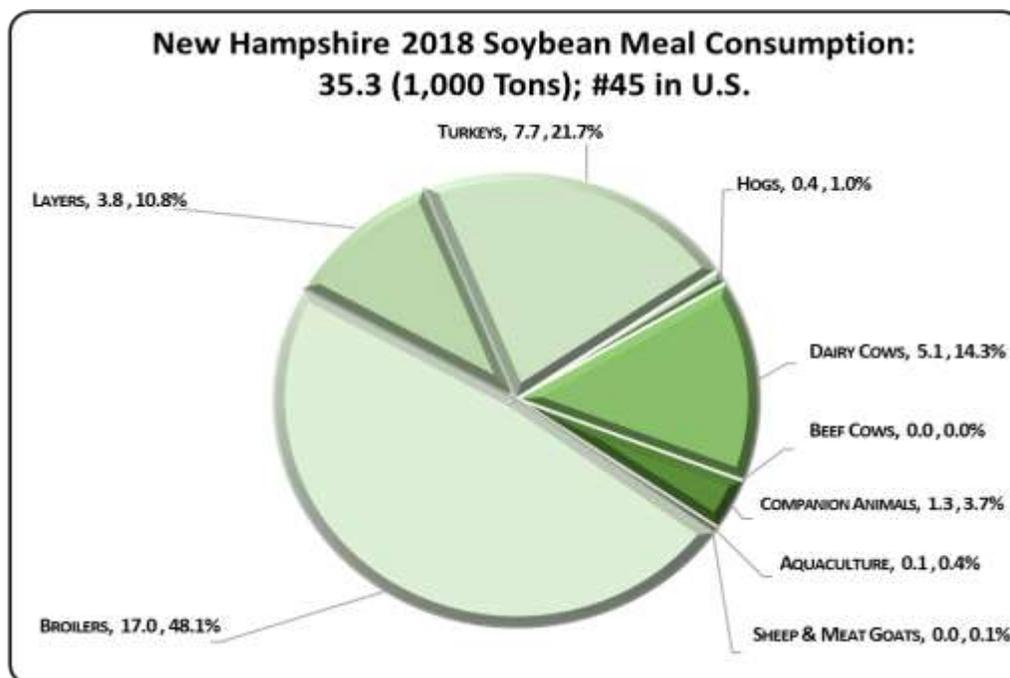
New Hampshire Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

New Hampshire's animal agriculture consumed almost 35,300 tons of soybean meal in 2018, placing the state as #45 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in New Hampshire consumed almost 100 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (17,000 tons)
2. Turkeys (7,700 tons)
3. Dairy Cows (5,100 tons)

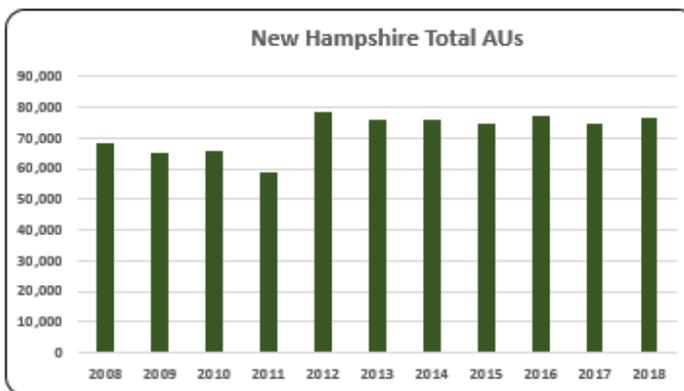
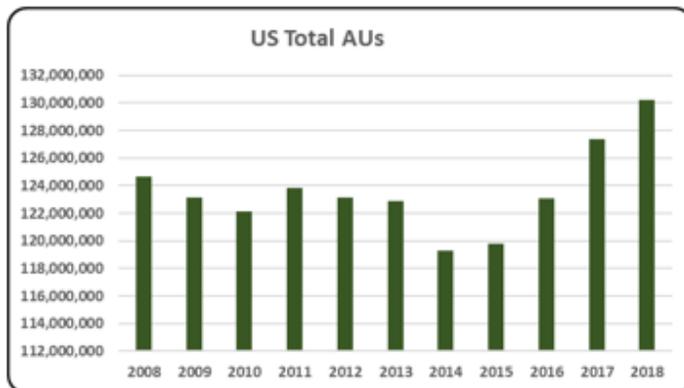


New Hampshire Animal Unit (AU) Trends

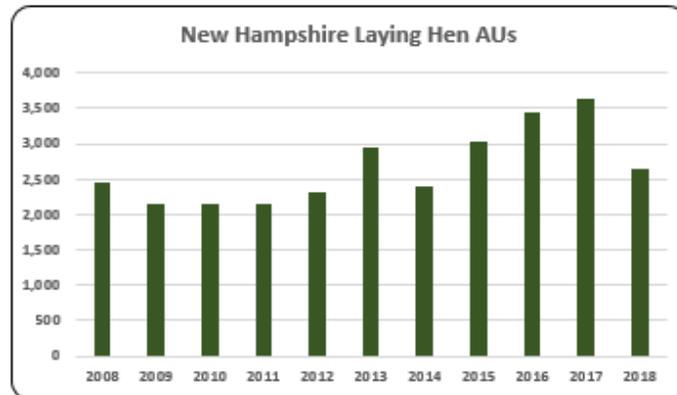
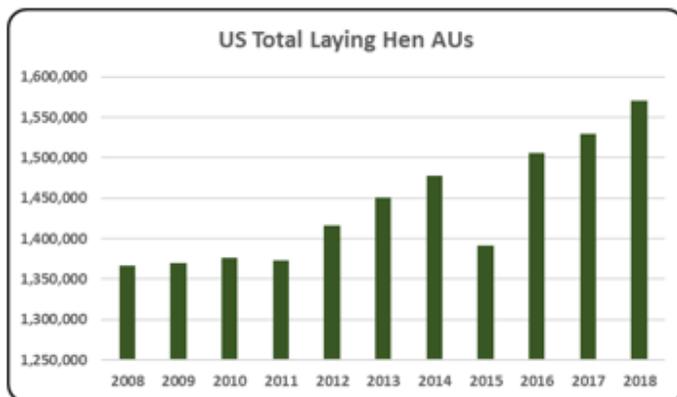
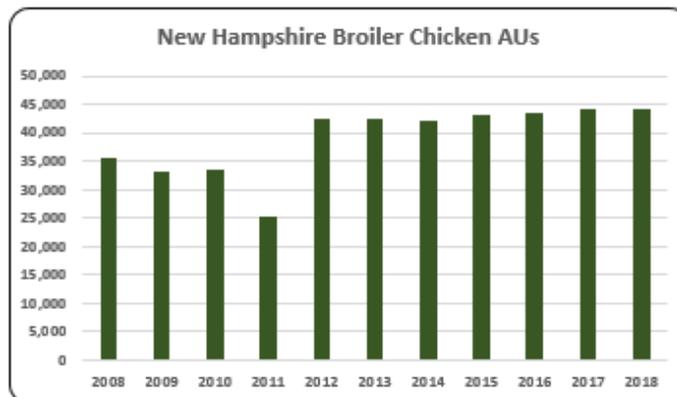
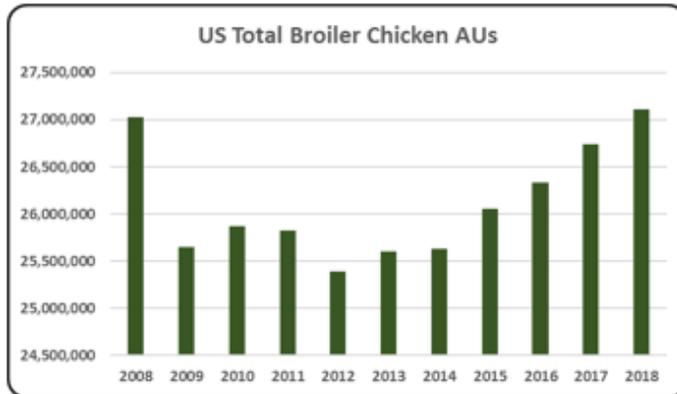
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New Hampshire. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to New Hampshire and to give perspective on New Hampshire’s contribution to the nation’s animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

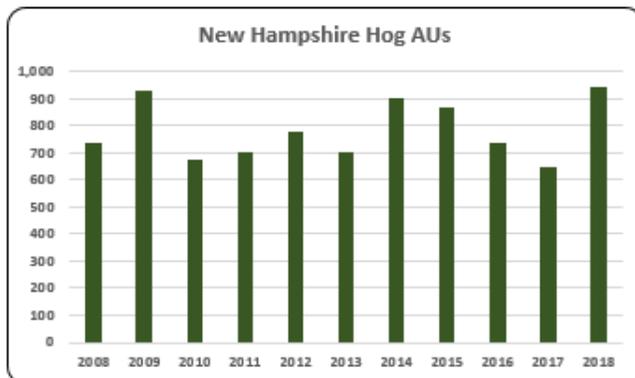
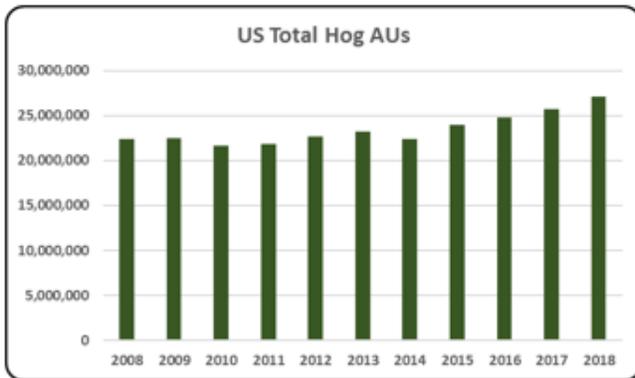
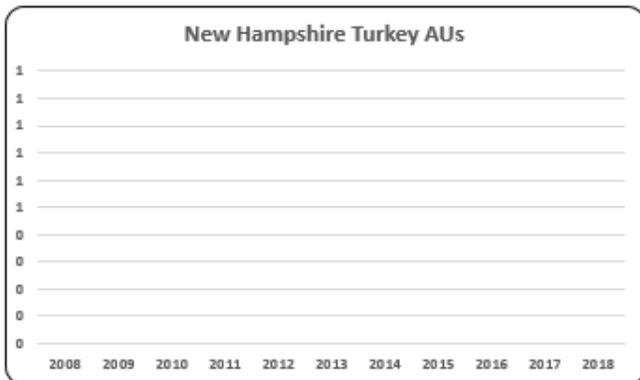
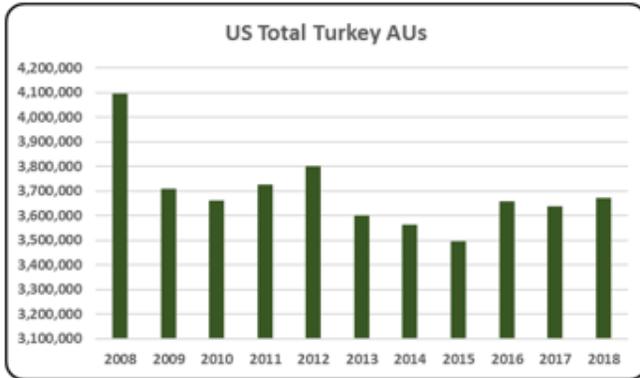
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New Hampshire, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (44,179 AUs), Dairy Cows (17,500 AUs), and Beef Cows (11,295 AUs). Total animal units in New Hampshire during 2018 were 76,559 AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Animal production in New Hampshire represents 0.1% (76,559 AUs) of all animal units in the U.S. in 2018. New Hampshire AUs have increased 12.7% since 2008.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 57.7% (44,179) of all AUs in the state of New Hampshire were broilers in 2018. Broiler AUs rose 24.1% in 2018 compared to 2008.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 2,641 laying hen AUs in 2018 in New Hampshire. Laying hen AUs in the state increased 8.2% during the past decade.

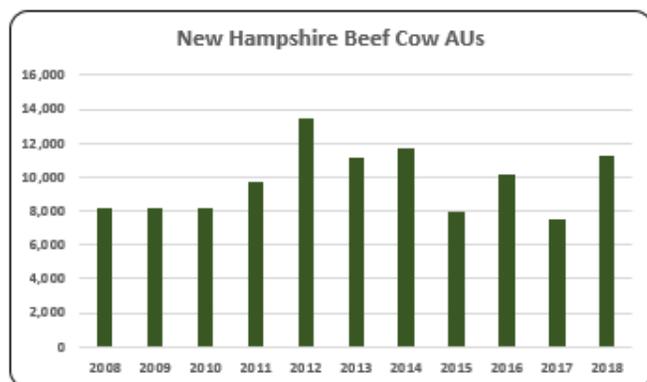
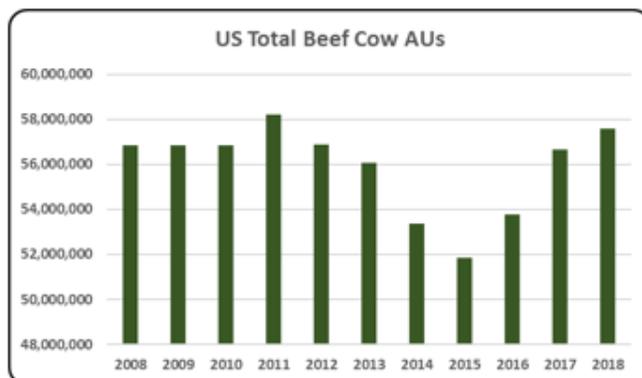
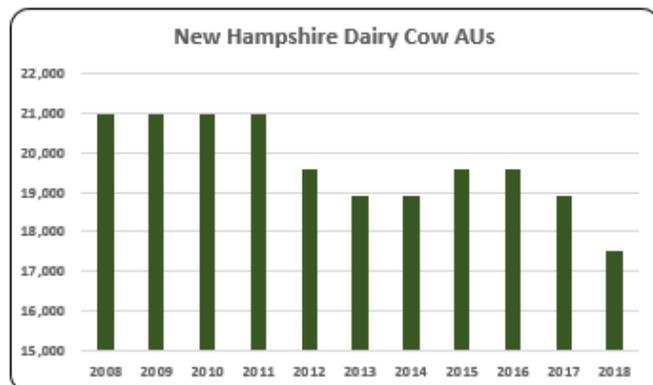
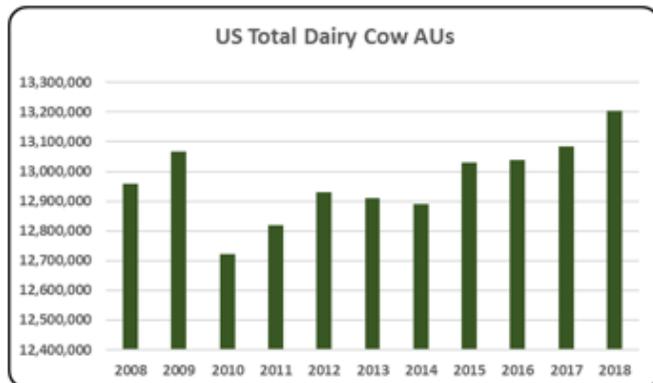


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

- Turkey production was non-existent in New Hampshire during the last decade.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- Hog AUs represented 1.2% (945) of all animal units in the state of New Hampshire. Hog AUs in New Hampshire increased 28.6% since 2008.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- 22.9% (17,500) of all AUs in New Hampshire were from dairy cows in 2018. However, dairy cow AUs have declined 16.7% since the beginning of the decade in New Hampshire.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- New Hampshire had 11,295 beef cow AUs in 2018, a 38.2% increase from 2008.

New Hampshire Additional Information and Methodology

Animal agriculture is a small part of New Hampshire's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in New Hampshire, of interest is the degree to which the industry impacts the New Hampshire economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for New Hampshire animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted New Hampshire's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in New Hampshire which have occurred. As shown in this state report, New Hampshire has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in New Hampshire. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

New Hampshire Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on New Hampshire's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in New Hampshire, \$1.40 to \$1.61 million in total economic activity, \$0.27 to \$0.36 in household wages and 6 to 8 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.415	\$ 0.270	6.0
	Hogs, Pigs, and Other	\$ 1.395	\$ 0.315	6.9
	Poultry and Eggs	\$ 1.544	\$ 0.324	6.8
	Dairy	\$ 1.607	\$ 0.358	8.3

Appendix

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	8,175	8,175	8,175	9,660	13,455	11,130	11,670	7,950	10,125	7,545	11,295
	Hog and Pig AUs	735	930	675	705	780	705	900	870	735	645	945
	Broiler AUs	35,588	33,088	33,533	25,268	42,505	42,357	42,116	43,203	43,526	44,150	44,179
	Turkey AUs	-	-	-	-	-	-	-	-	-	-	-
	Egg Layer AUs	2,440	2,158	2,143	2,156	2,322	2,959	2,396	3,024	3,452	3,644	2,641
	Dairy AUs	21,000	21,000	21,000	21,000	19,600	18,900	18,900	19,600	19,600	18,900	17,500
	Total Animal Units	67,938	65,351	65,527	58,789	78,662	76,051	75,982	74,648	77,438	74,884	76,559
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 7,011	\$ 6,928	\$ 5,781	\$ 8,974	\$ 11,065	\$ 10,063	\$ 13,799	\$ 14,727	\$ 10,084	\$ 8,990	\$ 8,257
	Hogs and Pigs (\$1,000)	\$ 242	\$ 386	\$ 262	\$ 248	\$ 815	\$ 665	\$ 949	\$ 902	\$ 685	\$ 642	\$ 764
	Broilers (\$1,000)	\$ 28,503	\$ 24,592	\$ 25,700	\$ 22,500	\$ 42,353	\$ 51,606	\$ 54,138	\$ 47,231	\$ 41,994	\$ 49,311	\$ 35,358
	Turkeys (\$1,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Eggs (\$1,000)	\$ 14,354	\$ 10,216	\$ 11,215	\$ 12,296	\$ 13,790	\$ 15,579	\$ 24,938	\$ 41,573	\$ 16,349	\$ 22,106	\$ 34,303
	Milk (\$1,000)	\$ 59,501	\$ 41,020	\$ 52,332	\$ 62,062	\$ 53,900	\$ 58,480	\$ 73,038	\$ 52,170	\$ 49,938	\$ 50,778	\$ 42,330
	Other	\$ 2,214	\$ 2,561	\$ 2,974	\$ 3,273	\$ 3,636	\$ 4,976	\$ 6,251	\$ 7,568	\$ 8,843	\$ 10,043	\$ 11,321
	Sheep and Lambs (\$1,000)	\$ 164	\$ 180	\$ 261	\$ 229	\$ 260	\$ 321	\$ 316	\$ 353	\$ 349	\$ 270	\$ 268
	Aquaculture (\$1,000)	\$ 2,049	\$ 2,381	\$ 2,713	\$ 3,044	\$ 3,376	\$ 4,655	\$ 5,935	\$ 7,214	\$ 8,494	\$ 9,773	\$ 11,052
	Total (\$1,000)	\$ 111,825	\$ 85,703	\$ 98,263	\$ 109,353	\$ 125,558	\$ 141,369	\$ 173,113	\$ 164,170	\$ 127,893	\$ 141,870	\$ 132,332

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	242	328	383	443	
	Cattle feedlots (112112)	39	3	1	-	
	Dairy cattle and milk production (11212)	191	194	150	145	
	Hog and pig farming (1122)	64	62	88	62	
	Poultry and egg production (1123)	100	247	224	107	
	Sheep and goat farming (1124)	174	257	300	369	
	Animal aquaculture and other animal production (1125,1129)	749	864	1,003	876	
Value of Sales (\$1,000)	Cattle and Calves	5,140	6,743	9,477	9,706	
	Hogs and Pigs	withheld	518	846	withheld	
	Poultry and Eggs	6,251	15,390	13,488	withheld	
	Milk*			54,798	52,451	
	Aquaculture	3,340	3,734	3,376	withheld	
	Other (calculated)	46,955	7,067	4,124	17,835	
	Total	61,686	33,452	86,109	79,992	
Input Purchases	Livestock and poultry purchased	(Farms)	705	994	1,247	1,051
		\$1,000	1,638	4,470	3,874	5,024
	Breeding livestock purchased	(Farms)	227	360	526	346
		\$1,000	522	1,786	1,842	1,536
	Other livestock and poultry purchased	(Farms)	537	768	989	851
		\$1,000	1,116	2,684	2,033	3,488
	Feed purchased	(Farms)	2,010	2,308	2,787	2,516
		\$1,000	20,933	30,644	44,756	33,176

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 11,680	\$ 2,230	49	\$ 562
	Hogs, Pigs, and Other	\$ 16,863	\$ 3,803	83	\$ 958
	Poultry and Eggs	\$ 107,521	\$ 22,598	472	\$ 5,695
	Dairy	\$ 68,012	\$ 15,141	352	\$ 3,816
	Total	\$ 204,075	\$ 43,773	956	\$ 11,031
Change from 2008 to 2018	Cattle and Calves	\$ (172)	\$ (33)	(1)	\$ (8)
	Hogs, Pigs, and Other	\$ 12,768	\$ 2,880	63	\$ 726
	Poultry and Eggs	\$ 28,468	\$ 5,983	125	\$ 1,508
	Dairy	\$ (46,235)	\$ (10,293)	(239)	\$ (2,594)
	Total	\$ (5,171)	\$ (1,463)	(52)	\$ (369)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.415	\$ 0.270	6.0	
	Hogs, Pigs, and Other	\$ 1.395	\$ 0.315	6.9	
	Poultry and Eggs	\$ 1.544	\$ 0.324	6.8	
	Dairy	\$ 1.607	\$ 0.358	8.3	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.0%	
	Total			25.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NEW JERSEY

New Jersey Executive Summary

The use of soybean meal as a key feed ingredient is a small part of New Jersey animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of New Jersey. The success of New Jersey animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of New Jersey during 2018 animal agriculture contributed:

- \$161.3 million in economic output
- 961 jobs
- \$34.5 million in earnings
- \$8.7 million in income taxes paid at local, state, and federal levels
- \$69.1 million in the form of property taxes

New Jersey's animal agriculture consumed almost 32,500 tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (11,300 tons)
- Companion Animals (7,000 tons)
- Egg-Laying Hens (6,500 tons)

This report examines animal agriculture in New Jersey over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in New Jersey, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a small contributor to the economic well-being of the people of New Jersey and beyond.

New Jersey Economic Impact of Animal Agriculture

Animal agriculture is a shrinking part of New Jersey's economy. In 2018, New Jersey's animal agriculture contributed the following to the economy:

- About \$161.3 million in economic output
- \$34.5 million in household earnings
- 961 jobs
- \$8.7 million in income taxes

During the last decade, contractions in New Jersey's animal agriculture has:

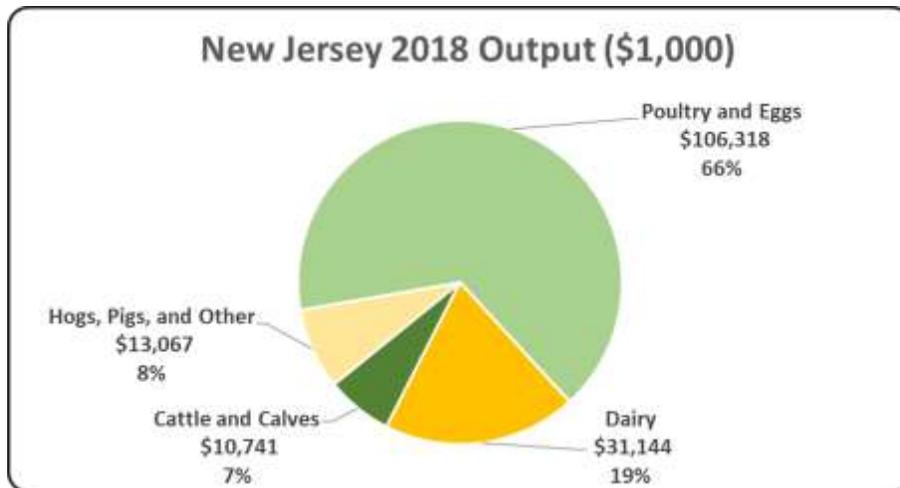
- Decreased economic output by \$48.4 million
- Reduced household earnings by \$10.6 million
- Shrunk by 273 jobs
- Paid \$2.7 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 161,270	\$ (48,368)	-23.07%
Earnings (\$1,000)	\$ 34,466	\$ (10,611)	-23.54%
Employment (Jobs)	961	(273)	-22.10%
Income Taxes Paid (\$1,000)	\$ 8,749	\$ (2,694)	-23.54%
Property Taxes Paid in 2017 (\$1,000)	\$ 69,122		

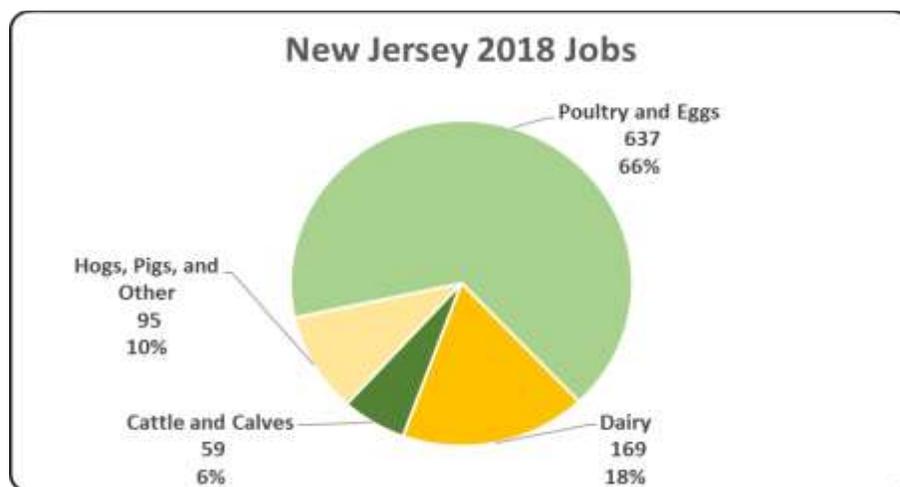
New Jersey Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the New Jersey economy. Animal agriculture’s impact on New Jersey total economic output is about \$161.3 million.



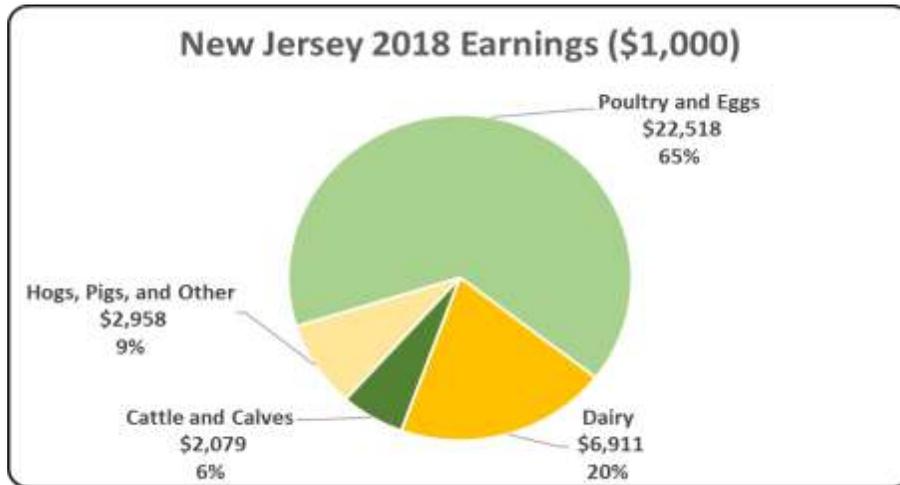
New Jersey Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to New Jersey in terms of animal agriculture jobs. As shown, animal agriculture contributes 961 jobs within and outside of animal agriculture.



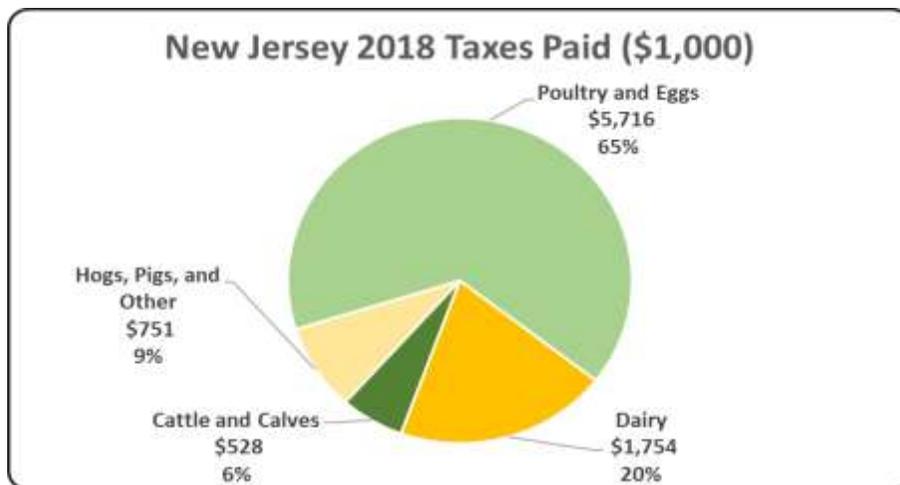
New Jersey Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the New Jersey economy in terms of earnings. New Jersey’s animal agriculture contributed about \$34.5 million to household earnings in 2018.



New Jersey Taxes Paid by Animal Agriculture

New Jersey’s animal agriculture is not a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$8.7 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$69.1 million in property taxes paid by all of New Jersey agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



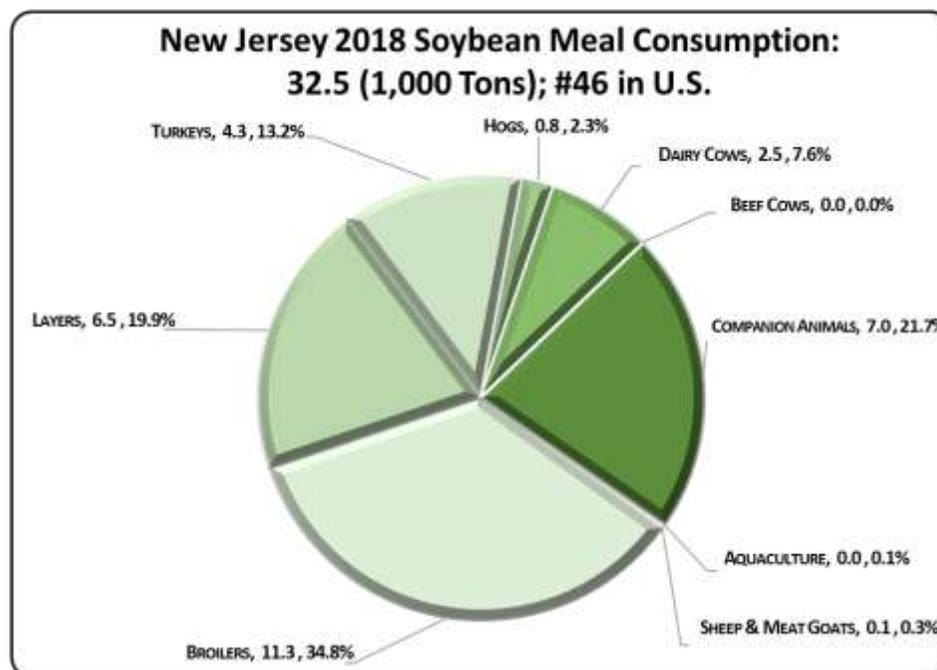
New Jersey Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

New Jersey's animal agriculture consumed almost 32,500 tons of soybean meal in 2018, placing the state as #46 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in New Jersey consumed almost 100 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (11,300 tons)
2. Companion Animals (7,000 tons)
3. Egg-Laying Hens (6,500 tons)

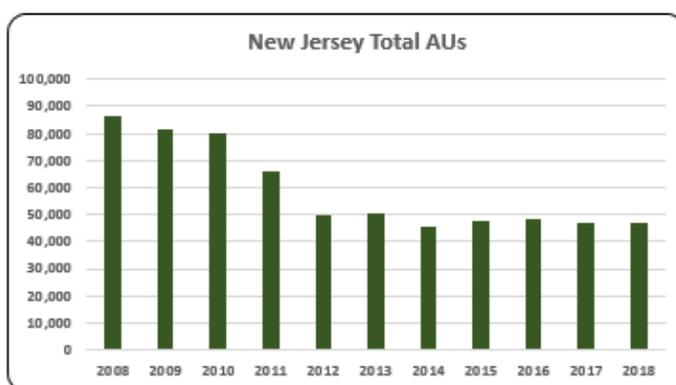
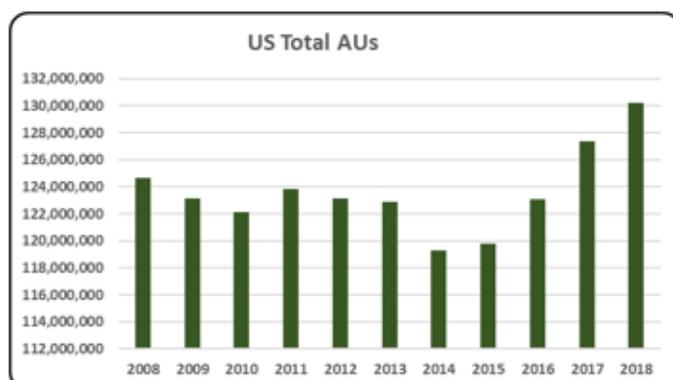


New Jersey Animal Unit (AU) Trends

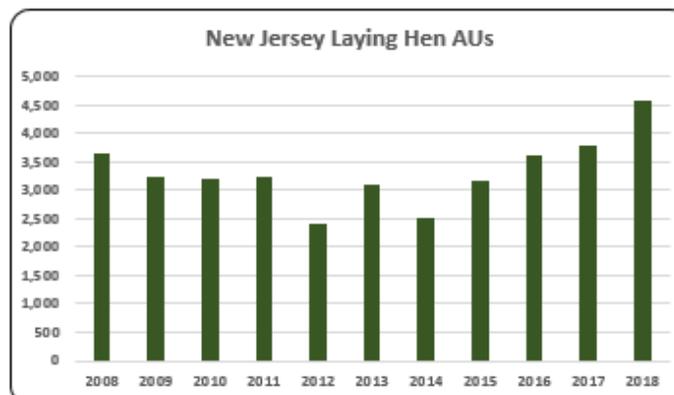
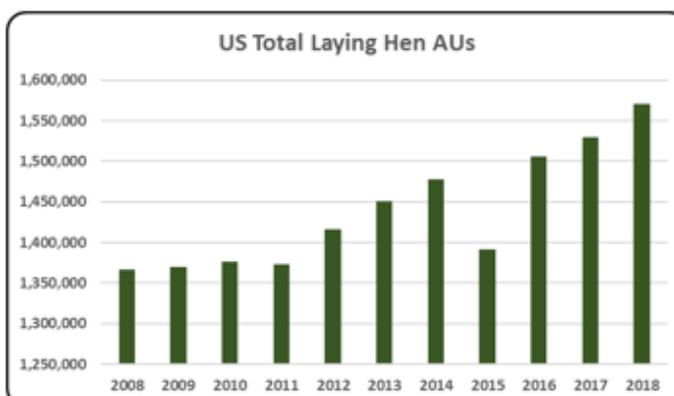
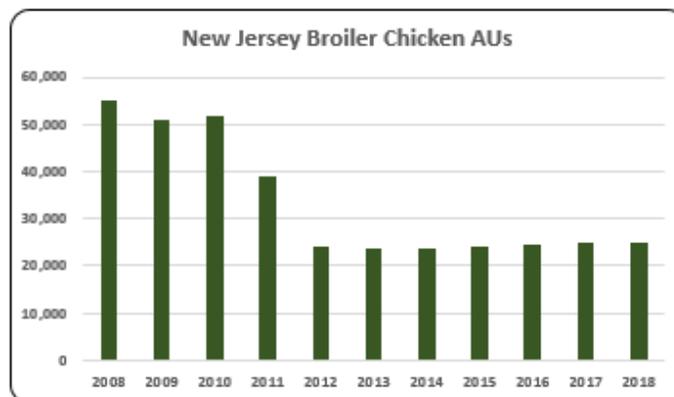
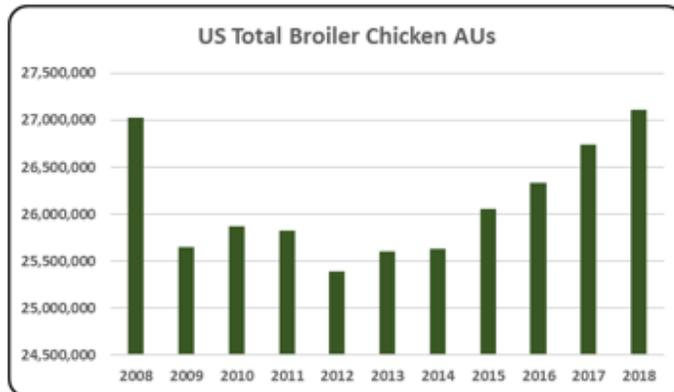
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New Jersey. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to New Jersey and to give perspective on New Jersey's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

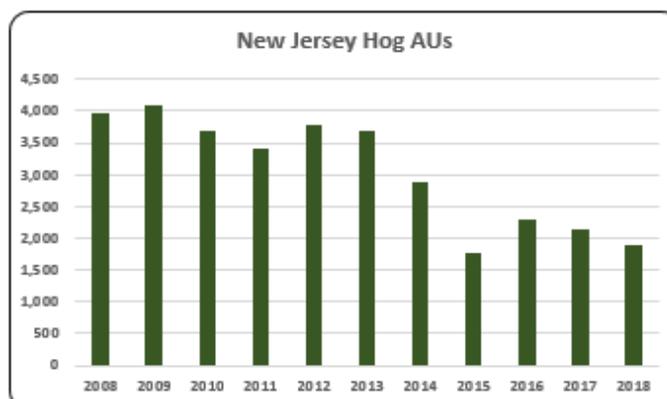
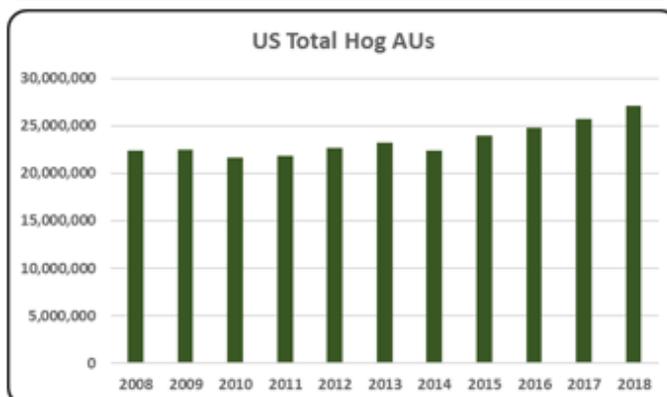
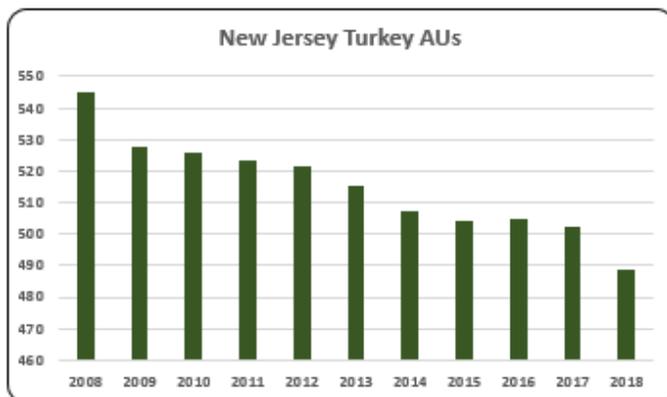
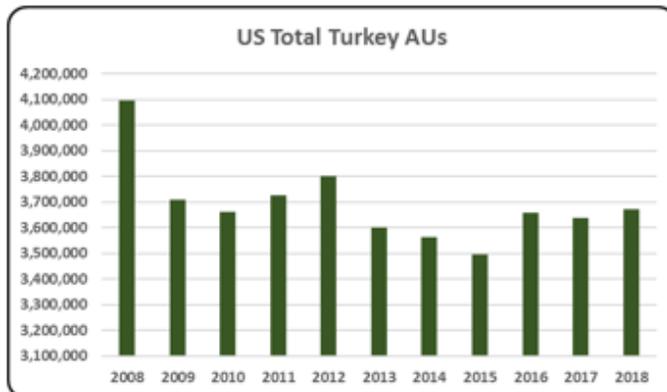
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New Jersey, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (24,839 AUs), Dairy Cows (8,400 AUs), and Beef Cows (6,735 AUs). Total animal units in New Jersey during 2018 were 46,948 AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Only 0.04% (46,948 AUs) of all AUs in 2018 were in New Jersey, and total animal units in the state have declined 45.6% throughout the last decade.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 52.9% (24,839 AUs) of AUs in New Jersey in 2018 were broilers. Broiler AUs substantially decreased (54.7%) during 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hen numbers in New Jersey increased to 4,581 in 2018. A 25.3% increase from a decade earlier, and 9.8% of total AUs in New Jersey in 2018.

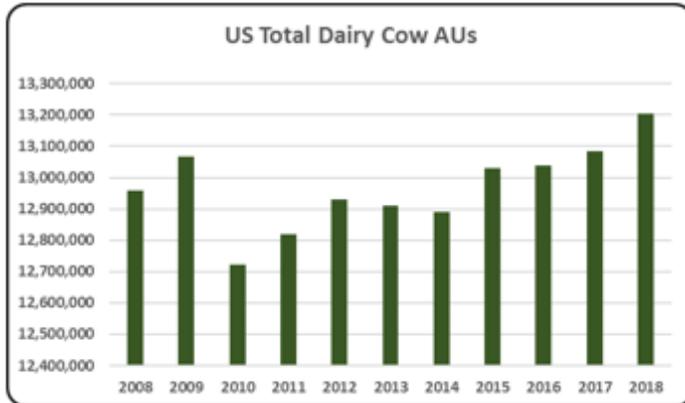


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

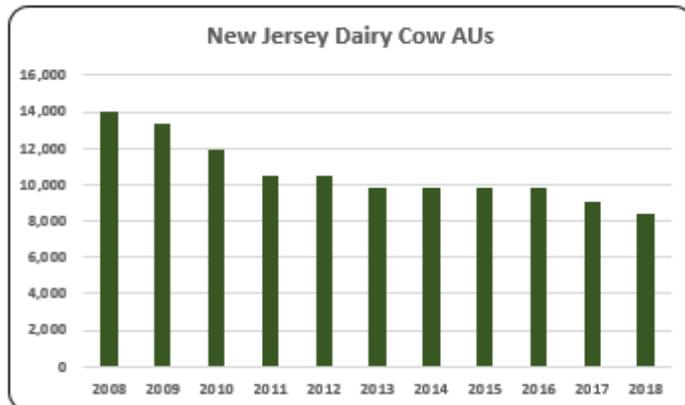
- With only 489 turkey AUs in 2018 and an average of 515 turkey AUs from 2008 to 2018, the turkey sector is small in New Jersey.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

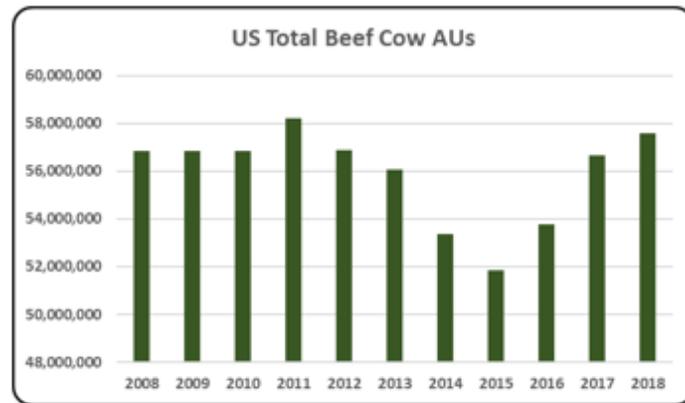
- Hogs in 2018 (1,905 AUs) represented about 4.1% of all animal units in the state. Hog AUs in 2018 decreased 51.9% compared to 2008 (3,960 AUs).



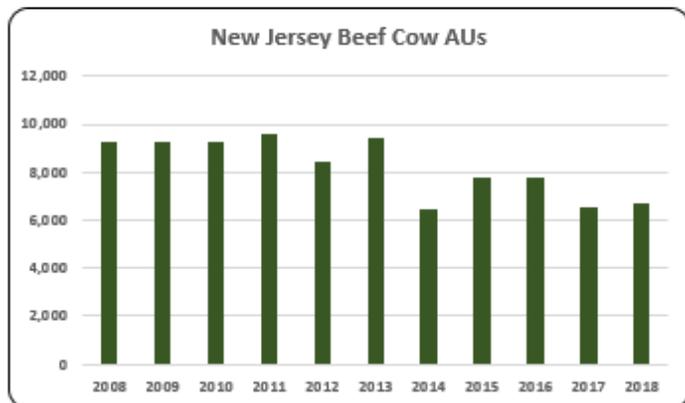
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Dairy cow AUs in New Jersey consistently decreased from 2008 to 2018, from 14,000 dairy cow AUs in 2008 to 8,400 dairy cow AUs in 2018.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Although beef cows are the third largest animal unit sector in New Jersey, AU units declined 27.6% since 2008. Beef cow AUs were 6,735 in 2018.

New Jersey Additional Information and Methodology

Animal agriculture is a small part of New Jersey's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in New Jersey, of interest is the degree to which the industry impacts the New Jersey economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for New Jersey animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted New Jersey's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in New Jersey which have occurred. As shown in this state report, New Jersey has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in New Jersey. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

New Jersey Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on New Jersey's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in New Jersey, \$1.48 to \$1.75 million in total economic activity, \$0.30 to \$0.39 in household wages and 9 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.551	\$ 0.300	8.5
	Hogs, Pigs, and Other	\$ 1.481	\$ 0.335	10.8
	Poultry and Eggs	\$ 1.654	\$ 0.350	9.9
	Dairy	\$ 1.748	\$ 0.388	9.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	9,300	9,300	9,300	9,570	8,460	9,405	6,495	7,815	7,770	6,570	6,735
	Hog and Pig AUs	3,960	4,095	3,675	3,405	3,765	3,675	2,880	1,770	2,280	2,130	1,905
	Broiler AUs	54,882	51,028	51,714	38,967	23,898	23,814	23,679	24,290	24,472	24,822	24,839
	Turkey AUs	545	528	526	523	522	515	507	504	505	502	489
	Egg Layer AUs	3,657	3,234	3,213	3,231	2,423	3,088	2,500	3,156	3,602	3,803	4,581
	Dairy AUs	14,000	13,300	11,900	10,500	10,500	9,800	9,800	9,800	9,800	9,100	8,400
	Total Animal Units	86,344	81,485	80,327	66,197	49,567	50,298	45,862	47,336	48,429	46,928	46,948
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 5,717	\$ 5,014	\$ 5,178	\$ 7,859	\$ 8,734	\$ 7,340	\$ 10,549	\$ 11,893	\$ 7,436	\$ 7,143	\$ 6,926
	Hogs and Pigs (\$1,000)	\$ 376	\$ 426	\$ 554	\$ 716	\$ 581	\$ 372	\$ 262	\$ 733	\$ 836	\$ 762	\$ 89
	Broilers (\$1,000)	\$ 43,957	\$ 37,926	\$ 39,633	\$ 34,699	\$ 23,812	\$ 29,014	\$ 30,438	\$ 26,555	\$ 23,611	\$ 27,724	\$ 23,572
	Turkeys (\$1,000)	\$ 1,437	\$ 1,591	\$ 1,866	\$ 2,239	\$ 2,535	\$ 2,804	\$ 3,223	\$ 3,503	\$ 3,762	\$ 5,040	\$ 4,915
	Eggs (\$1,000)	\$ 14,979	\$ 10,661	\$ 11,703	\$ 12,831	\$ 14,390	\$ 16,258	\$ 26,024	\$ 43,383	\$ 17,061	\$ 23,068	\$ 35,796
	Milk (\$1,000)	\$ 31,265	\$ 20,224	\$ 23,520	\$ 28,215	\$ 24,570	\$ 26,162	\$ 31,623	\$ 22,352	\$ 20,008	\$ 21,777	\$ 17,820
	Other	\$ 7,771	\$ 9,042	\$ 10,449	\$ 11,623	\$ 12,927	\$ 12,347	\$ 11,634	\$ 11,006	\$ 10,294	\$ 9,443	\$ 8,736
	Sheep and Lambs (\$1,000)	\$ 336	\$ 367	\$ 534	\$ 468	\$ 531	\$ 655	\$ 646	\$ 722	\$ 714	\$ 567	\$ 564
	Aquaculture (\$1,000)	\$ 7,435	\$ 8,675	\$ 9,915	\$ 11,156	\$ 12,396	\$ 11,692	\$ 10,988	\$ 10,284	\$ 9,580	\$ 8,876	\$ 8,172
	Total (\$1,000)	\$ 105,502	\$ 84,884	\$ 92,903	\$ 98,182	\$ 87,549	\$ 94,297	\$ 113,753	\$ 119,425	\$ 83,007	\$ 94,958	\$ 97,854

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	657	704	701	726
	Cattle feedlots (112112)	214	75	9	9
	Dairy cattle and milk production (11212)	129	123	76	57
	Hog and pig farming (1122)	133	95	60	58
	Poultry and egg production (1123)	283	405	455	286
	Sheep and goat farming (1124)	503	669	630	753
	Animal aquaculture and other animal production (1125,1129)	1,831	1,962	1,611	2,020
Value of Sales (\$1,000)	Cattle and Calves	7,094	9,559	8,829	10,603
	Hogs and Pigs	2,313	2,349	1,682	2,154
	Poultry and Eggs	26,041	33,044	40,081	31,216
	Milk*			26,119	23,962
	Aquaculture	2,223	6,637	12,396	8,876
	Other (calculated)	25,553	49,553	10,048	36,610
	Total	63,224	101,142	99,155	113,421
Input Purchases	Livestock and poultry purchased	(Farms) 1,819	1,768	1,876	2,077
		\$1,000 8,265	11,977	14,758	18,845
	Breeding livestock purchased	(Farms) 562	572	621	643
		\$1,000 1,971	4,681	4,087	4,266
	Other livestock and poultry purchased	(Farms) 1,397	1,380	1,473	1,711
		\$1,000 6,294	7,296	10,671	14,579
Feed purchased	(Farms) 4,654	4,669	4,683	4,997	
	\$1,000 31,277	41,361	54,047	47,403	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 10,741	\$ 2,079	59	\$ 528
	Hogs, Pigs, and Other	\$ 13,067	\$ 2,958	95	\$ 751
	Poultry and Eggs	\$ 106,318	\$ 22,518	637	\$ 5,716
	Dairy	\$ 31,144	\$ 6,911	169	\$ 1,754
	Total	\$ 161,270	\$ 34,466	961	\$ 8,749
Change from 2008 to 2018	Cattle and Calves	\$ 146	\$ 28	1	\$ 7
	Hogs, Pigs, and Other	\$ (1,349)	\$ (305)	(10)	\$ (78)
	Poultry and Eggs	\$ (13,009)	\$ (2,755)	(78)	\$ (699)
	Dairy	\$ (34,156)	\$ (7,579)	(186)	\$ (1,924)
	Total	\$ (48,368)	\$ (10,611)	(273)	\$ (2,694)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.551	\$ 0.300	8.5	
	Hogs, Pigs, and Other	\$ 1.481	\$ 0.335	10.8	
	Poultry and Eggs	\$ 1.654	\$ 0.350	9.9	
	Dairy	\$ 1.748	\$ 0.388	9.5	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				5.2%
	Total				25.4%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NEW MEXICO

New Mexico Executive Summary

The use of soybean meal as a key feed ingredient is a moderate part of New Mexico animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of New Mexico. The success of New Mexico animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of New Mexico during 2018 animal agriculture contributed:

- \$3.8 billion in economic output
- 19,288 jobs
- \$801.9 million in earnings
- \$188.5 million in income taxes paid at local, state, and federal levels
- \$46.0 million in the form of property taxes

New Mexico's animal agriculture consumed almost 147.8 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (117.4 thousand tons)
- Egg-Laying Hens (10,300 tons)
- Broilers (8,300 tons)

This report examines animal agriculture in New Mexico over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in New Mexico, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a small contributor to the economic well-being of the people of New Mexico and beyond.

New Mexico Economic Impact of Animal Agriculture

Animal agriculture is a shrinking part of New Mexico's economy. In 2018, New Mexico's animal agriculture contributed the following to the economy:

- About \$3.8 billion in economic output
- \$801.9 million in household earnings
- 19,288 jobs
- \$188.5 million in income taxes

During the last decade New Mexico's animal agriculture has:

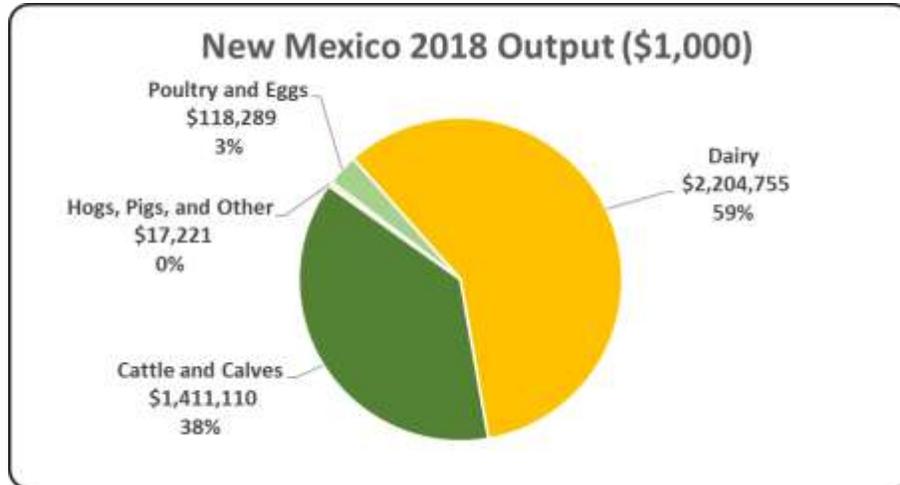
- Decreased economic output by \$822.4 million
- Reduced household earnings by \$183.1 million
- Shrunk by 4,506 jobs
- Paid \$43.0 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 3,751,375	\$ (822,402)	-17.98%
Earnings (\$1,000)	\$ 801,918	\$ (183,101)	-18.59%
Employment (Jobs)	19,288	(4,506)	-18.94%
Income Taxes Paid (\$1,000)	\$ 188,451	\$ (43,029)	-18.59%
Property Taxes Paid in 2017 (\$1,000)	\$ 45,977		

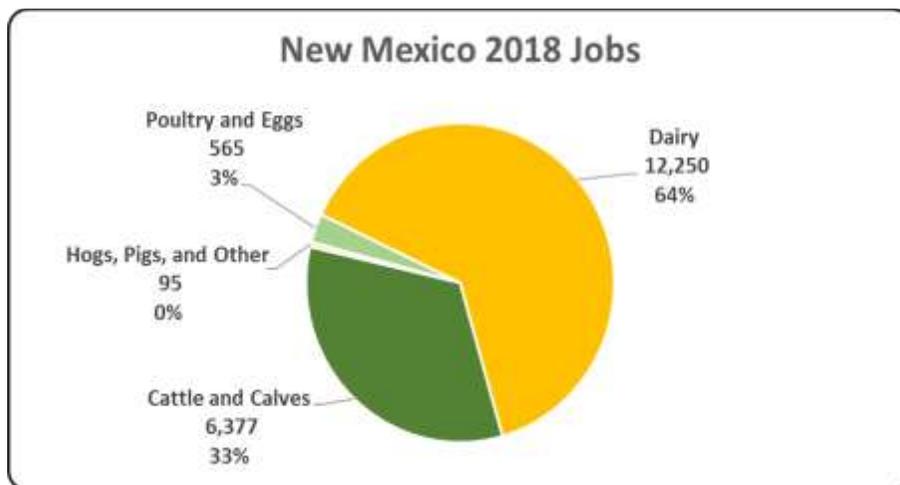
New Mexico Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the New Mexico economy. Animal agriculture’s impact on New Mexico total economic output is about \$3.8 billion.



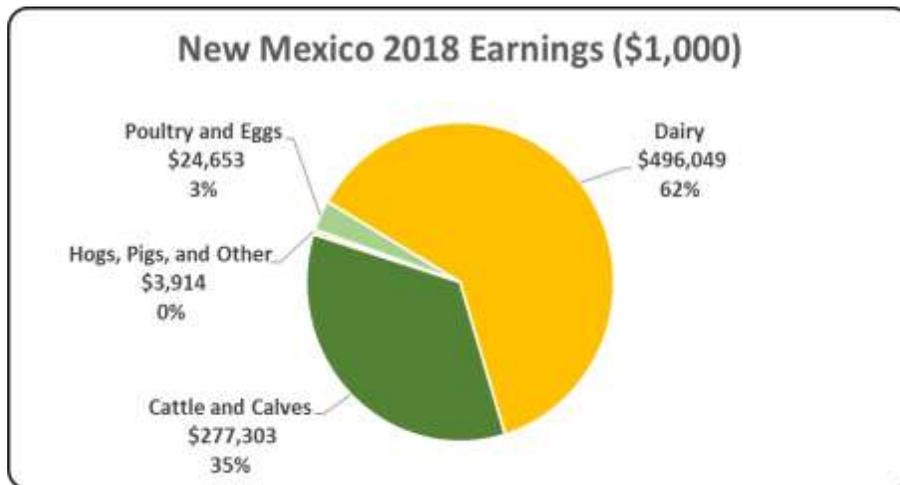
New Mexico Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to New Mexico in terms of animal agriculture jobs. As shown, animal agriculture contributes 19,288 jobs within and outside of animal agriculture.



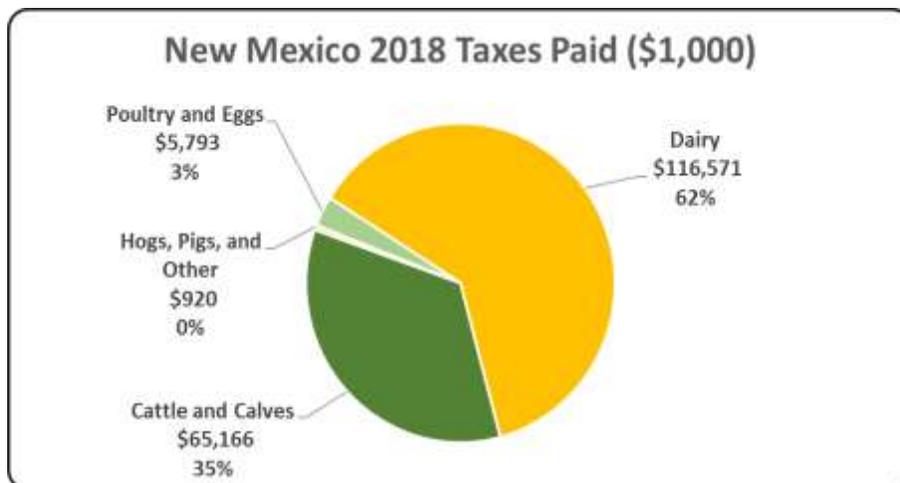
New Mexico Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the New Mexico economy in terms of earnings. New Mexico’s animal agriculture contributed about \$801.9 million to household earnings in 2018.



New Mexico Taxes Paid by Animal Agriculture

New Mexico’s animal agriculture is also a small source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$188.5 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$46.0 million in property taxes paid by all of New Mexico agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



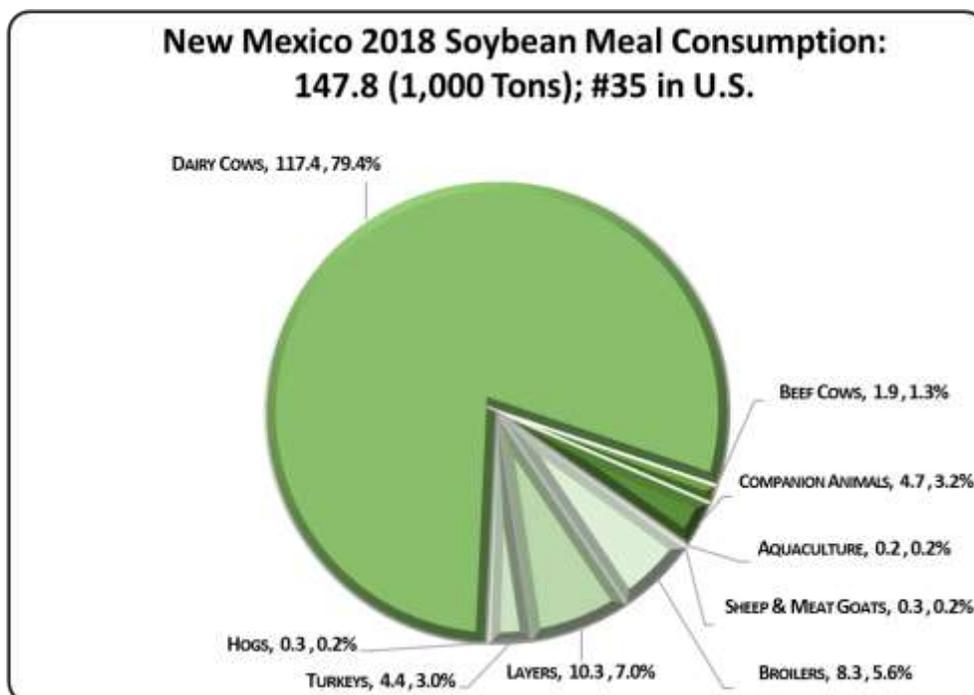
New Mexico Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

New Mexico's animal agriculture consumed almost 147.8 thousand tons of soybean meal in 2018, placing the state as #35 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in New Mexico consumed 22,900 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (117.4 thousand tons)
2. Egg-Laying Hens (10,300 tons)
3. Broilers (8,300 tons)

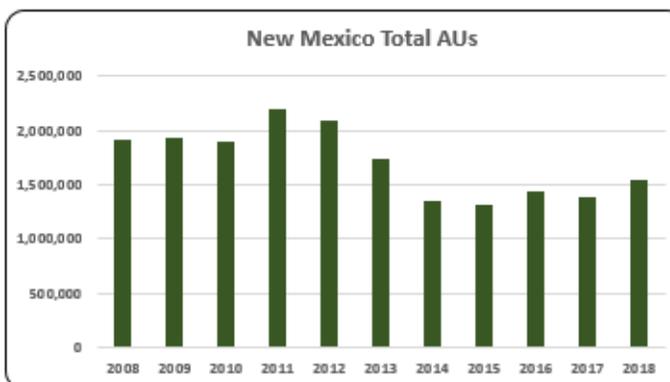
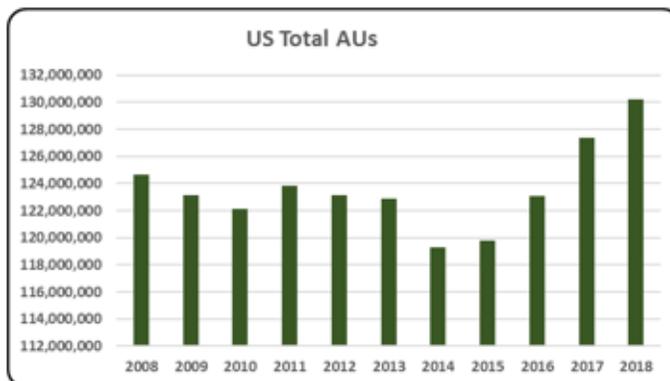


New Mexico Animal Unit (AU) Trends

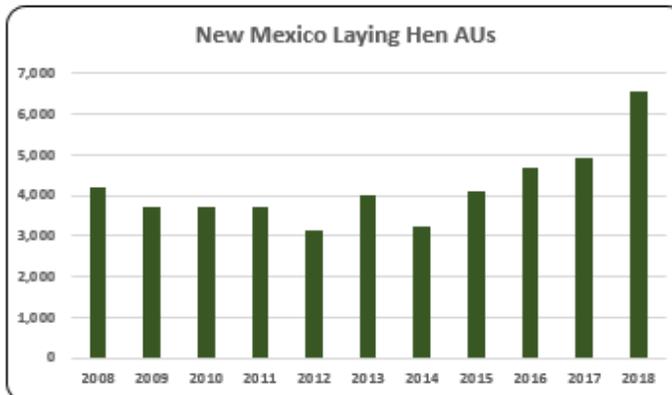
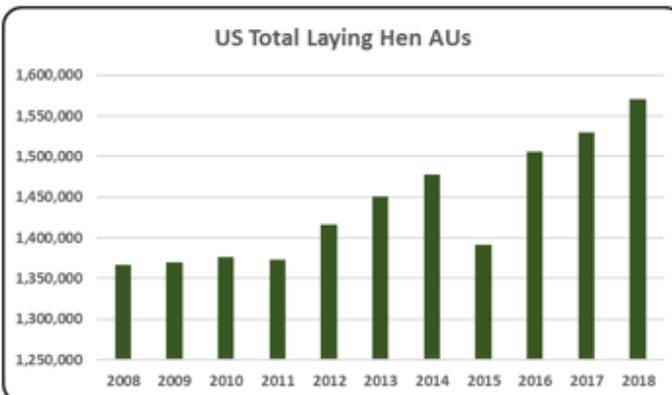
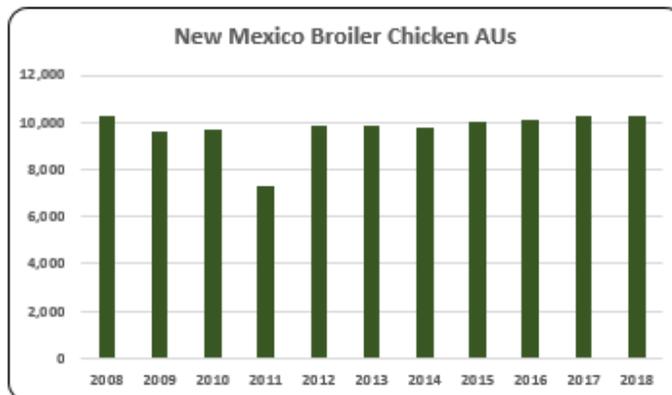
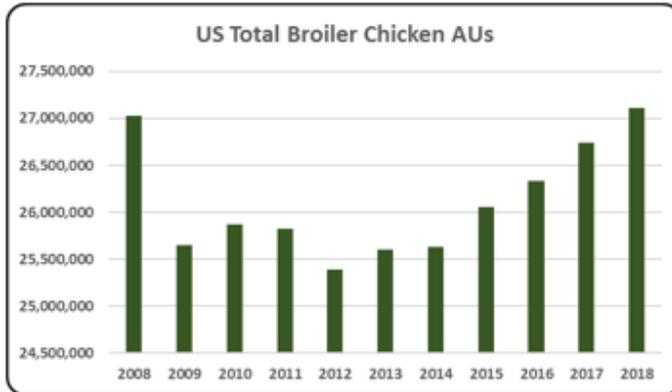
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New Mexico. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to New Mexico and to give perspective on New Mexico's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

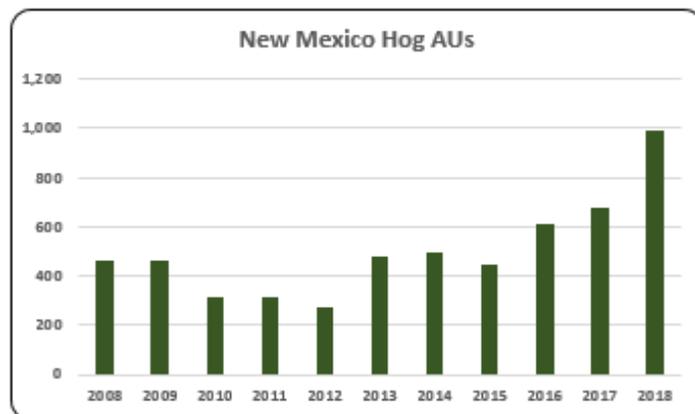
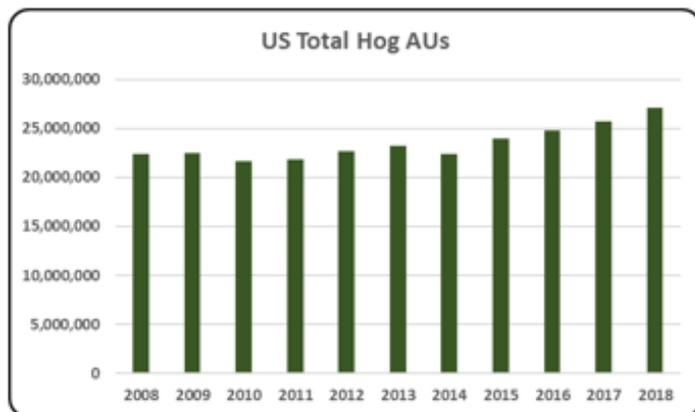
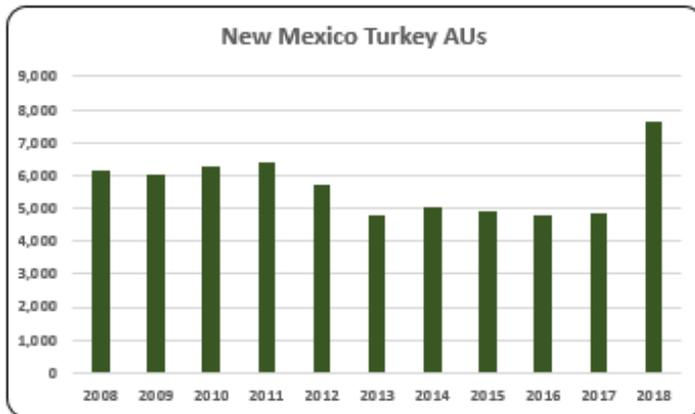
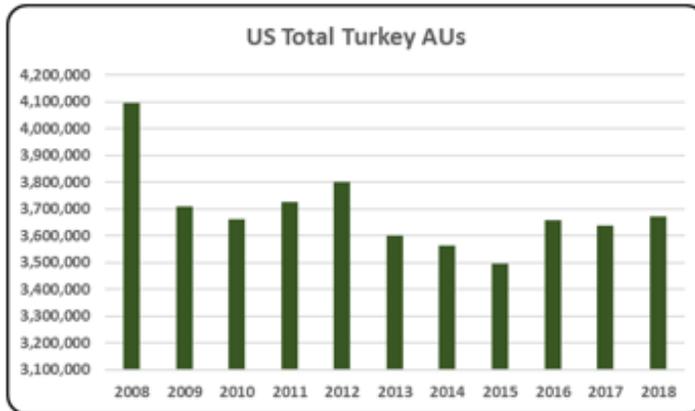
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New Mexico, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (1.1 million AUs), Dairy Cows (464,800 AUs), and Broilers (10,239 AUs). Total animal units in New Mexico during 2018 were 1.5 million AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 2011 was a record year for animal units in New Mexico with 2.1 million AUs, however AUs have since declined and 2018 animal units for the state were only 1.5 million AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broilers represented 0.7% (10,239 broiler AUs) of all AUs in the New Mexico in 2018. Broiler AUs have declined 0.5% from the past decade in 2008.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 0.4% (6,569 AUs) of all animal units for New Mexico were from laying hens in 2018. The increase in laying hens from 2008 to 2018 was 56.3%.

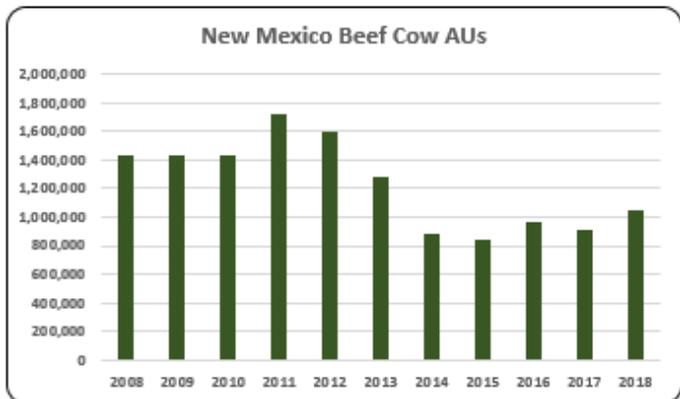
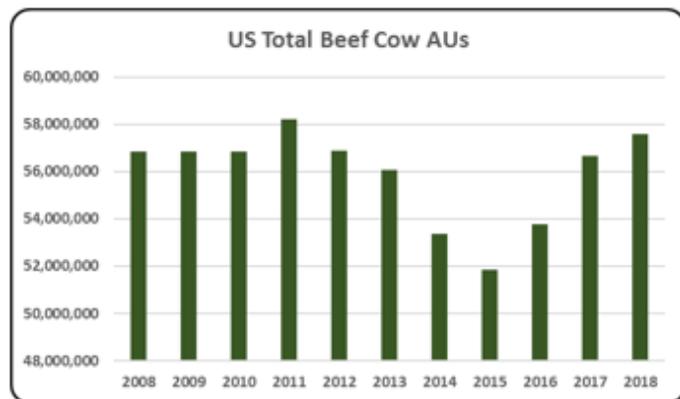
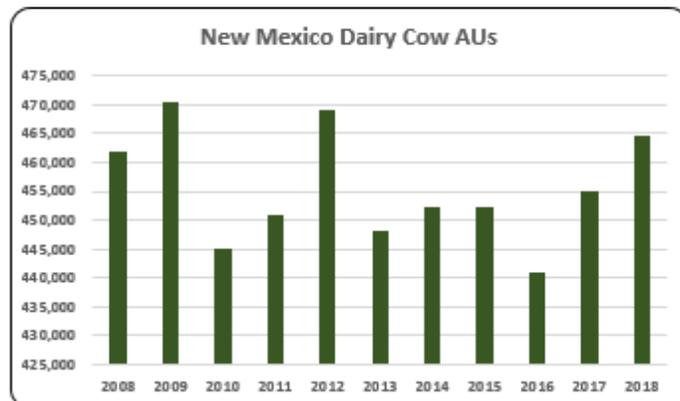
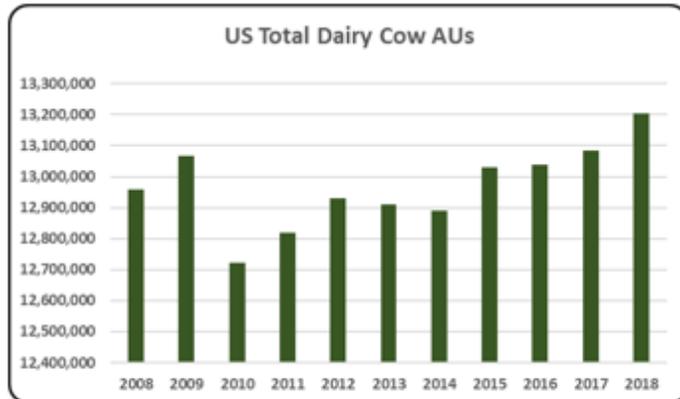


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

- Turkey numbers increased 24.0% during the past decade to 7,642 turkey AUs in 2018.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- The hog sector in New Mexico is small with only 990 hog AUs in 2018. It has an average of 503 AUs for the decade.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cows are the second largest sector in terms of animal units in New Mexico with an average of 455,509 AUs throughout the past decade.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cow animal units have decreased 26.9% to 1.0 million AUs in the last decade. Still 68.2% of the state AUs are beef cows.

New Mexico Additional Information and Methodology

Animal agriculture is a part of New Mexico's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in New Mexico, of interest is the degree to which the industry impacts the New Mexico economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for New Mexico animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted New Mexico's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in New Mexico which have occurred. As shown in this state report, New Mexico has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in New Mexico. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

New Mexico Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on New Mexico's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in New Mexico, \$1.50 to \$2.13 million in total economic activity, \$0.34 to \$0.42 in household wages and 8 to 10 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.134	\$ 0.419	9.6
	Hogs, Pigs, and Other	\$ 1.504	\$ 0.342	8.3
	Poultry and Eggs	\$ 1.788	\$ 0.373	8.5
	Dairy	\$ 1.810	\$ 0.407	10.1

Appendix

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	1,437,000	1,437,000	1,437,000	1,725,150	1,597,050	1,275,450	877,425	844,200	971,250	907,575	1,050,300
	Hog and Pig AUs	465	465	315	315	270	480	495	450	615	675	990
	Broiler AUs	10,290	9,568	9,696	7,306	9,851	9,817	9,761	10,013	10,088	10,232	10,239
	Turkey AUs	6,165	6,026	6,279	6,391	5,734	4,806	5,044	4,931	4,812	4,835	7,642
	Egg Layer AUs	4,203	3,717	3,692	3,714	3,136	3,997	3,236	4,085	4,662	4,922	6,569
	Dairy AUs	462,000	470,400	445,200	450,800	469,000	448,000	452,200	452,200	441,000	455,000	464,800
	Total Animal Units	1,920,123	1,927,176	1,902,182	2,193,676	2,085,041	1,742,550	1,348,161	1,315,878	1,432,427	1,383,240	1,540,540
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 587,945	\$ 539,497	\$ 659,946	\$ 893,864	\$ 993,045	\$ 723,204	\$ 857,620	\$ 786,306	\$ 695,565	\$ 694,496	\$ 661,189
	Hogs and Pigs (\$1,000)	\$ 300	\$ 267	\$ 264	\$ 252	\$ 181	\$ 472	\$ 579	\$ 428	\$ 426	\$ 518	\$ 460
	Broilers (\$1,000)	\$ 8,242	\$ 7,111	\$ 7,431	\$ 6,506	\$ 9,816	\$ 11,960	\$ 12,547	\$ 10,946	\$ 9,733	\$ 11,428	\$ 14,732
	Turkeys (\$1,000)	\$ 10,970	\$ 10,397	\$ 12,336	\$ 9,700	\$ 10,430	\$ 7,560	\$ 5,001	\$ 4,571	\$ 5,169	\$ 3,500	\$ 5,102
	Eggs (\$1,000)	\$ 19,387	\$ 13,798	\$ 15,147	\$ 16,608	\$ 18,625	\$ 21,042	\$ 33,682	\$ 56,151	\$ 22,081	\$ 29,857	\$ 46,331
	Milk (\$1,000)	\$ 1,376,375	\$ 956,384	\$ 1,245,198	\$ 1,586,338	\$ 1,417,926	\$ 1,514,716	\$ 1,807,415	\$ 1,260,791	\$ 1,202,916	\$ 1,338,556	\$ 1,217,895
	Other	\$ 7,559	\$ 9,172	\$ 10,327	\$ 10,510	\$ 11,644	\$ 10,834	\$ 10,456	\$ 11,773	\$ 11,360	\$ 11,515	\$ 10,994
	Sheep and Lambs (\$1,000)	\$ 4,432	\$ 5,099	\$ 5,309	\$ 4,546	\$ 4,735	\$ 4,222	\$ 4,141	\$ 5,756	\$ 5,639	\$ 6,092	\$ 5,868
	Aquaculture (\$1,000)	\$ 3,127	\$ 4,073	\$ 5,018	\$ 5,964	\$ 6,909	\$ 6,612	\$ 6,315	\$ 6,017	\$ 5,720	\$ 5,423	\$ 5,126
	Total (\$1,000)	\$ 2,010,779	\$ 1,536,626	\$ 1,950,649	\$ 2,523,777	\$ 2,461,667	\$ 2,289,788	\$ 2,727,301	\$ 2,130,966	\$ 1,947,250	\$ 2,089,870	\$ 1,956,703

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	5,395	7,219	8,989	9,530
	Cattle feedlots (112112)	142	102	68	45
	Dairy cattle and milk production (11212)	185	196	196	191
	Hog and pig farming (1122)	96	125	76	75
	Poultry and egg production (1123)	116	396	134	138
	Sheep and goat farming (1124)	344	1,634	1,222	2,785
	Animal aquaculture and other animal production (1125,1129)	2,692	3,091	3,852	3,485
Value of Sales (\$1,000)	Cattle and Calves	533,952	576,025	630,837	626,745
	Hogs and Pigs	381	375	392	477
	Poultry and Eggs	17,468	withheld	3,346	4,201
	Milk*			1,251,065	1,267,940
	Aquaculture	1,604	3,228	6,909	5,423
	Other (calculated)	19,285	32,641	16,440	26,822
	Total	572,690	612,269	1,908,989	1,931,608
Input Purchases	Livestock and poultry purchased	(Farms) 3,708	4,054	4,962	5,503
		\$1,000 217,212	187,501	137,673	174,946
	Breeding livestock purchased	(Farms) 2,344	2,569	3,043	3,498
		\$1,000 71,093	66,729	33,048	71,324
	Other livestock and poultry purchased	(Farms) 2,060	2,066	2,530	2,878
		\$1,000 146,119	120,772	104,625	103,622
Feed purchased	(Farms) 9,443	12,073	16,204	17,338	
	\$1,000 486,979	697,004	1,124,762	913,386	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,411,110	\$ 277,303	6,377	\$ 65,166
	Hogs, Pigs, and Other	\$ 17,221	\$ 3,914	95	\$ 920
	Poultry and Eggs	\$ 118,289	\$ 24,653	565	\$ 5,793
	Dairy	\$ 2,204,755	\$ 496,049	12,250	\$ 116,571
	Total	\$ 3,751,375	\$ 801,918	19,288	\$ 188,451
Change from 2008 to 2018	Cattle and Calves	\$ (88,430)	\$ (17,378)	(400)	\$ (4,084)
	Hogs, Pigs, and Other	\$ 3,100	\$ 705	17	\$ 166
	Poultry and Eggs	\$ 35,821	\$ 7,466	171	\$ 1,754
	Dairy	\$ (772,893)	\$ (173,894)	(4,294)	\$ (40,865)
	Total	\$ (822,402)	\$ (183,101)	(4,506)	\$ (43,029)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.134	\$ 0.419	9.6	
	Hogs, Pigs, and Other	\$ 1.504	\$ 0.342	8.3	
	Poultry and Eggs	\$ 1.788	\$ 0.373	8.5	
	Dairy	\$ 1.810	\$ 0.407	10.1	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.3%	
	Total			23.5%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NEW YORK

New York Executive Summary

The use of soybean meal as a key feed ingredient is an important part of New York animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of New York. The success of New York animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of New York during 2018 animal agriculture contributed:

- \$5.0 billion in economic output
- 29,893 jobs
- \$1.0 billion in earnings
- \$279.0 million in income taxes paid at local, state, and federal levels
- \$236.4 million in the form of property taxes

New York's animal agriculture consumed almost 370.6 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (221.0 thousand tons)
- Broilers (60.4 thousand tons)
- Egg-Laying Hens (42.6 thousand tons)

This report examines animal agriculture in New York over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in New York, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of New York and beyond.

New York Economic Impact of Animal Agriculture

Animal agriculture is a shrinking part of New York's economy. In 2018, New York's animal agriculture contributed the following to the economy:

- About \$5.0 billion in economic output
- \$1.0 billion in household earnings
- 29,893 jobs
- \$279.0 million in income taxes

During the last decade, contractions in New York's animal agriculture has:

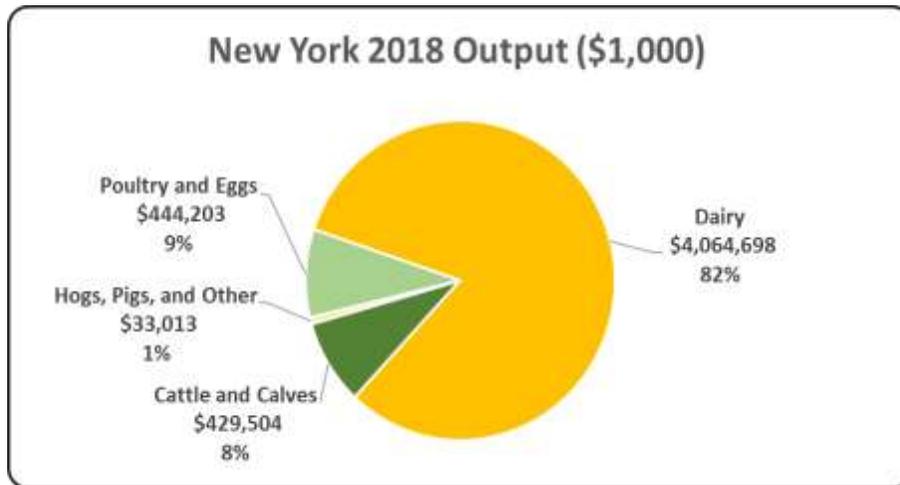
- Decreased economic output by \$439.5 million
- Reduced household earnings by \$100.7 million
- Shrunk by 2,835 jobs
- Paid \$26.8 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 4,971,419	\$ (439,550)	-8.12%
Earnings (\$1,000)	\$ 1,048,503	\$ (100,668)	-8.76%
Employment (Jobs)	29,893	(2,835)	-8.66%
Income Taxes Paid (\$1,000)	\$ 279,007	\$ (26,788)	-8.76%
Property Taxes Paid in 2017 (\$1,000)	\$ 236,418		

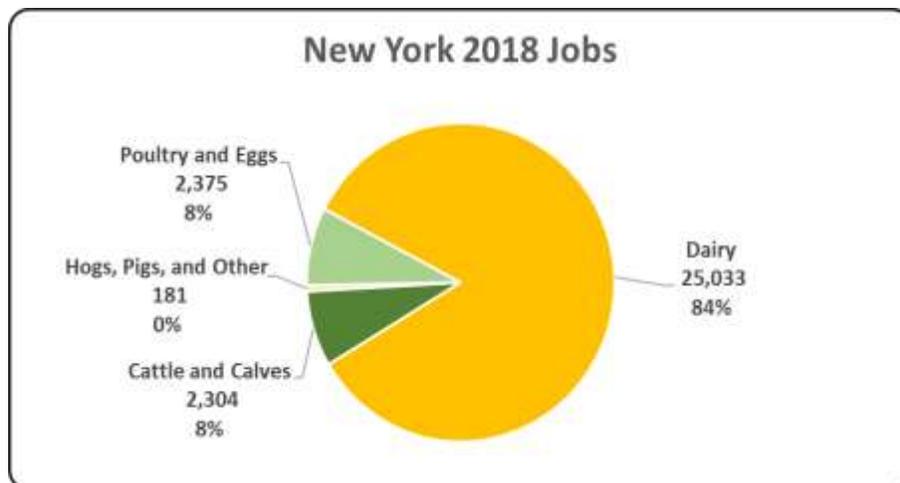
New York Output

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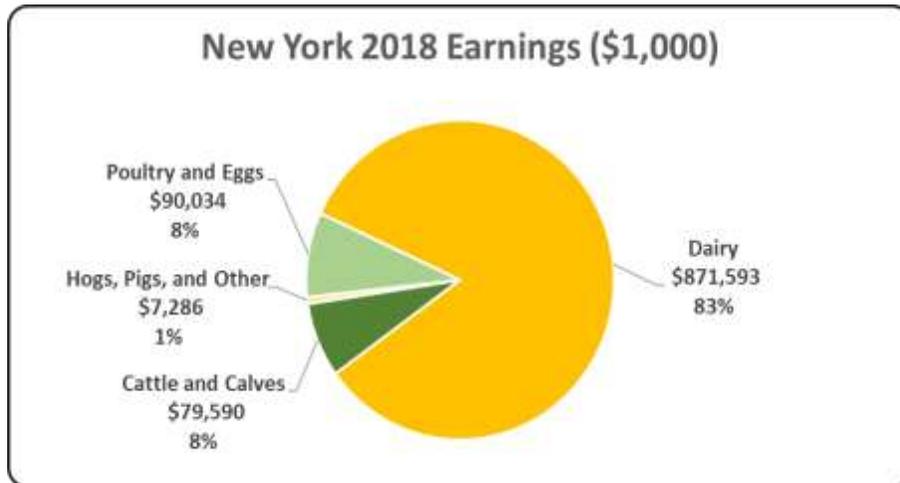
New York Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to New York in terms of animal agriculture jobs. As shown, animal agriculture contributes 29,893 jobs within and outside of animal agriculture.



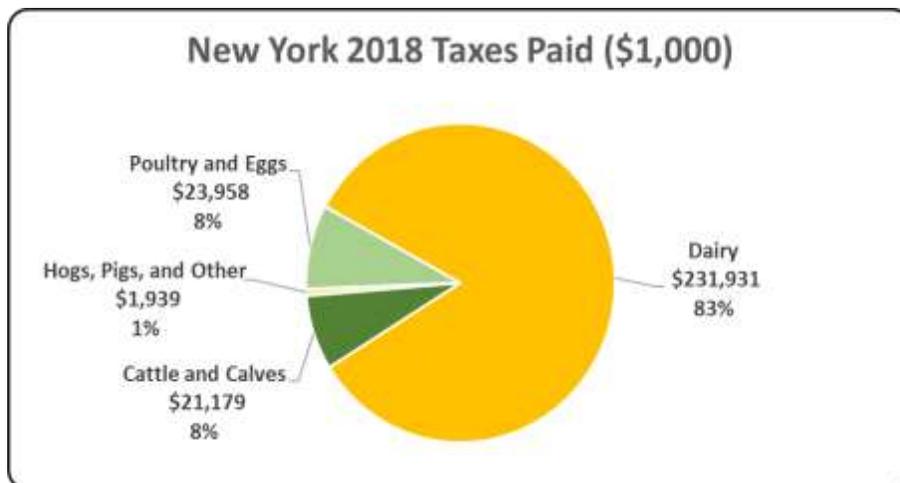
New York Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the New York economy in terms of earnings. New York’s animal agriculture contributed about \$1.0 billion to household earnings in 2018.



New York Taxes Paid by Animal Agriculture

New York’s animal agriculture is also a small source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$279.0 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$236.4 million in property taxes paid by all of New York agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



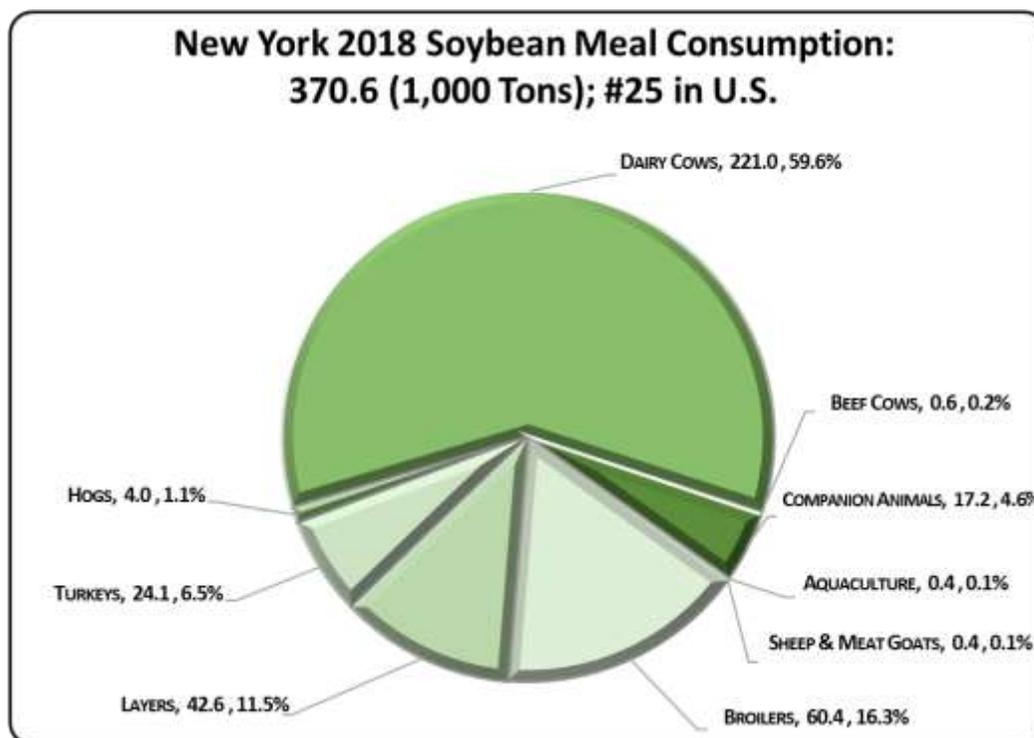
New York Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

New York's animal agriculture consumed almost 370.6 thousand tons of soybean meal in 2018, placing the state as #25 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in New York consumed 3,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (221.0 thousand tons)
2. Broilers (60.4 thousand tons)
3. Egg-Laying Hens (42.6 thousand tons)

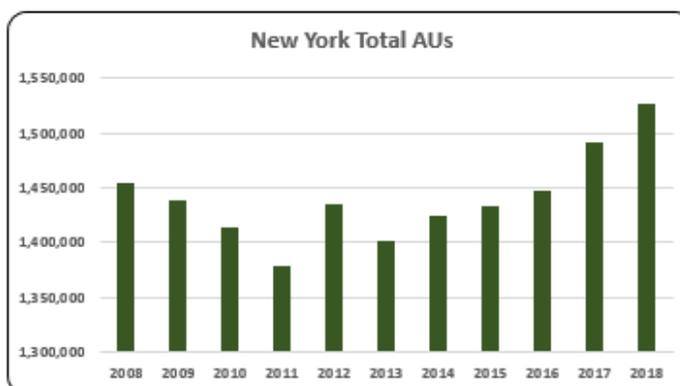
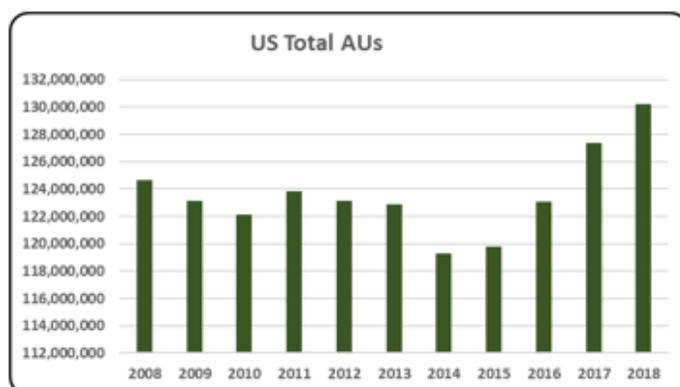


New York Animal Unit (AU) Trends

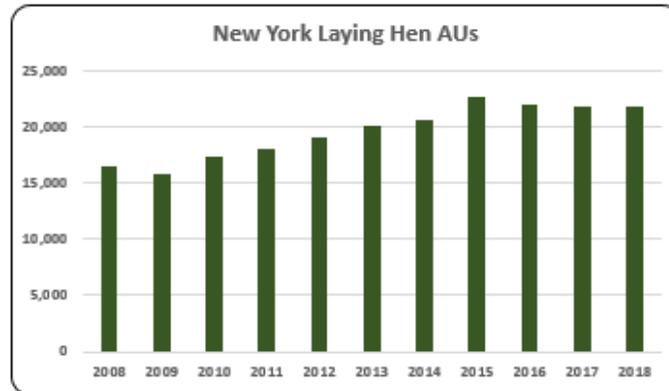
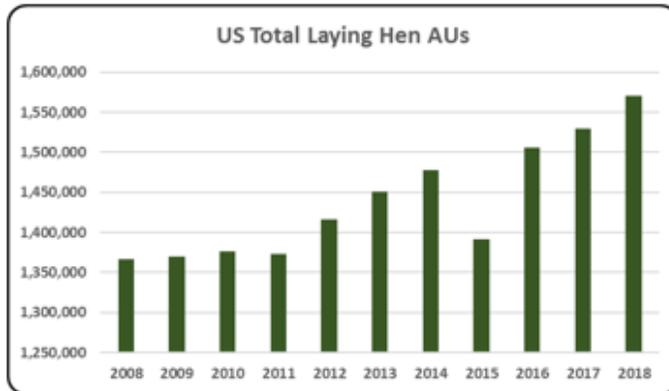
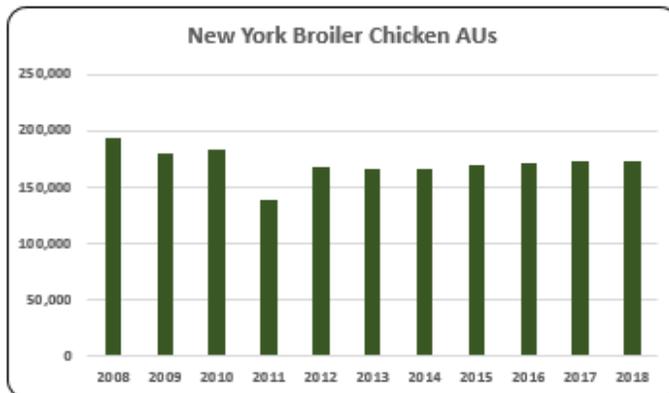
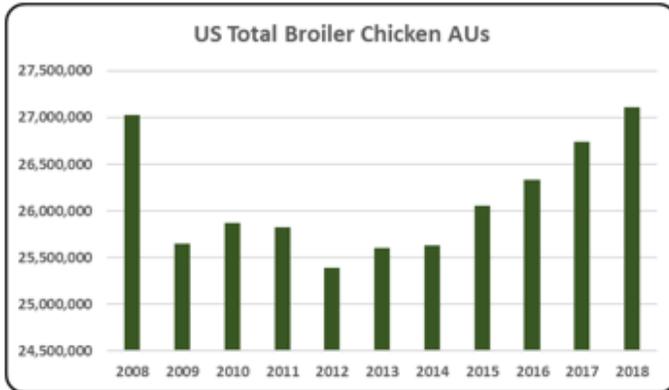
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New York. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to New York and to give perspective on New York's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

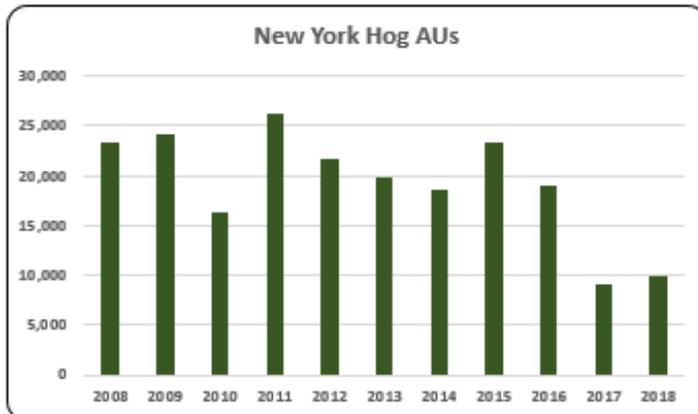
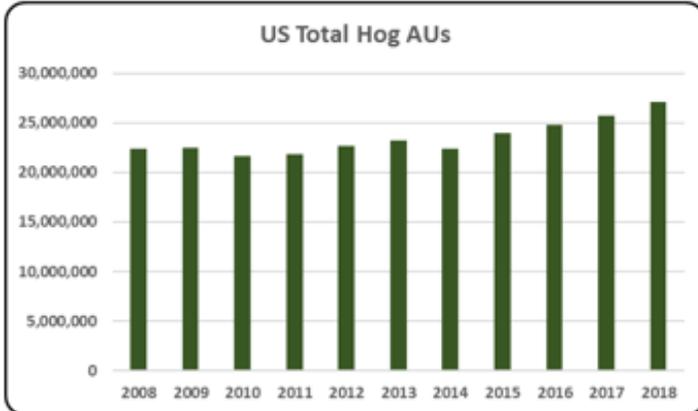
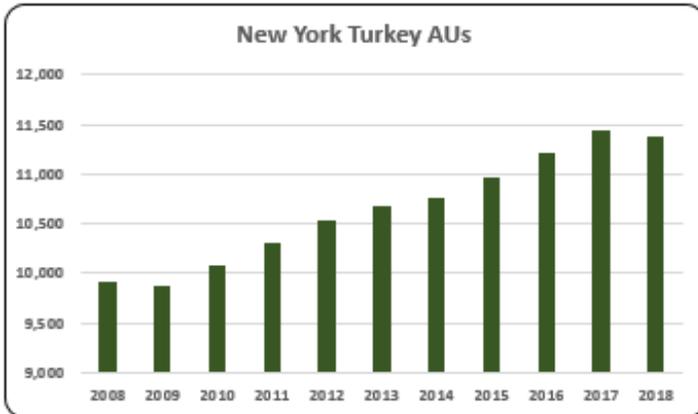
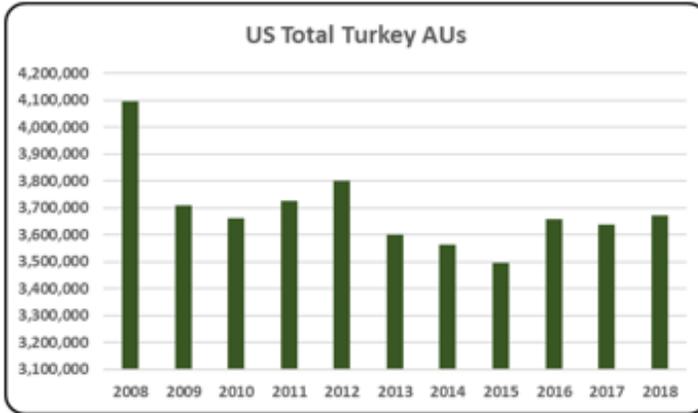
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New York, the largest three segments of animal agriculture in terms of AUs during 2018 were: Dairy Cows (875,000 AUs), Beef Cows (435,960 AUs), and Broilers (173,302 AUs). Total animal units in New York during 2018 were 1.5 million AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Total animal units in New York widely fluctuated during 2008 to 2018, however 2018 holds the decade record for the highest number of animal units at 1.5 million.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broilers in 2018 (173,302 AUs) represented 11.4% of all animal units in New York. Broiler AUs decreased 10.6% during 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- The average number of layer AUs from 2008 to 2018 was 19,635. Layer numbers in 2018 reached 21,792 AUs, a 32.3% increase from 2008.

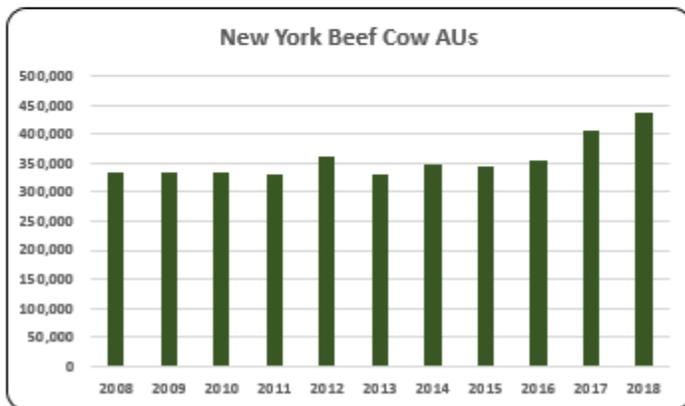
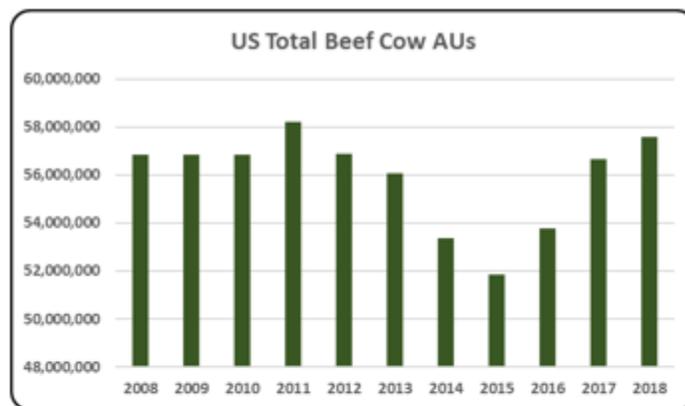
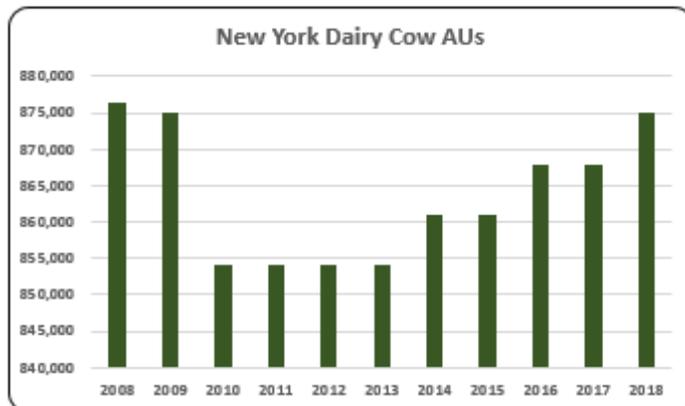
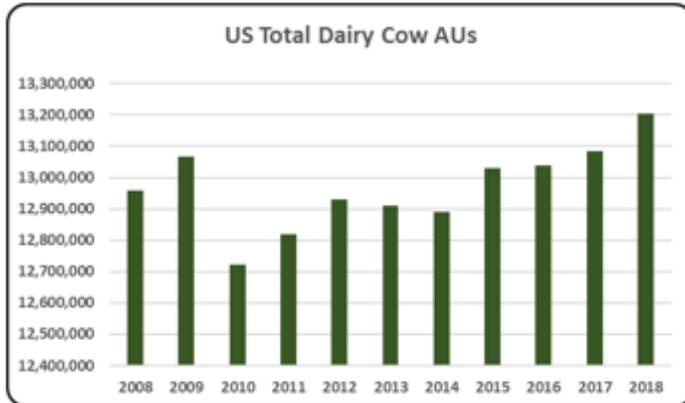


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

- Turkeys AUs increased by 14.8% from 2008 (9,917) to the 2018 AU number of 11,385.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- New York hog AUs decreased 57.0% over the past decade going back to 2008. The average number of hog AUs was 19,227 from 2008 to 2018.



- From 2007 to 2017 dairy cow AUs averaged 12.9 million. In 2017 dairy cow AUs remained at 13 million increasing only 50,000 AUs from 2016. There have been steady but small increases in dairy cow numbers since the early 2010s.
- The leading animal sector in New York is dairy cows with 57.3% of all AUs in the state in 2018. The average dairy cow AUs for the 2008 to 2018 decade were 863,673 AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cows represent 28.5% (435,960) of AUs in the state of New York. There has been a 30.7% increase in beef cow AUs since 2008.

New York Additional Information and Methodology

Animal agriculture is a minor part of New York's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in New York, of interest is the degree to which the industry impacts the New York economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for New York animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted New York's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in New York which have occurred. As shown in this state report, New York has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in New York. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

New York Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on New York's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in New York, \$1.41 to \$1.64 million in total economic activity, \$0.27 to \$0.35 in household wages and 8 to 10 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.433	\$ 0.266	7.7
	Hogs, Pigs, and Other	\$ 1.411	\$ 0.311	7.7
	Poultry and Eggs	\$ 1.601	\$ 0.324	8.6
	Dairy	\$ 1.636	\$ 0.351	10.1

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	333,600	333,600	333,600	331,950	363,450	331,350	347,925	346,035	355,425	407,025	435,960
	Hog and Pig AUs	23,280	24,120	16,305	26,295	21,705	19,725	18,525	23,340	19,050	9,135	10,020
	Broiler AUs	193,803	180,192	182,615	137,602	166,736	166,154	165,210	169,475	170,742	173,188	173,302
	Turkey AUs	9,917	9,865	10,086	10,305	10,538	10,672	10,763	10,961	11,225	11,433	11,385
	Egg Layer AUs	16,477	15,904	17,340	18,116	19,066	20,173	20,656	22,710	21,967	21,780	21,792
	Dairy AUs	876,400	875,000	854,000	854,000	854,000	854,000	861,000	861,000	868,000	868,000	875,000
	Total Animal Units	1,453,478	1,438,681	1,413,946	1,378,269	1,435,494	1,402,074	1,424,080	1,433,521	1,446,409	1,490,562	1,527,459
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 104,390	\$ 127,438	\$ 166,544	\$ 259,842	\$ 305,678	\$ 334,031	\$ 405,250	\$ 410,986	\$ 293,527	\$ 315,300	\$ 299,661
	Hogs and Pigs (\$1,000)	\$ 9,508	\$ 8,708	\$ 11,264	\$ 18,669	\$ 16,818	\$ 16,325	\$ 20,924	\$ 20,665	\$ 13,755	\$ 5,671	\$ 5,869
	Broilers (\$1,000)	\$ 155,223	\$ 133,925	\$ 139,956	\$ 122,530	\$ 166,138	\$ 202,436	\$ 212,371	\$ 185,275	\$ 164,733	\$ 193,436	\$ 125,793
	Turkeys (\$1,000)	\$ 22,159	\$ 33,953	\$ 47,797	\$ 64,598	\$ 69,457	\$ 50,346	\$ 33,308	\$ 39,037	\$ 44,144	\$ 29,889	\$ 24,388
	Eggs (\$1,000)	\$ 96,871	\$ 66,428	\$ 66,177	\$ 82,740	\$ 93,883	\$ 107,145	\$ 133,207	\$ 193,585	\$ 63,470	\$ 89,145	\$ 127,359
	Milk (\$1,000)	\$ 2,386,944	\$ 1,689,664	\$ 2,212,062	\$ 2,747,332	\$ 2,558,860	\$ 2,854,156	\$ 3,487,420	\$ 2,565,108	\$ 2,512,090	\$ 2,713,984	\$ 2,485,294
	Other	\$ 15,586	\$ 17,085	\$ 19,393	\$ 20,435	\$ 21,508	\$ 20,821	\$ 20,149	\$ 20,348	\$ 19,286	\$ 18,283	\$ 17,530
	Sheep and Lambs (\$1,000)	\$ 2,763	\$ 2,959	\$ 3,964	\$ 3,702	\$ 3,472	\$ 3,755	\$ 4,052	\$ 5,222	\$ 5,130	\$ 5,096	\$ 5,313
	Aquaculture (\$1,000)	\$ 12,823	\$ 14,126	\$ 15,429	\$ 16,733	\$ 18,036	\$ 17,066	\$ 16,096	\$ 15,127	\$ 14,157	\$ 13,187	\$ 12,217
	Total (\$1,000)	\$ 2,790,682	\$ 2,077,201	\$ 2,663,193	\$ 3,316,146	\$ 3,232,342	\$ 3,585,261	\$ 4,312,628	\$ 3,435,004	\$ 3,111,006	\$ 3,365,708	\$ 3,085,894

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	3,974	4,302	4,453	4,603
	Cattle feedlots (112112)	1,038	501	143	165
	Dairy cattle and milk production (11212)	6,531	5,237	4,694	3,799
	Hog and pig farming (1122)	363	385	422	380
	Poultry and egg production (1123)	423	1,005	882	517
	Sheep and goat farming (1124)	1,115	1,068	1,120	1,201
	Animal aquaculture and other animal production (1125,1129)	4,976	5,111	5,171	4,864
Value of Sales (\$1,000)	Cattle and Calves	251,121	318,080	449,497	426,026
	Hogs and Pigs	14,005	28,302	38,999	24,920
	Poultry and Eggs	106,620	123,727	144,663	194,747
	Milk*			2,417,398	2,528,282
	Aquaculture	15,185	20,417	18,036	13,187
	Other (calculated)	34,880	85,962	39,094	74,064
	Total	421,811	576,488	3,107,687	3,261,226
Input Purchases	Livestock and poultry purchased	(Farms) 9,678	8,447	10,255	9,332
		\$1,000 122,666	117,208	139,833	126,281
	Breeding livestock purchased	(Farms) 5,796	4,657	5,449	4,548
		\$1,000 50,639	49,526	72,677	60,844
	Other livestock and poultry purchased	(Farms) 5,053	5,103	6,538	6,318
		\$1,000 72,026	67,683	67,156	65,438
Feed purchased	(Farms) 22,148	18,994	21,869	20,803	
	\$1,000 537,185	695,165	1,007,295	874,202	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 429,504	\$ 79,590	2,304	\$ 21,179
	Hogs, Pigs, and Other	\$ 33,013	\$ 7,286	181	\$ 1,939
	Poultry and Eggs	\$ 444,203	\$ 90,034	2,375	\$ 23,958
	Dairy	\$ 4,064,698	\$ 871,593	25,033	\$ 231,931
	Total	\$ 4,971,419	\$ 1,048,503	29,893	\$ 279,007
Change from 2008 to 2018	Cattle and Calves	\$ 250,698	\$ 46,456	1,345	\$ 12,362
	Hogs, Pigs, and Other	\$ (9,297)	\$ (2,052)	(51)	\$ (546)
	Poultry and Eggs	\$ (80,356)	\$ (16,287)	(430)	\$ (4,334)
	Dairy	\$ (600,594)	\$ (128,785)	(3,699)	\$ (34,270)
	Total	\$ (439,550)	\$ (100,668)	(2,835)	\$ (26,788)
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.433	\$ 0.266	7.7	
	Hogs, Pigs, and Other	\$ 1.411	\$ 0.311	7.7	
	Poultry and Eggs	\$ 1.601	\$ 0.324	8.6	
	Dairy	\$ 1.636	\$ 0.351	10.1	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				6.4%
	Total				26.6%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NORTH CAROLINA

North Carolina Executive Summary

The use of soybean meal as a key feed ingredient is an important part of North Carolina animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of North Carolina. The success of North Carolina animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of North Carolina during 2018 animal agriculture contributed:

- \$18.2 billion in economic output
- 88,621 jobs
- \$4.1 billion in earnings
- \$1.1 billion in income taxes paid at local, state, and federal levels
- \$157.4 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in North Carolina has increased economic output by over \$1.2 billion, boosted household earnings by \$239.3 million, contributed 4,804 additional jobs and paid \$62.1 million in additional tax revenues.

North Carolina's animal agriculture consumed 2.6 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (1.4 million tons)
- Hogs (799.1 thousand tons)
- Turkeys (288.1 thousand tons)

This report examines animal agriculture in North Carolina over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in North Carolina, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of North Carolina and beyond.

North Carolina Economic Impact of Animal Agriculture

Animal agriculture is an integral part of North Carolina's economy. In 2018, North Carolina's animal agriculture contributed the following to the economy:

- About \$18.2 billion in economic output
- \$4.1 billion in household earnings
- 88,621 jobs
- \$1.1 billion in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade North Carolina's animal agriculture has:

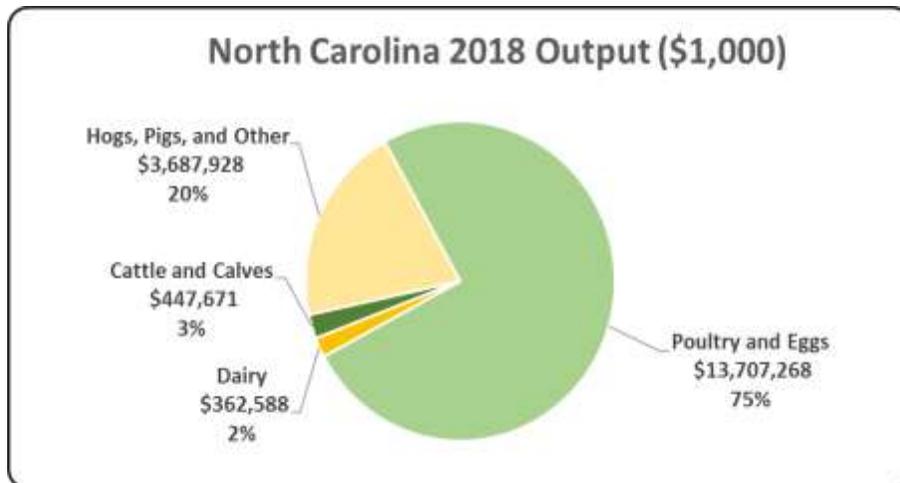
- Increased economic output by \$1.2 billion
- Boosted household earnings by \$239.3 million
- Added 4,804 jobs
- Paid an additional \$62.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 18,205,455	\$ 1,150,473	6.75%
Earnings (\$1,000)	\$ 4,061,600	\$ 239,285	6.26%
Employment (Jobs)	88,621	4,804	5.73%
Income Taxes Paid (\$1,000)	\$ 1,053,985	\$ 62,094	6.26%
Property Taxes Paid in 2017 (\$1,000)	\$ 157,354		

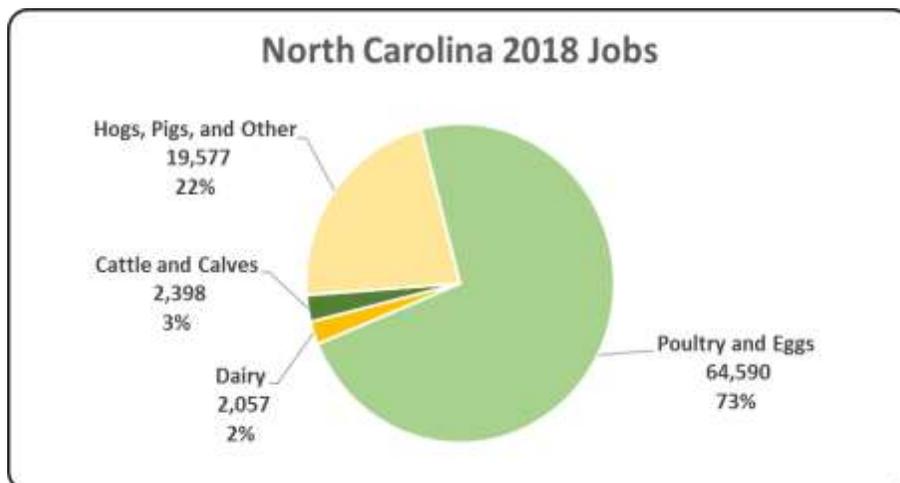
North Carolina Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the North Carolina economy. Animal agriculture’s impact on North Carolina total economic output is about \$18.2 billion.



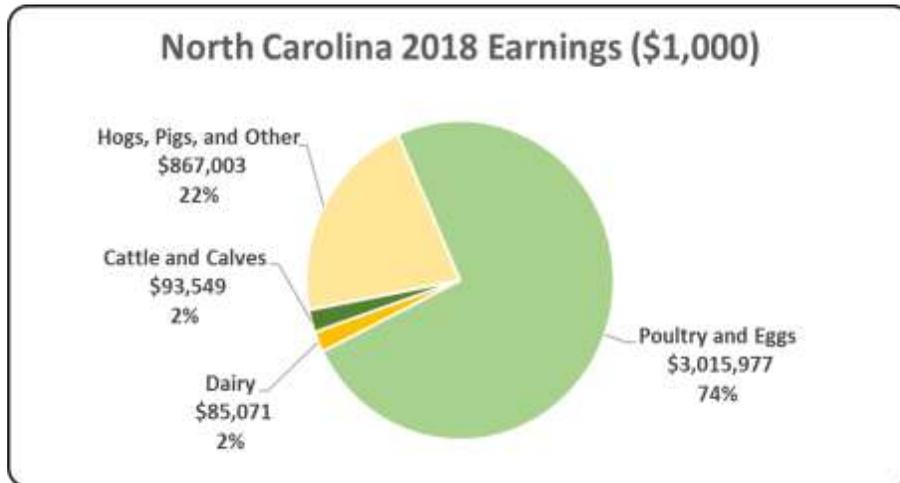
North Carolina Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to North Carolina in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to North Carolina total jobs, contributing 88,621 jobs within and outside of animal agriculture.



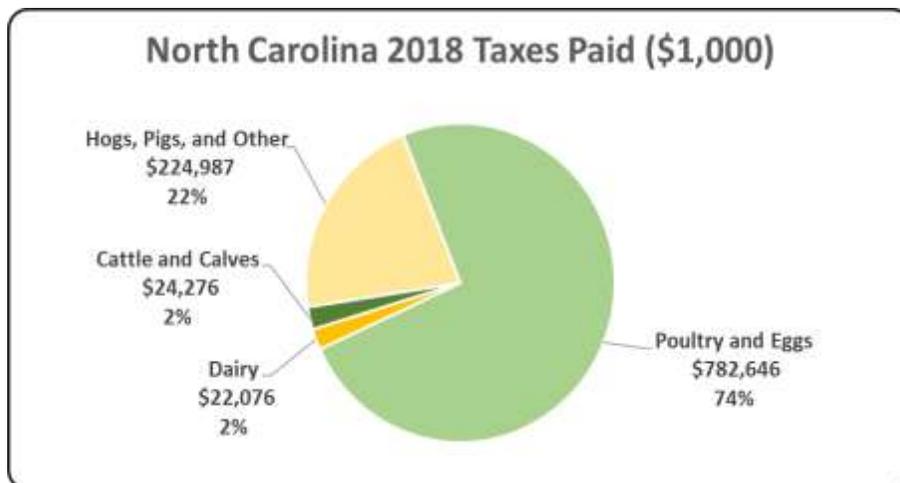
North Carolina Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the North Carolina economy in terms of earnings. North Carolina’s animal agriculture contributed about \$4.1 billion to household earnings in 2018.



North Carolina Taxes Paid by Animal Agriculture

North Carolina’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$1,054.0 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$157.4 million in property taxes paid by all of North Carolina agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



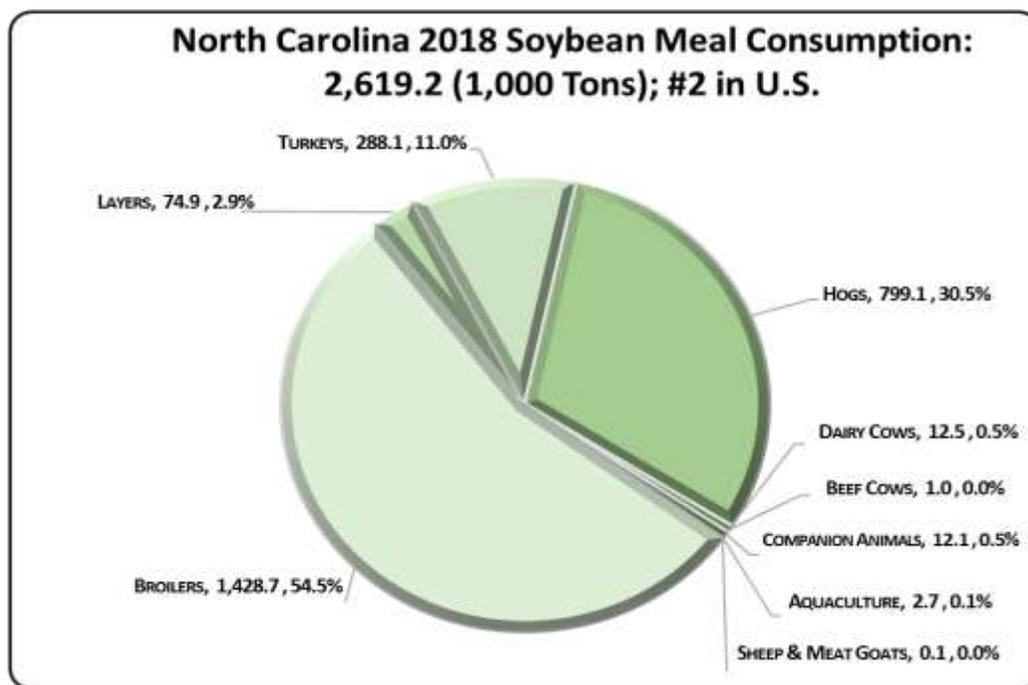
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The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

North Carolina's animal agriculture consumed 2.6 million tons of soybean meal in 2018, placing the state as #2 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in North Carolina consumed 17,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (1.4 million tons)
2. Hogs (799.1 thousand tons)
3. Turkeys (288.1 thousand tons)

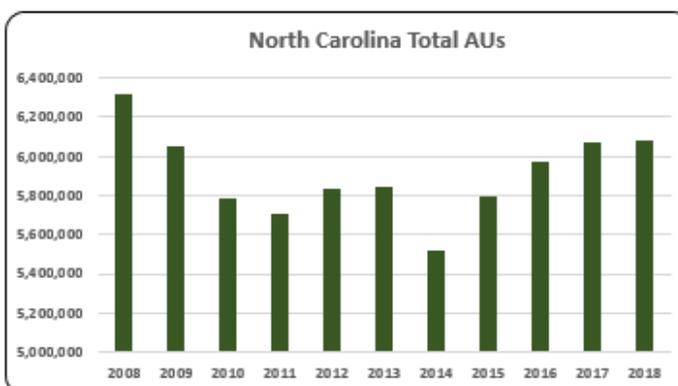
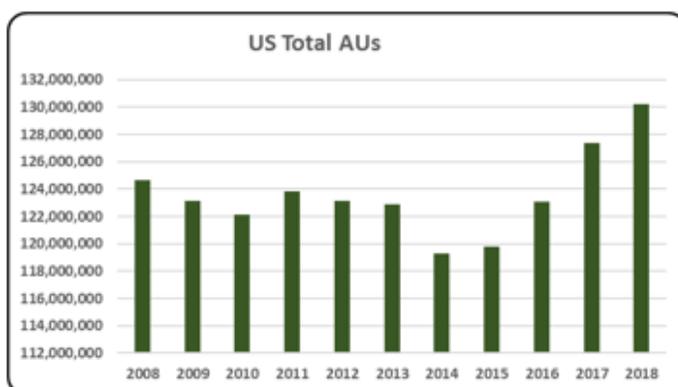


North Carolina Animal Unit (AU) Trends

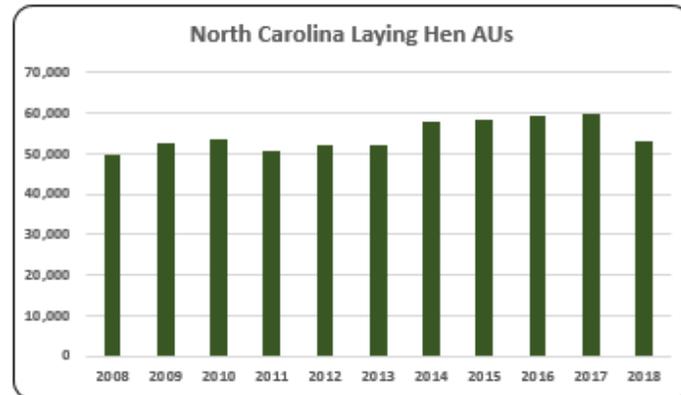
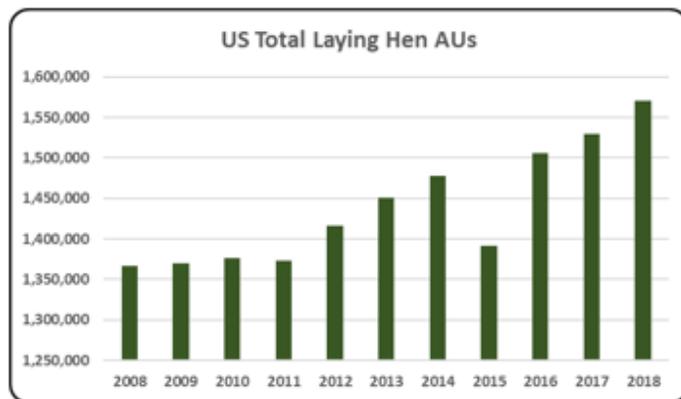
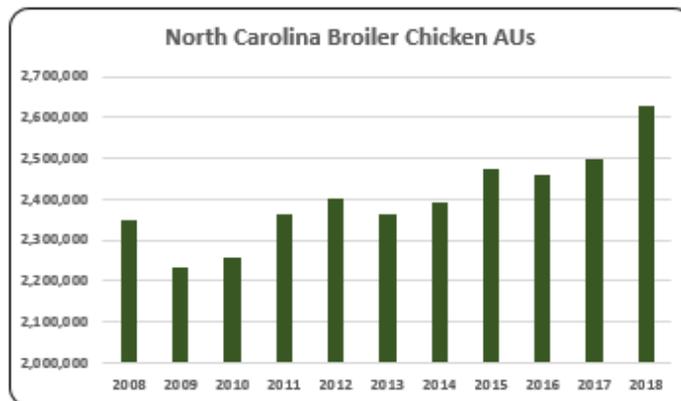
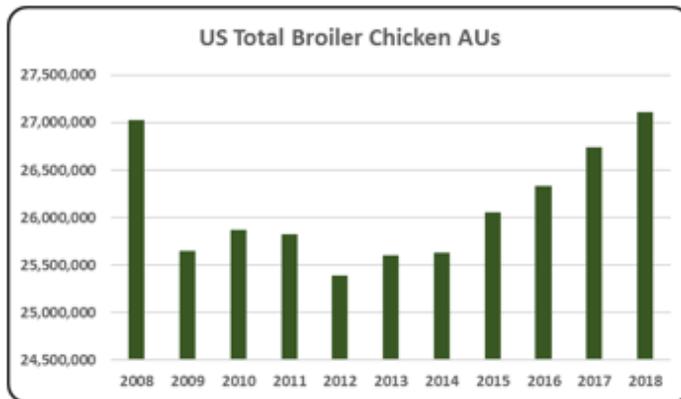
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of North Carolina. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to North Carolina and to give perspective on North Carolina's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

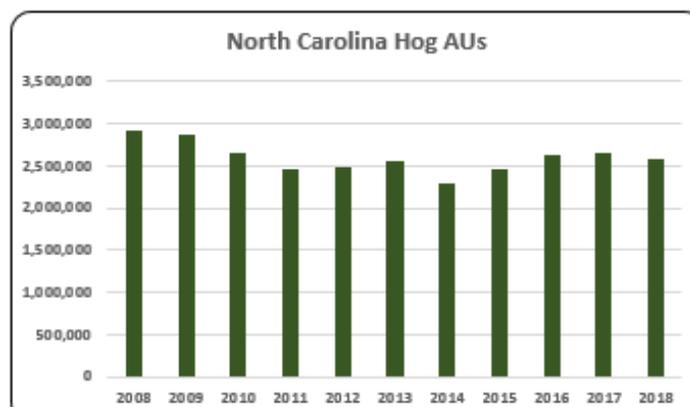
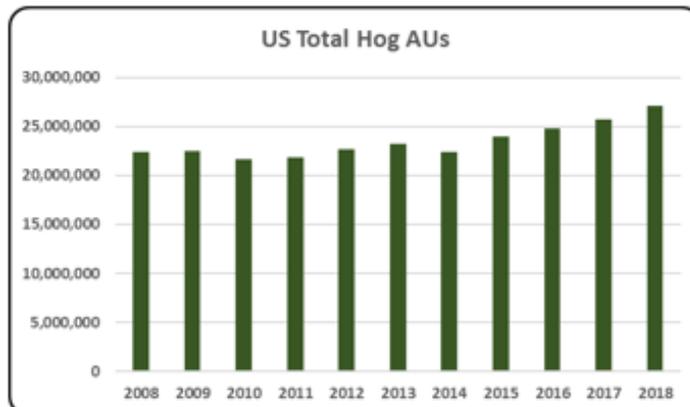
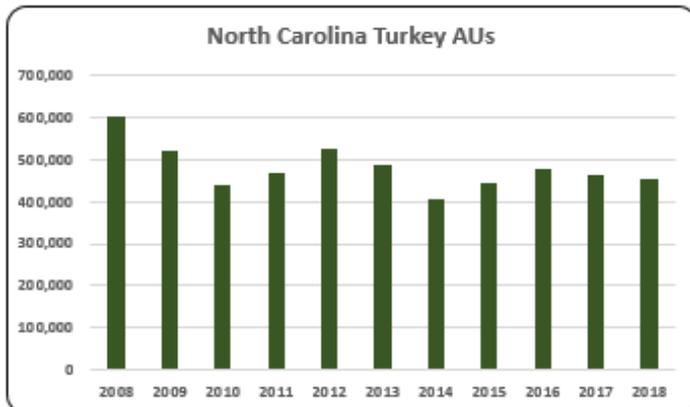
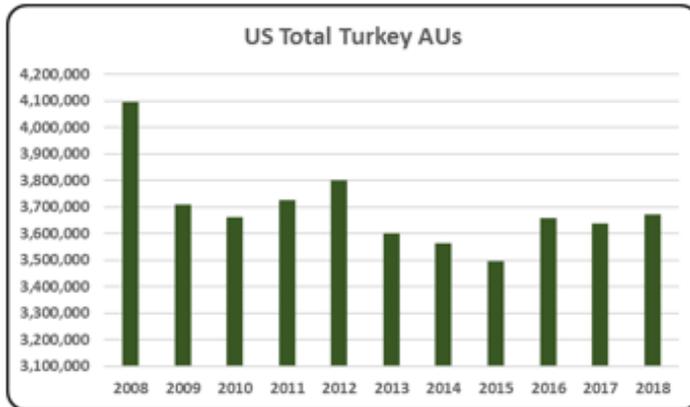
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In North Carolina, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (2.6 million AUs), Hogs (2,575,950 AUs), and Turkeys (453,992 AUs). Total animal units in North Carolina during 2018 were 6.1 million AUs.



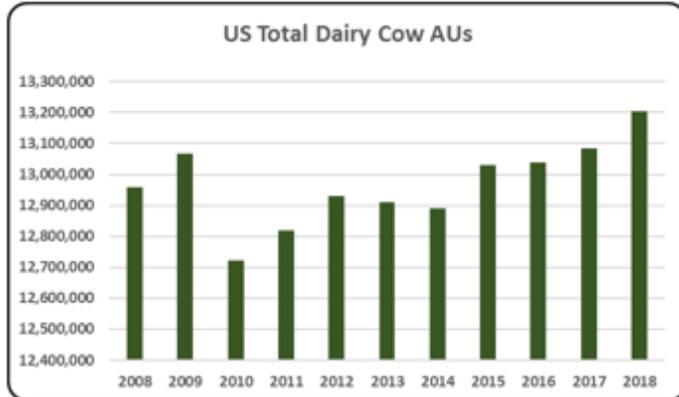
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 4.7% of all AUs in the U.S. were in North Carolina in 2018. 2008 was a record year for animal units in North Carolina with 6.3 million AUs. 2018 saw an increase from 2017 to 6.1 million AUs.



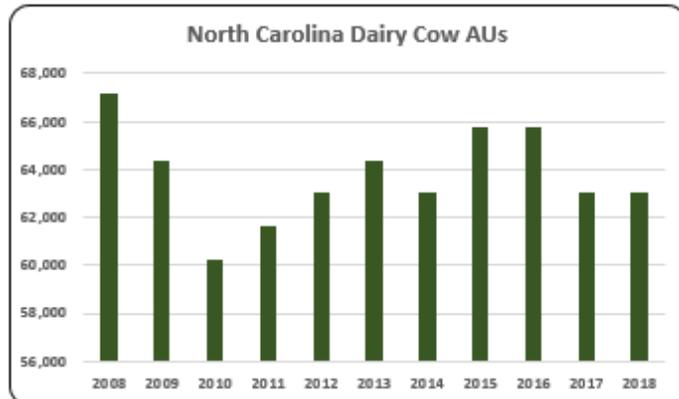
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 43.2% (2.6 million AUs) of all AUs in 2018 were from broilers in North Carolina. There was an upward trend in the broiler industry during the last decade and broiler AUs increased 11.9% from 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Only 0.9% (53,204) of all AUs in North Carolina were from laying hens in 2018. The average number of layers during last decade was about 54,445 AUs.



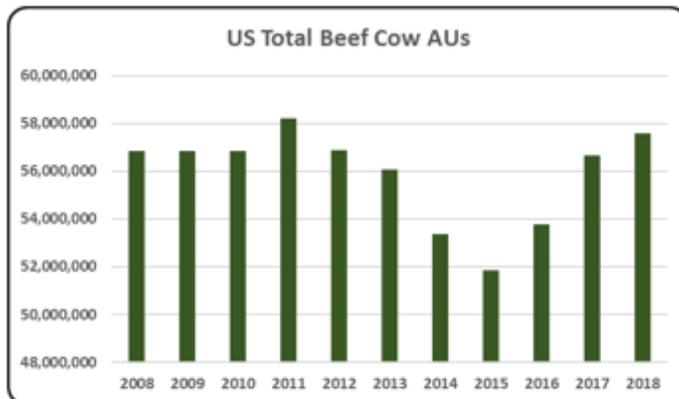
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- North Carolina represented 12.4% (453,992) of all turkey AUs in the U.S. Overall, turkey AUs decreased 25.0% during the 2008-2018 period.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hogs in North Carolina account for 42.4% (2.6 million AUs) of the state total AUs in 2018. Hog AUs in North Carolina experienced a slight downward trend during the last decade.



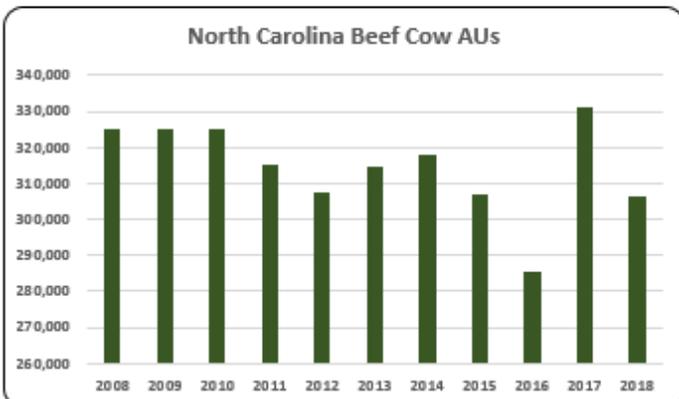
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- The average number of dairy cow AUs in North Carolina were 63,764 from 2008 to 2018. Dairy cow AUs decreased 6.3% throughout the past decade going back to 2008.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- From 2008 to 2018 North Carolina's beef cow AUs averaged 314,704. In 2018 beef cow AUs decreased to 306,375 from the decreased from the high of the decade in 2017.

North Carolina Additional Information and Methodology

Animal agriculture is an important part of North Carolina's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in North Carolina, of interest is the degree to which the industry impacts the North Carolina economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for North Carolina animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted North Carolina's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in North Carolina which have occurred. As shown in this state report, North Carolina has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in North Carolina. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

North Carolina Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on North Carolina's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in North Carolina, \$1.75 to \$2.75 million in total economic activity, \$0.38 to \$0.61 in household wages and 9 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.824	\$ 0.381	9.8
	Hogs, Pigs, and Other	\$ 1.747	\$ 0.411	9.3
	Poultry and Eggs	\$ 2.754	\$ 0.606	13.0
	Dairy	\$ 2.237	\$ 0.525	12.7

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	325,275	325,275	325,275	315,420	307,575	314,850	317,775	307,125	285,675	331,125	306,375
	Hog and Pig AUs	2,923,650	2,855,250	2,650,845	2,446,500	2,480,415	2,562,150	2,286,450	2,451,900	2,624,850	2,659,650	2,575,950
	Broiler AUs	2,347,373	2,235,055	2,255,662	2,364,262	2,403,427	2,364,243	2,390,000	2,472,688	2,460,616	2,496,954	2,625,475
	Turkey AUs	605,633	521,937	440,440	469,097	527,628	486,423	408,466	443,017	480,265	465,056	453,992
	Egg Layer AUs	49,531	52,744	53,336	50,824	51,970	52,154	57,646	58,251	59,455	59,775	53,204
	Dairy AUs	67,200	64,400	60,200	61,600	63,000	64,400	63,000	65,800	65,800	63,000	63,000
	Total Animal Units	6,318,662	6,054,661	5,785,758	5,707,702	5,834,016	5,844,220	5,523,338	5,798,781	5,976,661	6,075,560	6,077,996
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 210,118	\$ 205,617	\$ 236,278	\$ 306,298	\$ 316,790	\$ 304,014	\$ 412,922	\$ 404,242	\$ 272,237	\$ 277,545	\$ 245,407
	Hogs and Pigs (\$1,000)	\$ 2,115,293	\$ 1,809,998	\$ 2,167,461	\$ 2,471,953	\$ 2,553,214	\$ 2,824,115	\$ 2,821,777	\$ 2,263,676	\$ 2,098,086	\$ 2,345,097	\$ 2,076,752
	Broilers (\$1,000)	\$ 2,526,826	\$ 2,429,960	\$ 2,612,054	\$ 2,564,433	\$ 2,838,600	\$ 3,580,997	\$ 3,849,710	\$ 3,452,400	\$ 3,091,561	\$ 3,570,435	\$ 3,857,883
	Turkeys (\$1,000)	\$ 628,000	\$ 468,319	\$ 534,710	\$ 670,078	\$ 827,406	\$ 727,935	\$ 737,831	\$ 888,781	\$ 990,577	\$ 729,334	\$ 609,960
	Eggs (\$1,000)	\$ 373,944	\$ 349,371	\$ 327,373	\$ 375,573	\$ 392,549	\$ 431,359	\$ 501,063	\$ 588,368	\$ 444,441	\$ 460,106	\$ 509,017
	Milk (\$1,000)	\$ 191,780	\$ 134,368	\$ 167,138	\$ 207,016	\$ 192,700	\$ 200,090	\$ 246,977	\$ 183,210	\$ 165,015	\$ 178,976	\$ 162,101
	Other	\$ 25,111	\$ 24,881	\$ 25,203	\$ 24,728	\$ 24,550	\$ 26,067	\$ 27,656	\$ 29,449	\$ 30,971	\$ 32,437	\$ 33,771
	Sheep and Lambs (\$1,000)	\$ 969	\$ 933	\$ 1,449	\$ 1,169	\$ 1,185	\$ 1,185	\$ 1,258	\$ 1,535	\$ 1,540	\$ 1,489	\$ 1,306
	Aquaculture (\$1,000)	\$ 24,142	\$ 23,948	\$ 23,754	\$ 23,559	\$ 23,365	\$ 24,882	\$ 26,398	\$ 27,915	\$ 29,431	\$ 30,948	\$ 32,465
	Total (\$1,000)	\$ 6,071,072	\$ 5,422,514	\$ 6,070,216	\$ 6,620,079	\$ 7,145,809	\$ 8,094,576	\$ 8,597,936	\$ 7,810,126	\$ 7,092,888	\$ 7,593,930	\$ 7,494,891

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	16,761	14,413	13,909	13,583
	Cattle feedlots (112112)	13	3	10	18
	Dairy cattle and milk production (11212)	740	381	263	261
	Hog and pig farming (1122)	1,735	1,619	1,170	1,264
	Poultry and egg production (1123)	3,827	4,096	3,404	3,106
	Sheep and goat farming (1124)	1,004	2,437	1,922	2,046
	Animal aquaculture and other animal production (1125,1129)	5,232	6,290	5,190	4,943
Value of Sales (\$1,000)	Cattle and Calves	185,222	288,801	332,733	275,175
	Hogs and Pigs	2,183,646	3,104,731	2,873,988	3,216,902
	Poultry and Eggs	2,382,365	4,087,004	4,837,026	5,413,591
	Milk*			179,265	184,855
	Aquaculture	17,669	32,175	23,365	30,948
	Other (calculated)	33,744	33,266	15,340	44,223
	Total	4,802,646	7,545,977	8,261,717	9,165,694
Input Purchases	Livestock and poultry purchased	(Farms) 11,972	12,342	12,827	12,188
		\$1,000 1,049,514	1,666,076	1,397,510	1,674,565
	Breeding livestock purchased	(Farms) 5,119	5,004	5,806	5,789
		\$1,000 57,036	131,277	136,342	193,167
	Other livestock and poultry purchased	(Farms) 7,997	8,677	8,692	8,015
		\$1,000 992,478	1,534,800	1,261,168	1,481,398
Feed purchased	(Farms) 30,938	28,263	29,837	29,230	
	\$1,000 1,917,997	3,183,993	4,121,552	3,124,286	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 447,671	\$ 93,549	2,398	\$ 24,276
	Hogs, Pigs, and Other	\$ 3,687,928	\$ 867,003	19,577	\$ 224,987
	Poultry and Eggs	\$ 13,707,268	\$ 3,015,977	64,590	\$ 782,646
	Dairy	\$ 362,588	\$ 85,071	2,057	\$ 22,076
	Total	\$ 18,205,455	\$ 4,061,600	88,621	\$ 1,053,985
Change from 2008 to 2018	Cattle and Calves	\$ (10,388)	\$ (2,171)	(56)	\$ (563)
	Hogs, Pigs, and Other	\$ (781,730)	\$ (183,778)	(4,150)	\$ (47,691)
	Poultry and Eggs	\$ 2,092,648	\$ 460,440	9,861	\$ 119,484
	Dairy	\$ (150,057)	\$ (35,207)	(851)	\$ (9,136)
	Total	\$ 1,150,473	\$ 239,285	4,804	\$ 62,094
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.824	\$ 0.381	9.8	
	Hogs, Pigs, and Other	\$ 1.747	\$ 0.411	9.3	
	Poultry and Eggs	\$ 2.754	\$ 0.606	13.0	
	Dairy	\$ 2.237	\$ 0.525	12.7	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.8%	
	Total			26.0%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: NORTH DAKOTA

North Dakota Executive Summary

The use of soybean meal as a key feed ingredient is an important part of North Dakota animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture success in the State of North Dakota. The success of North Dakota animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of North Dakota during 2018 animal agriculture contributed:

- \$2.6 billion in economic output
- 12,544 jobs
- \$518.6 million in earnings
- \$115.1 million in income taxes paid at local, state, and federal levels
- \$142.3 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in North Dakota has increased economic output by over \$396.1 million, boosted household earnings by \$75.5 million, contributed 1,805 additional jobs and paid \$16.8 million in additional tax revenues.

North Dakota's animal agriculture consumed almost 64.5 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (31.2 thousand tons)
- Broilers (11.8 thousand tons)
- Beef Cows (10.5 thousand tons)

This report examines animal agriculture in North Dakota over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in North Dakota, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of North Dakota and beyond.

North Dakota Economic Impact of Animal Agriculture

Animal agriculture is an important part of North Dakota's economy. In 2018, North Dakota's animal agriculture contributed the following to the economy:

- About \$2.6 billion in economic output
- \$518.6 million in household earnings
- 12,544 jobs
- \$115.1 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade North Dakota's animal agriculture has:

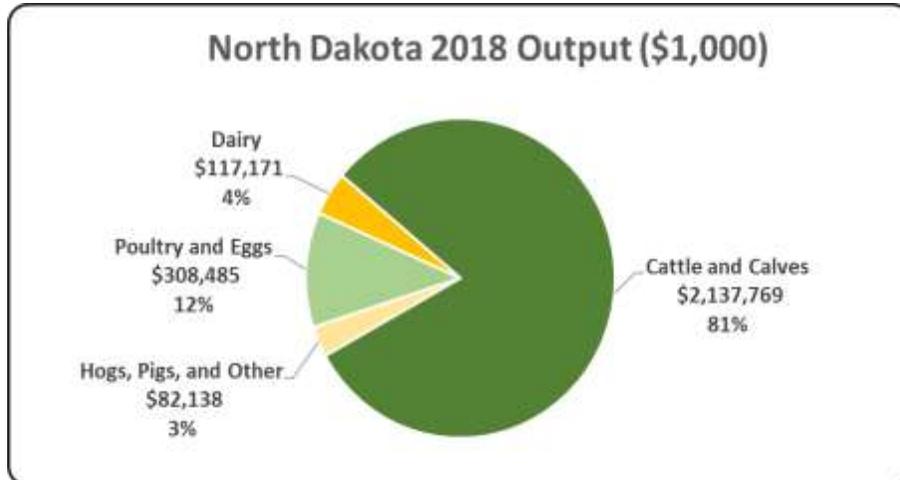
- Increased economic output by \$396.1 million
- Boosted household earnings by \$75.5 million
- Added 1,805 jobs
- Paid an additional \$16.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,645,563	\$ 396,113	17.61%
Earnings (\$1,000)	\$ 518,556	\$ 75,520	17.05%
Employment (Jobs)	12,544	1,805	16.80%
Income Taxes Paid (\$1,000)	\$ 115,120	\$ 16,766	17.05%
Property Taxes Paid in 2017 (\$1,000)	\$ 142,315		

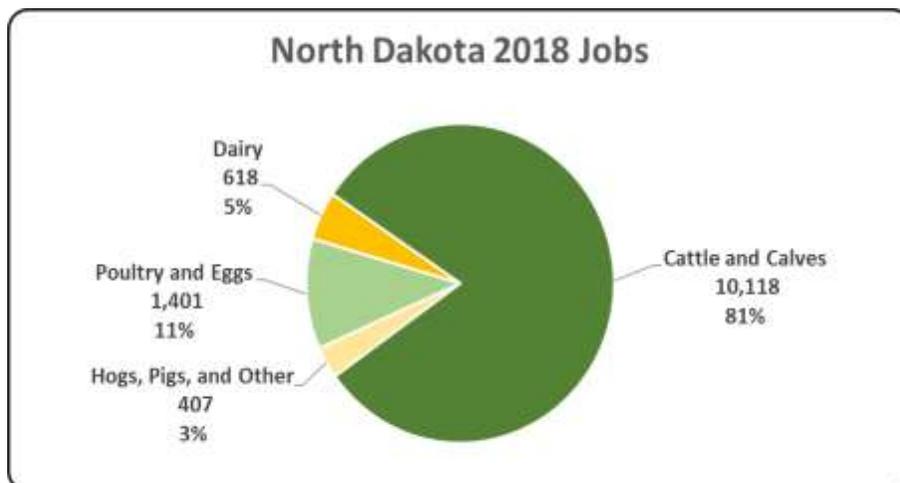
North Dakota Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the North Dakota economy. Animal agriculture’s impact on North Dakota total economic output is about \$2.6 billion.



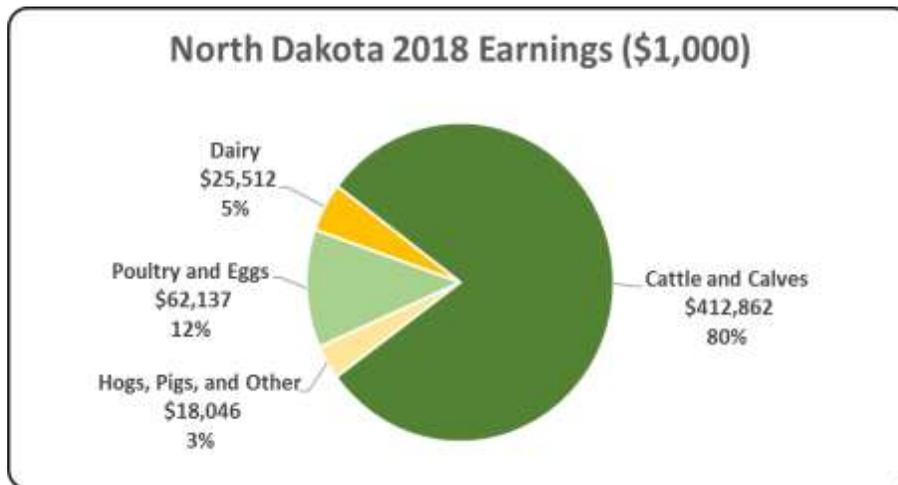
North Dakota Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to North Dakota in terms of animal agriculture jobs. As shown, animal agriculture contributes 12,544 jobs within and outside of animal agriculture.



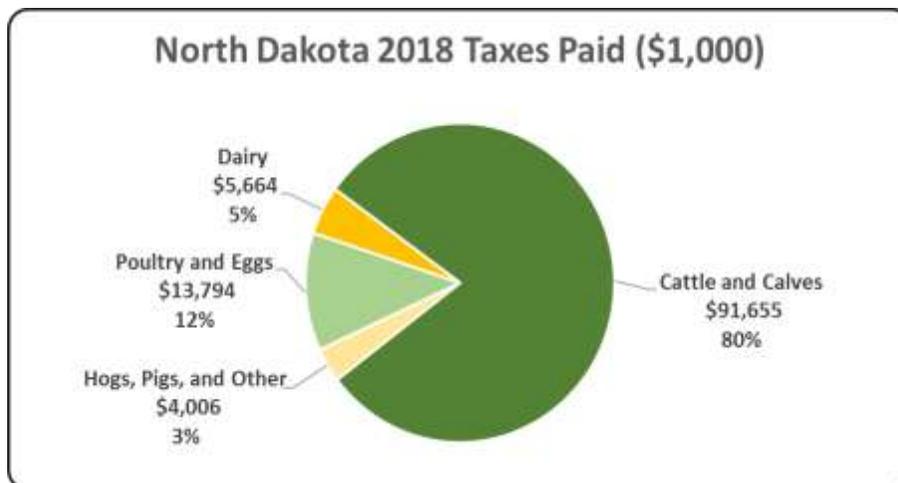
North Dakota Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the North Dakota economy in terms of earnings. North Dakota’s animal agriculture contributed about \$518.6 million to household earnings in 2018.



North Dakota Taxes Paid by Animal Agriculture

North Dakota’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$115.1 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$142.3 million in property taxes paid by all of North Dakota agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



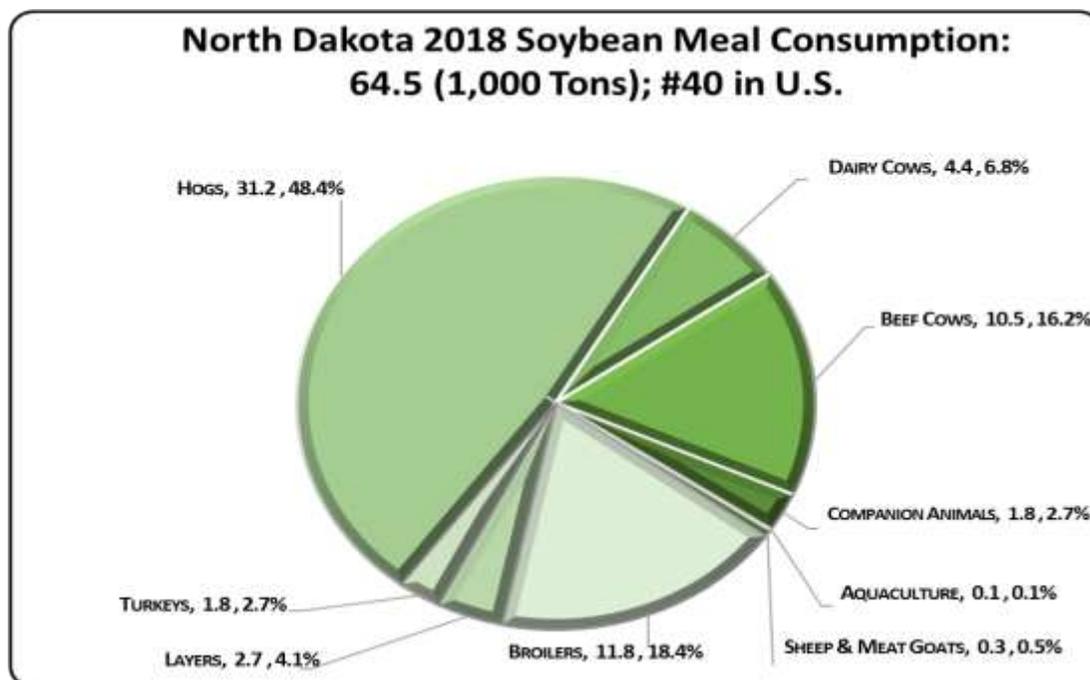
North Dakota Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

North Dakota's animal agriculture consumed almost 64.5 thousand tons of soybean meal in 2018, placing the state as #40 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in North Dakota consumed 53.8 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (31.2 thousand tons)
2. Broilers (11.8 thousand tons)
3. Beef Cows (10.5 thousand tons)

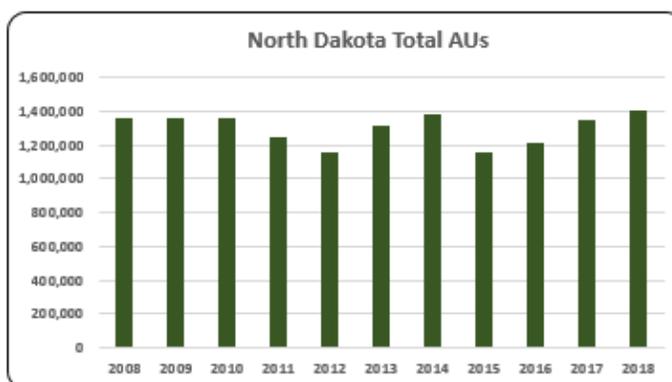
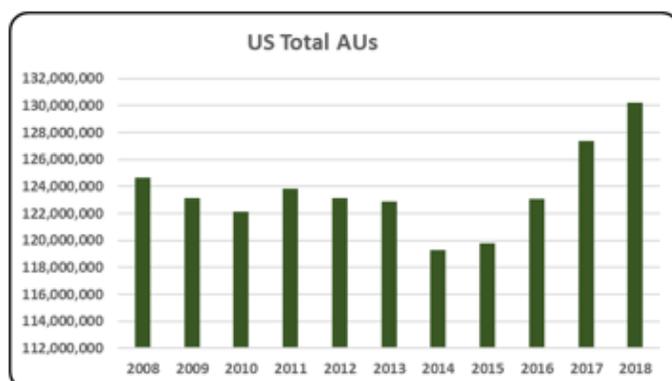


North Dakota Animal Unit (AU) Trends

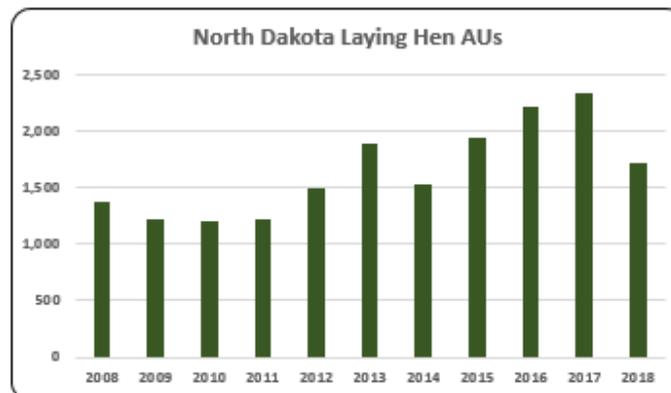
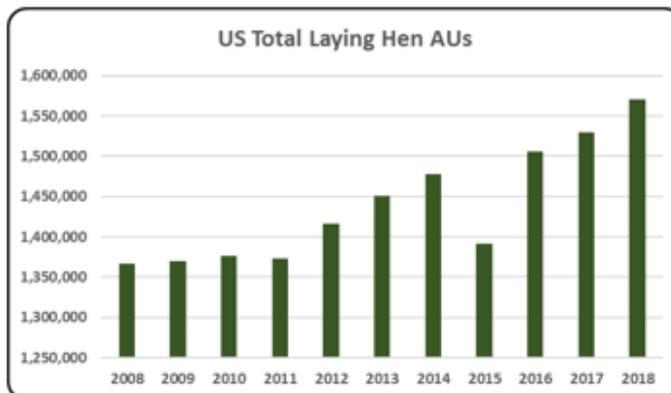
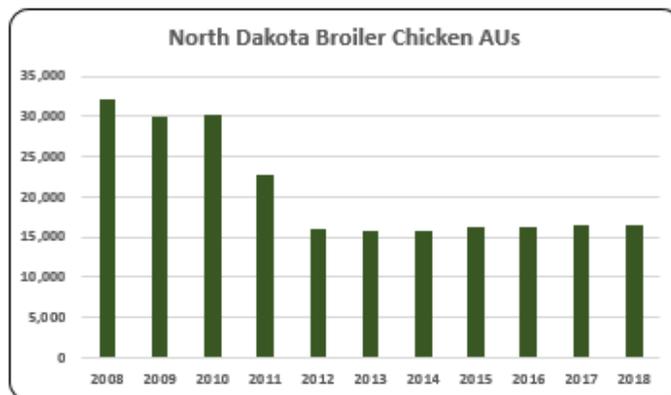
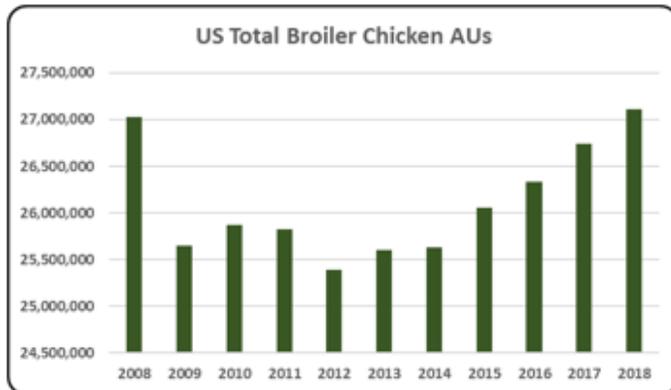
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Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

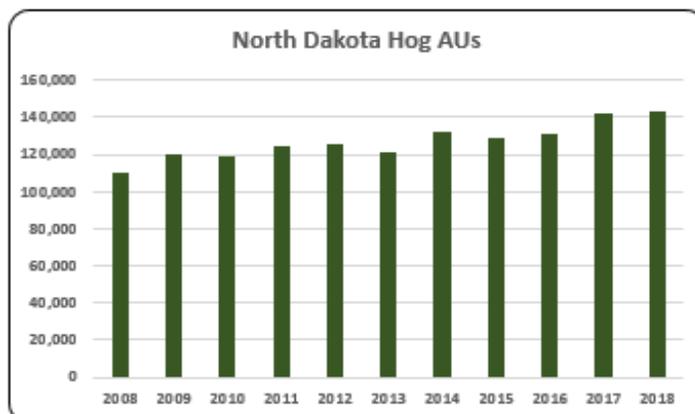
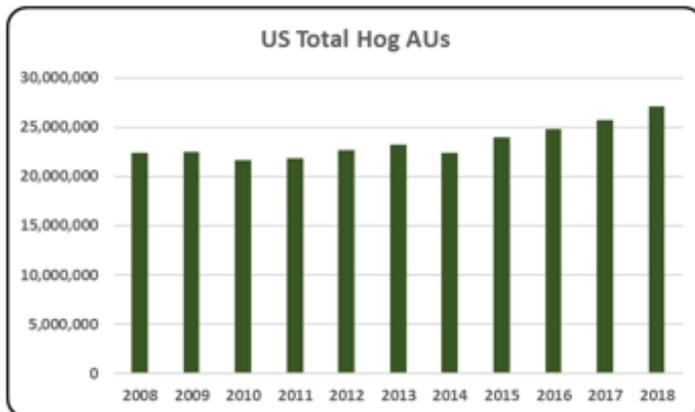
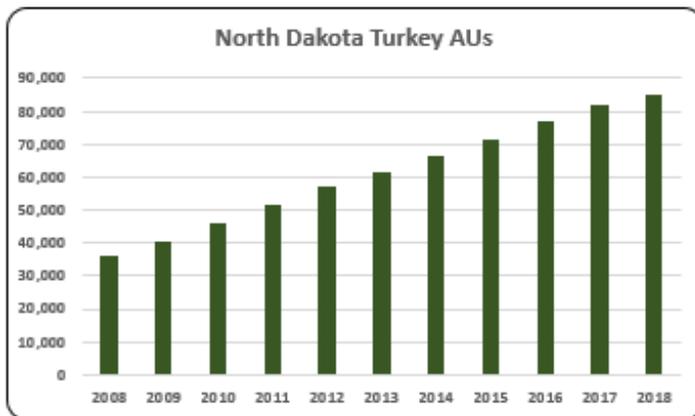
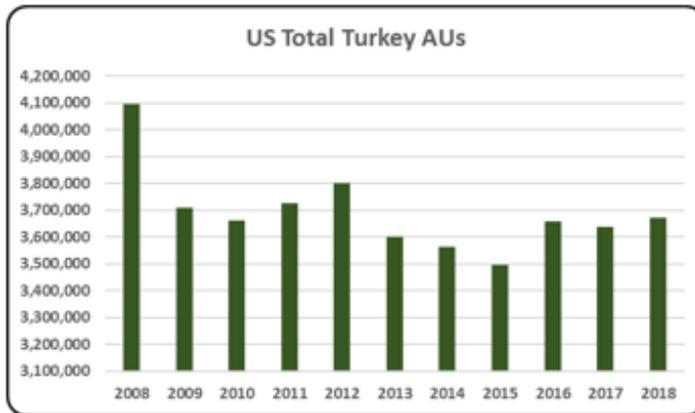
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In North Dakota, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (1.1 million AUs), Hogs (143,085 AUs), and Turkeys (85,211 AUs). Total animal units in North Dakota during 2018 were 1.4 million AUs.



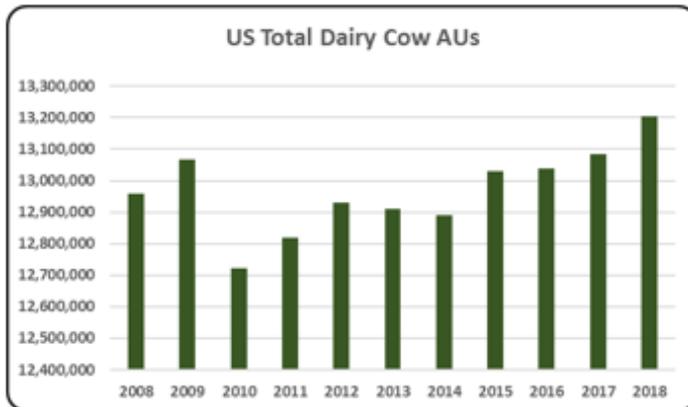
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 1.1% (1.4 million) of all AUs in the U.S. were in North Dakota in 2018. 80.9% of all AUs in North Dakota were from beef cows in 2018.



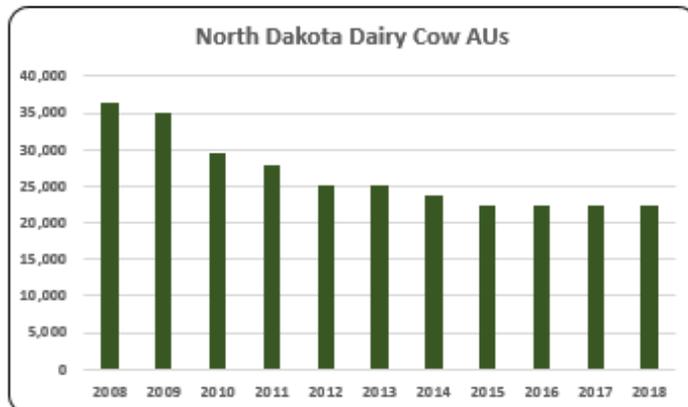
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- In 2018, there were 16,496 broiler AUs in North Dakota. There was a 48.7% reduction in broiler AUs from 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens in North Dakota were the smallest sector in terms of animal units in the state with only 1,714 layer AUs in 2017. Overall AUs increased 24.1% during the last decade going back to 2008.



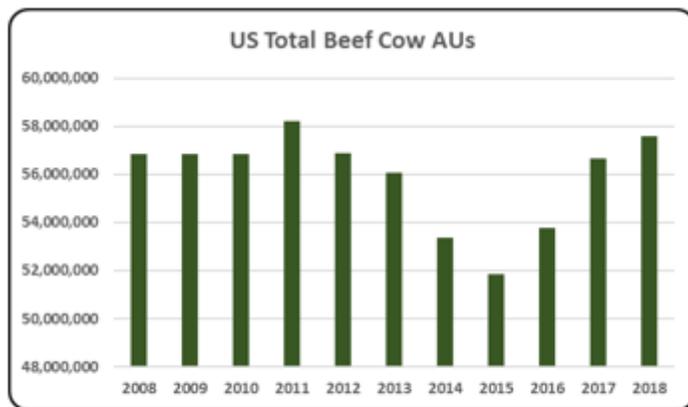
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs increased 134.5% in North Dakota from 2008 to 2018. Turkeys represented 6.1% (85,211 AUs) of all animal units in the state in 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- There were 143,085 hog AUs in North Dakota in 2018. Hog numbers rose 29.3% from 110,685 in 2008.



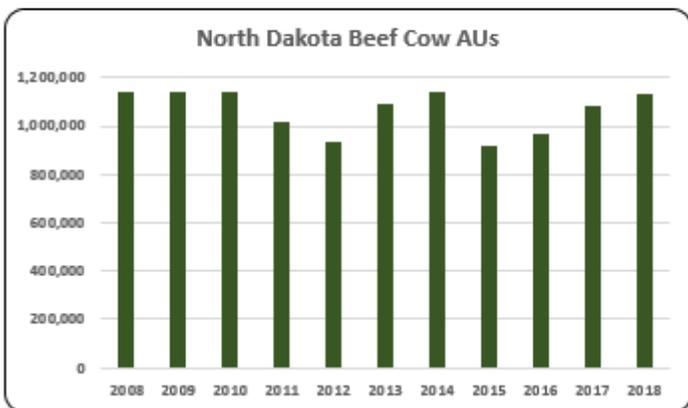
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Dairy cows were 1.6% (22,400 AUs) of all North Dakota AUs in 2018. Dairy cow AUs followed a downward trend since 2008.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Beef cow numbers in North Dakota, were 1.1 million AUs in 2018. The average beef cow AUs were 1.1 million from 2008 to 2018.

North Dakota Additional Information and Methodology

Animal agriculture is an important part of North Dakota's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in North Dakota, of interest is the degree to which the industry impacts the North Dakota economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for North Dakota animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted North Dakota's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in North Dakota which have occurred. As shown in this state report, North Dakota has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in North Dakota. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

North Dakota Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on North Dakota’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in North Dakota, \$1.66 to \$2.37 million in total economic activity, \$0.36 to \$0.47 in household wages and 8 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.375	\$ 0.459	11.2
	Hogs, Pigs, and Other	\$ 1.657	\$ 0.364	8.2
	Poultry and Eggs	\$ 2.343	\$ 0.472	10.6
	Dairy	\$ 2.166	\$ 0.472	11.4

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	1,139,025	1,139,025	1,139,025	1,021,125	933,765	1,091,460	1,140,090	917,970	964,740	1,087,155	1,135,500
	Hog and Pig AUs	110,685	119,580	119,010	124,425	126,015	121,155	131,835	128,940	131,250	142,125	143,085
	Broiler AUs	32,158	29,899	30,301	22,832	15,871	15,816	15,726	16,132	16,252	16,485	16,496
	Turkey AUs	36,338	40,726	46,099	51,454	56,867	61,710	66,215	71,311	76,842	81,993	85,211
	Egg Layer AUs	1,380	1,221	1,213	1,220	1,490	1,899	1,538	1,941	2,215	2,339	1,714
	Dairy AUs	36,400	35,000	29,400	28,000	25,200	25,200	23,800	22,400	22,400	22,400	22,400
	Total Animal Units	1,355,986	1,365,451	1,365,048	1,249,056	1,159,208	1,317,240	1,379,203	1,158,694	1,213,700	1,352,497	1,404,405
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 629,990	\$ 490,746	\$ 655,715	\$ 780,087	\$ 837,759	\$ 857,342	\$ 1,058,418	\$ 1,046,219	\$ 903,207	\$ 954,688	\$ 900,265
	Hogs and Pigs (\$1,000)	\$ 35,474	\$ 39,733	\$ 51,177	\$ 56,408	\$ 46,692	\$ 52,400	\$ 67,274	\$ 64,387	\$ 50,149	\$ 56,979	\$ 41,872
	Broilers (\$1,000)	\$ 25,756	\$ 22,222	\$ 23,223	\$ 20,331	\$ 15,814	\$ 19,269	\$ 20,215	\$ 17,636	\$ 15,680	\$ 18,412	\$ 19,266
	Turkeys (\$1,000)	\$ 28,913	\$ 32,287	\$ 38,084	\$ 45,896	\$ 52,166	\$ 57,855	\$ 66,655	\$ 72,579	\$ 78,079	\$ 83,228	\$ 90,368
	Eggs (\$1,000)	\$ 9,211	\$ 6,556	\$ 7,197	\$ 7,890	\$ 8,849	\$ 9,998	\$ 16,003	\$ 26,678	\$ 10,491	\$ 14,185	\$ 22,012
	Milk (\$1,000)	\$ 77,330	\$ 50,310	\$ 61,056	\$ 69,000	\$ 65,583	\$ 67,859	\$ 76,464	\$ 56,772	\$ 55,728	\$ 60,720	\$ 54,108
	Other	\$ 6,273	\$ 6,210	\$ 7,571	\$ 7,354	\$ 8,791	\$ 6,546	\$ 6,899	\$ 7,565	\$ 8,006	\$ 7,352	\$ 7,692
	Sheep and Lambs (\$1,000)	\$ 5,901	\$ 5,747	\$ 7,016	\$ 6,708	\$ 8,053	\$ 5,767	\$ 6,080	\$ 6,704	\$ 7,105	\$ 6,410	\$ 6,709
	Aquaculture (\$1,000)	\$ 372	\$ 463	\$ 555	\$ 646	\$ 738	\$ 779	\$ 820	\$ 860	\$ 901	\$ 942	\$ 983
	Total (\$1,000)	\$ 812,947	\$ 648,065	\$ 844,022	\$ 986,967	\$ 1,035,654	\$ 1,071,269	\$ 1,311,928	\$ 1,291,835	\$ 1,121,341	\$ 1,195,566	\$ 1,135,583

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,154	5,961	4,949	5,663	
	Cattle feedlots (112112)	378	252	157	298	
	Dairy cattle and milk production (11212)	410	212	90	81	
	Hog and pig farming (1122)	90	74	66	53	
	Poultry and egg production (1123)	63	130	105	48	
	Sheep and goat farming (1124)	307	276	251	274	
	Animal aquaculture and other animal production (1125,1129)	1,147	1,415	2,085	1,618	
Value of Sales (\$1,000)	Cattle and Calves	625,070	856,489	1,063,287	1,295,654	
	Hogs and Pigs	25,888	34,910	50,366	79,242	
	Poultry and Eggs	22,365	28,496	withheld	17,568	
	Milk*			67,079	66,161	
	Aquaculture	withheld	withheld	738	942	
	Other (calculated)	34,221	46,843	61,862	93,921	
	Total	707,544	966,738	1,243,332	1,553,488	
Input Purchases	Livestock and poultry purchased	(Farms)	7,129	6,074	7,183	5,901
		\$1,000	124,054	204,142	291,801	286,024
	Breeding livestock purchased	(Farms)	5,406	4,901	5,772	4,847
		\$1,000	31,117	59,706	101,420	98,187
	Other livestock and poultry purchased	(Farms)	2,841	2,022	2,666	1,958
		\$1,000	92,937	144,436	190,381	187,837
	Feed purchased	(Farms)	11,956	9,597	11,830	10,684
		\$1,000	118,559	158,337	324,796	266,066

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 2,137,769	\$ 412,862	10,118	\$ 91,655
	Hogs, Pigs, and Other	\$ 82,138	\$ 18,046	407	\$ 4,006
	Poultry and Eggs	\$ 308,485	\$ 62,137	1,401	\$ 13,794
	Dairy	\$ 117,171	\$ 25,512	618	\$ 5,664
	Total	\$ 2,645,563	\$ 518,556	12,544	\$ 115,120
Change from 2008 to 2018	Cattle and Calves	\$ 350,005	\$ 67,596	1,657	\$ 15,006
	Hogs, Pigs, and Other	\$ (539)	\$ (118)	(3)	\$ (26)
	Poultry and Eggs	\$ 129,597	\$ 26,104	589	\$ 5,795
	Dairy	\$ (82,950)	\$ (18,061)	(438)	\$ (4,010)
	Total	\$ 396,113	\$ 75,520	1,805	\$ 16,766
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.375	\$ 0.459	11.2	
	Hogs, Pigs, and Other	\$ 1.657	\$ 0.364	8.2	
	Poultry and Eggs	\$ 2.343	\$ 0.472	10.6	
	Dairy	\$ 2.166	\$ 0.472	11.4	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			2.0%	
	Total			22.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: OHIO

Ohio Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Ohio animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Ohio. The success of Ohio animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Ohio during 2018 animal agriculture contributed:

- \$8.0 billion in economic output
- 46,862 jobs
- \$1.7 billion in earnings
- \$401.3 million in income taxes paid at local, state, and federal levels
- \$411.7 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Ohio has increased economic output by over \$310.7 million, boosted household earnings by \$60.1 million, contributed 1,494 additional jobs and paid \$13.8 million in additional tax revenues.

Ohio's animal agriculture consumed almost 873.1 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Egg-Laying Hens (292.3 thousand tons)
- Broilers (214.7 thousand tons)
- Hogs (211.9 thousand tons)

This report examines animal agriculture in Ohio over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Ohio, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Ohio and beyond.

Ohio Economic Impact of Animal Agriculture

Animal agriculture is an important part of Ohio's economy. In 2018, Ohio's animal agriculture contributed the following to the economy:

- About \$8.0 billion in economic output
- \$1.7 billion in household earnings
- 46,862 jobs
- \$401.3 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Ohio's animal agriculture has:

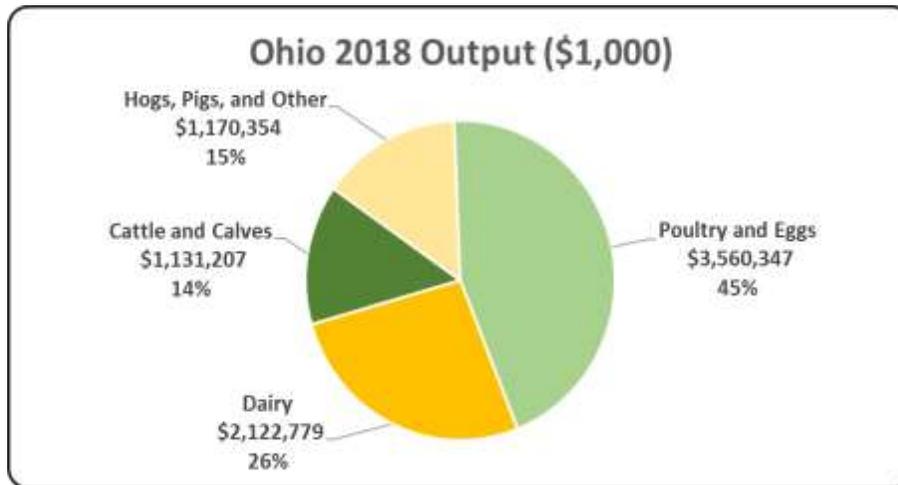
- Increased economic output by \$310.7 million
- Boosted household earnings by \$60.1 million
- Added 1,494 jobs
- Paid an additional \$13.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 7,984,687	\$ 310,727	4.05%
Earnings (\$1,000)	\$ 1,748,720	\$ 60,142	3.56%
Employment (Jobs)	46,862	1,494	3.29%
Income Taxes Paid (\$1,000)	\$ 401,331	\$ 13,803	3.56%
Property Taxes Paid in 2017 (\$1,000)	\$ 411,725		

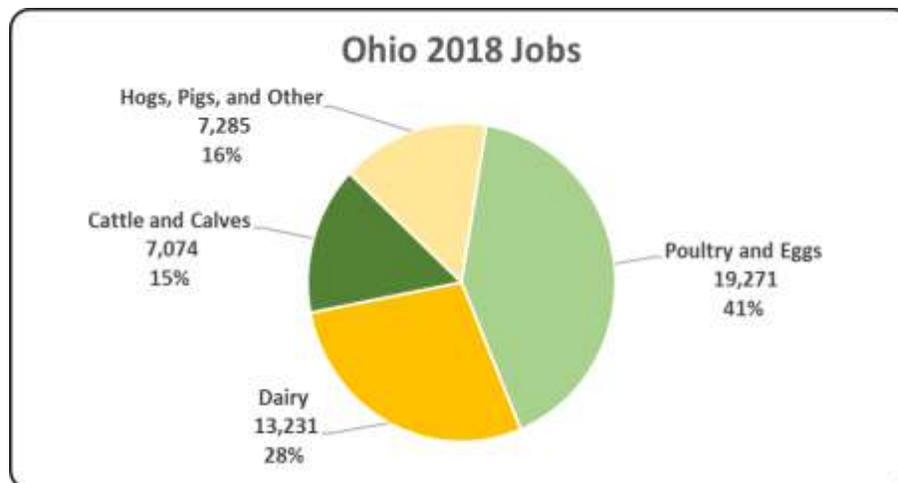
Ohio Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Ohio economy. Animal agriculture’s impact on Ohio total economic output is about \$8.0 billion.



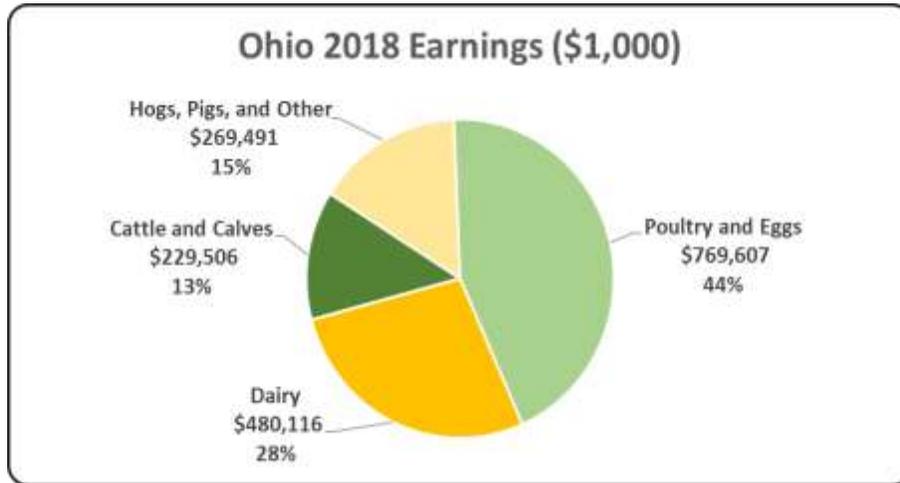
Ohio Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Ohio in terms of animal agriculture jobs. As shown, animal agriculture contributes 46,862 jobs within and outside of animal agriculture.



Ohio Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Ohio economy in terms of earnings. Ohio’s animal agriculture contributed about \$1.7 billion to household earnings in 2018.



Ohio Taxes Paid by Animal Agriculture

Ohio’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$401.3 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$411.7 million in property taxes paid by all of Ohio agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



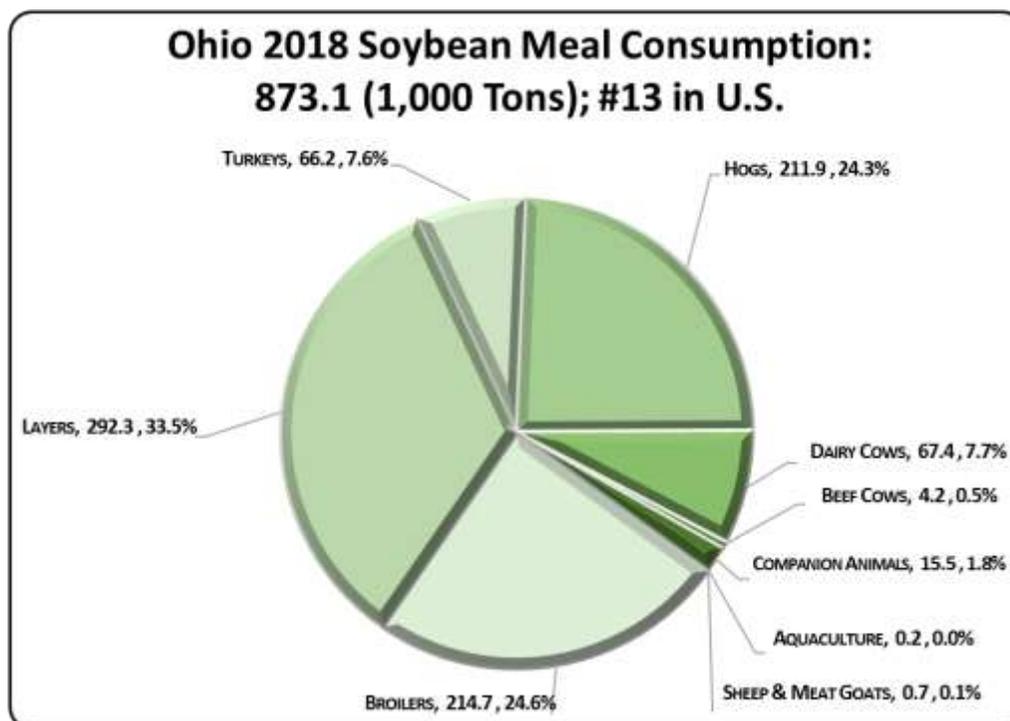
Ohio Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Ohio's animal agriculture consumed almost 873.1 thousand tons of soybean meal in 2018, placing the state as #13 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Ohio consumed 129.4 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Egg-Laying Hens (292.3 thousand tons)
2. Broilers (214.7 thousand tons)
3. Hogs (211.9 thousand tons)

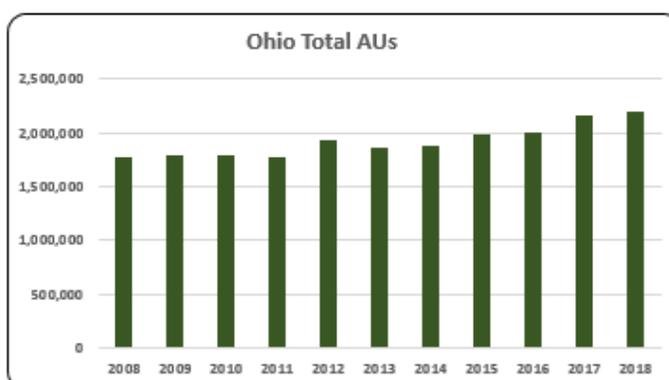
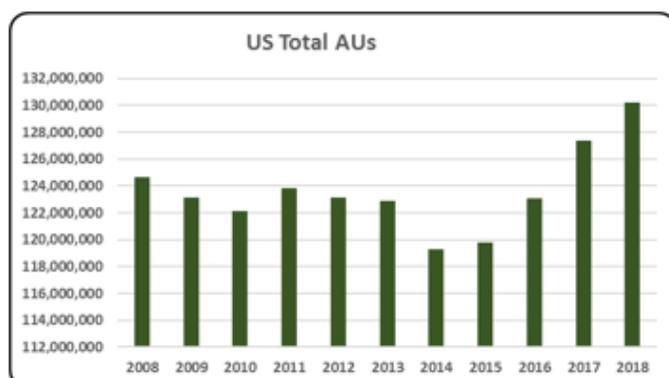


Ohio Animal Unit (AU) Trends

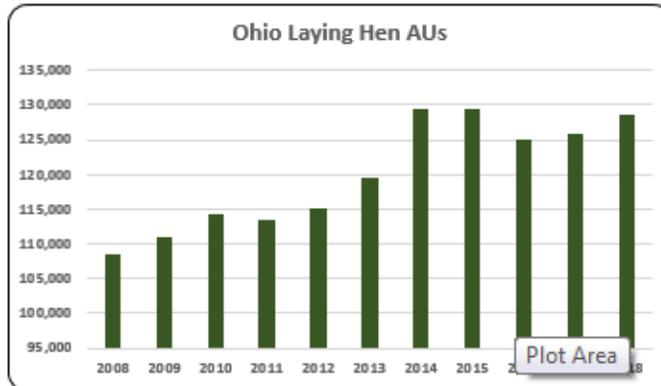
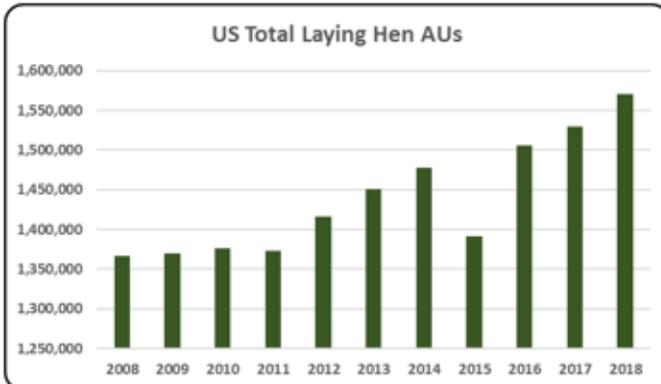
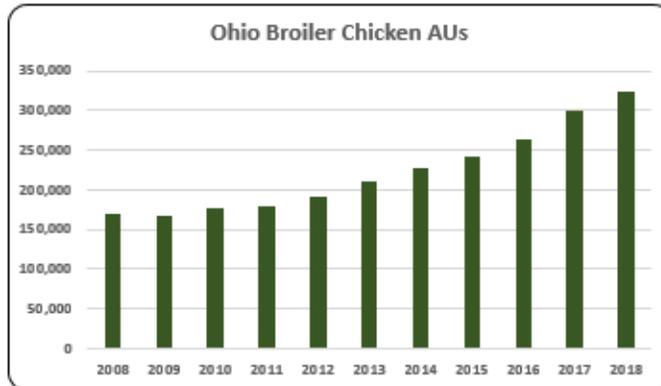
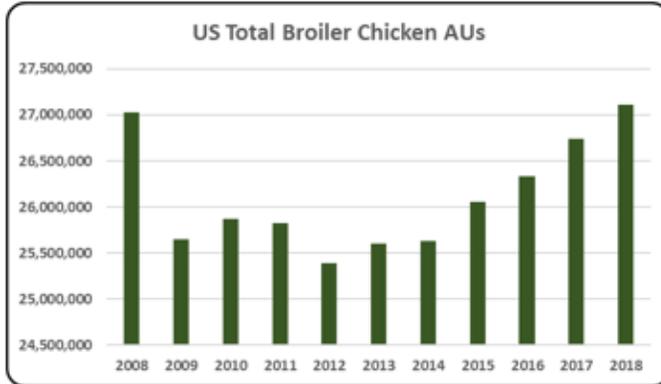
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Ohio. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Ohio and to give perspective on Ohio's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

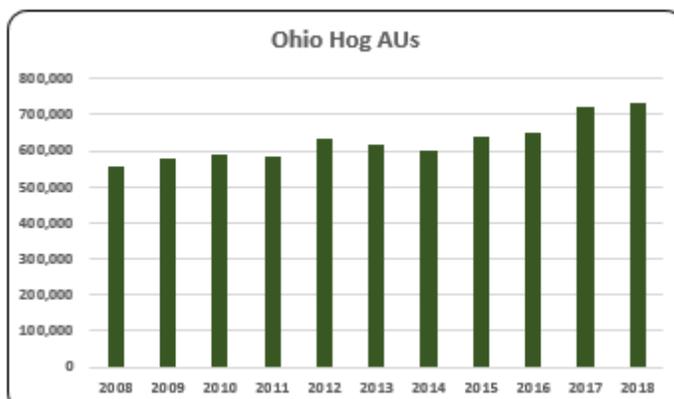
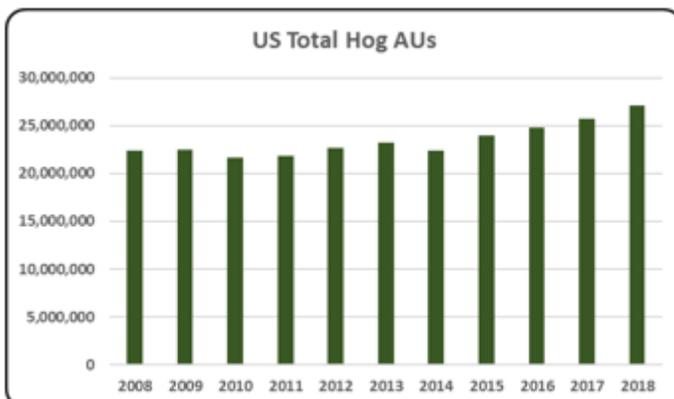
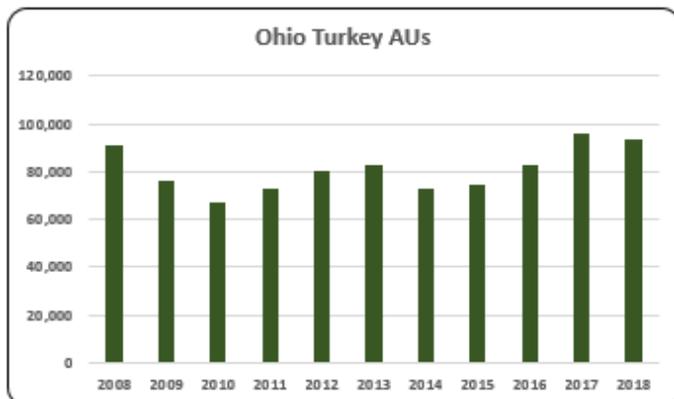
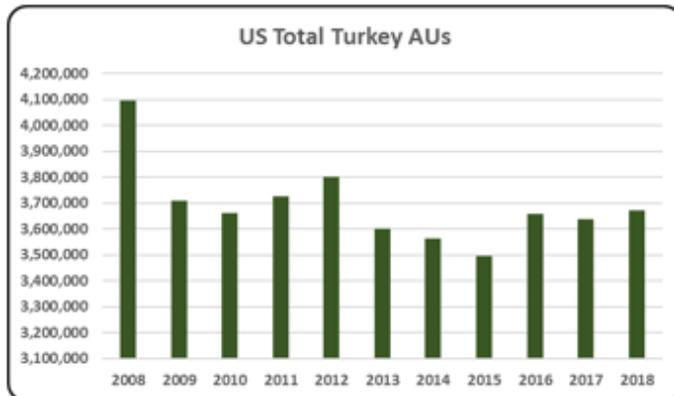
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Ohio, the largest three segments of animal agriculture in terms of AUs during 2018 were: Hogs (732,750 AUs), Beef Cows (554,250 AUs), and Dairy Cows (369,600 AUs). Total animal units in Ohio during 2018 were 2.2 million AUs.



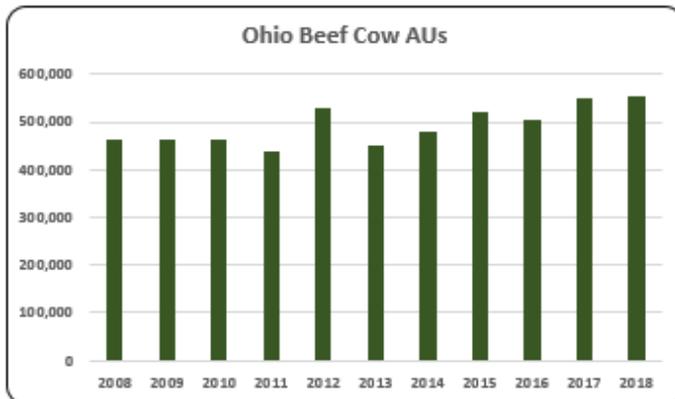
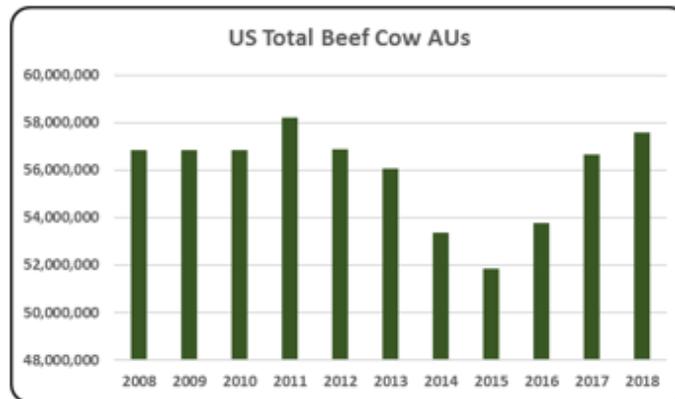
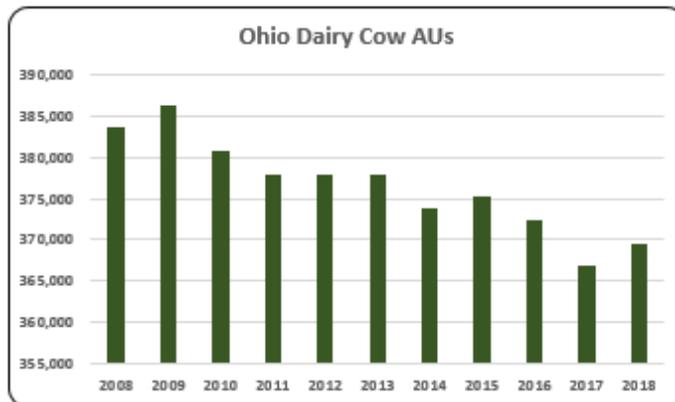
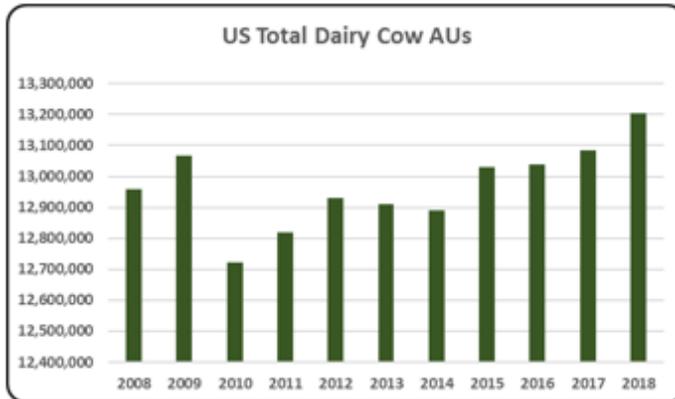
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 1.7% (2.2 million) of all AUs in the U.S. were in Ohio in 2018. There was a 24.6% (435,047 AUs) growth in AUs over the last decade.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- There were 324,277 broiler AUs in Ohio in 2018. Broiler AUs climbed 91.3% from 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In 2018, Ohio had the fourth largest number of layers in the U.S. with 8.2% of the country's layers. There were 128,639 layer AUs in 2018. Ohio layer AUs have grown 18.7% since 2008.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- The average number of turkey AUs in Ohio during the last decade going back to 2008 was 81,048. Turkey numbers grew 3.0% from 90,845 turkey AUs in 2008 to 93,592 turkey AUs in 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- In 2018, hogs contributed 33.3% (732,750 hog AUs) to the total AUs for Ohio.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- 16.8% (369,600 AUs) of total AUs in Ohio in 2018 were dairy cows. 2009 was a record high (386,400 AUs) for dairy cow AUs in Ohio.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- The average number of beef cow AUs was 492,068 from 2008 to 2018. Beef cow AUs contributed 25.2% (554,250) of AUs in the state.

Ohio Additional Information and Methodology

Animal agriculture is an important part of Ohio's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

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3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Ohio, of interest is the degree to which the industry impacts the Ohio economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Ohio animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Ohio's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Ohio which have occurred. As shown in this state report, Ohio has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Ohio. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Ohio Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Ohio’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Ohio, \$1.81 to \$2.92 million in total economic activity, \$0.41 to \$0.63 in household wages and 11 to 16 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.003	\$ 0.406	12.5
	Hogs, Pigs, and Other	\$ 1.813	\$ 0.417	11.3
	Poultry and Eggs	\$ 2.918	\$ 0.631	15.8
	Dairy	\$ 2.340	\$ 0.529	14.6

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	461,400	461,400	461,400	439,800	529,050	452,100	478,800	520,050	504,450	550,050	554,250
	Hog and Pig AUs	554,250	580,650	589,200	584,100	633,150	615,600	600,450	637,500	648,600	721,200	732,750
	Broiler AUs	169,544	165,952	176,568	179,070	189,966	209,794	227,218	241,648	264,485	298,444	324,277
	Turkey AUs	90,845	76,453	67,534	73,296	80,610	82,765	73,094	74,312	83,150	95,873	93,592
	Egg Layer AUs	108,422	111,108	114,200	113,436	115,198	119,541	129,337	129,415	124,930	125,736	128,639
	Dairy AUs	383,600	386,400	380,800	378,000	378,000	378,000	373,800	375,200	372,400	366,800	369,600
	Total Animal Units	1,768,061	1,781,963	1,789,703	1,767,702	1,925,973	1,857,800	1,882,699	1,978,126	1,998,016	2,158,104	2,203,109
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 371,612	\$ 303,704	\$ 380,804	\$ 411,199	\$ 522,424	\$ 495,967	\$ 611,530	\$ 691,543	\$ 576,523	\$ 584,987	\$ 564,869
	Hogs and Pigs (\$1,000)	\$ 420,245	\$ 392,245	\$ 553,136	\$ 695,683	\$ 671,567	\$ 720,787	\$ 768,076	\$ 631,779	\$ 585,057	\$ 696,334	\$ 623,182
	Broilers (\$1,000)	\$ 150,788	\$ 154,649	\$ 181,618	\$ 172,355	\$ 189,600	\$ 245,714	\$ 274,483	\$ 242,208	\$ 227,146	\$ 286,307	\$ 313,655
	Turkeys (\$1,000)	\$ 128,650	\$ 94,649	\$ 108,101	\$ 130,712	\$ 150,851	\$ 148,993	\$ 154,668	\$ 170,262	\$ 194,912	\$ 178,974	\$ 143,856
	Eggs (\$1,000)	\$ 585,477	\$ 403,793	\$ 427,361	\$ 486,185	\$ 523,315	\$ 587,562	\$ 772,430	\$ 1,262,374	\$ 411,781	\$ 479,638	\$ 762,538
	Milk (\$1,000)	\$ 1,011,595	\$ 732,072	\$ 938,060	\$ 1,116,248	\$ 1,038,870	\$ 1,154,976	\$ 1,334,550	\$ 983,247	\$ 932,064	\$ 1,028,744	\$ 907,248
	Other	\$ 13,550	\$ 13,505	\$ 15,442	\$ 15,734	\$ 17,938	\$ 18,226	\$ 18,125	\$ 19,862	\$ 20,563	\$ 21,172	\$ 22,459
	Sheep and Lambs (\$1,000)	\$ 10,069	\$ 9,926	\$ 11,764	\$ 11,957	\$ 14,063	\$ 13,265	\$ 12,078	\$ 12,729	\$ 12,344	\$ 11,867	\$ 12,068
	Aquaculture (\$1,000)	\$ 3,481	\$ 3,579	\$ 3,678	\$ 3,776	\$ 3,875	\$ 4,961	\$ 6,047	\$ 7,133	\$ 8,219	\$ 9,305	\$ 10,391
Total (\$1,000)	\$ 2,681,917	\$ 2,094,617	\$ 2,604,522	\$ 3,028,116	\$ 3,114,564	\$ 3,372,225	\$ 3,933,862	\$ 4,001,275	\$ 2,948,046	\$ 3,276,156	\$ 3,337,807	

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,526	12,297	11,445	12,978
	Cattle feedlots (112112)	4,191	1,890	548	695
	Dairy cattle and milk production (11212)	3,771	2,955	2,850	2,171
	Hog and pig farming (1122)	1,781	1,594	1,170	1,309
	Poultry and egg production (1123)	1,000	1,650	1,472	1,704
	Sheep and goat farming (1124)	1,932	2,227	2,188	3,123
	Animal aquaculture and other animal production (1125,1129)	9,357	7,195	8,071	8,192
Value of Sales (\$1,000)	Cattle and Calves	408,242	565,746	689,655	681,356
	Hogs and Pigs	322,687	571,685	788,761	1,010,793
	Poultry and Eggs	604,808	883,301	946,592	1,082,069
	Milk*			938,266	1,001,507
	Aquaculture	3,338	6,582	3,875	9,305
	Other (calculated)	67,702	71,544	51,921	129,942
	Total	1,406,777	2,098,858	3,419,070	3,914,972
Input Purchases	Livestock and poultry purchased	(Farms) 19,791	16,523	19,332	20,374
		\$1,000 269,910	538,127	473,494	625,486
	Breeding livestock purchased	(Farms) 9,275	7,668	9,355	9,524
		\$1,000 37,335	78,925	102,128	127,435
	Other livestock and poultry purchased	(Farms) 13,139	11,055	12,880	14,037
		\$1,000 232,575	459,202	371,366	498,050
Feed purchased	(Farms) 40,506	34,423	38,782	40,847	
	\$1,000 648,768	959,439	1,521,609	1,426,818	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,131,207	\$ 229,506	7,074	\$ 52,672
	Hogs, Pigs, and Other	\$ 1,170,354	\$ 269,491	7,285	\$ 61,848
	Poultry and Eggs	\$ 3,560,347	\$ 769,607	19,271	\$ 176,625
	Dairy	\$ 2,122,779	\$ 480,116	13,231	\$ 110,187
	Total	\$ 7,984,687	\$ 1,748,720	46,862	\$ 401,331
Change from 2008 to 2018	Cattle and Calves	\$ 241,862	\$ 49,070	1,512	\$ 11,262
	Hogs, Pigs, and Other	\$ 230,639	\$ 53,108	1,436	\$ 12,188
	Poultry and Eggs	\$ 544,047	\$ 117,601	2,945	\$ 26,990
	Dairy	\$ (705,821)	\$ (159,638)	(4,399)	\$ (36,637)
	Total	\$ 310,727	\$ 60,142	1,494	\$ 13,803
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.003	\$ 0.406	12.5	
	Hogs, Pigs, and Other	\$ 1.813	\$ 0.417	11.3	
	Poultry and Eggs	\$ 2.918	\$ 0.631	15.8	
	Dairy	\$ 2.340	\$ 0.529	14.6	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				2.8%
	Total				23.0%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: OKLAHOMA

Oklahoma Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Oklahoma animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Oklahoma. The success of Oklahoma animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Oklahoma during 2018 animal agriculture contributed:

- \$11.0 billion in economic output
- 72,225 jobs
- \$2.3 billion in earnings
- \$528.4 million in income taxes paid at local, state, and federal levels
- \$151.2 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Oklahoma has increased economic output by over \$1.5 billion, boosted household earnings by \$308.4 million, contributed 9,885 additional jobs and paid \$70.8 million in additional tax revenues.

Oklahoma's animal agriculture consumed almost 803.8 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (369.1 thousand tons)
- Broilers (357.5 thousand tons)
- Egg-Laying Hens (34.7 thousand tons)

This report examines animal agriculture in Oklahoma over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Oklahoma, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Oklahoma and beyond.

Oklahoma Economic Impact of Animal Agriculture

Animal agriculture is an important part of Oklahoma's economy. In 2018, Oklahoma's animal agriculture contributed the following to the economy:

- About \$11.0 billion in economic output
- \$2.3 billion in household earnings
- 72,225 jobs
- \$528.4 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Oklahoma's animal agriculture has:

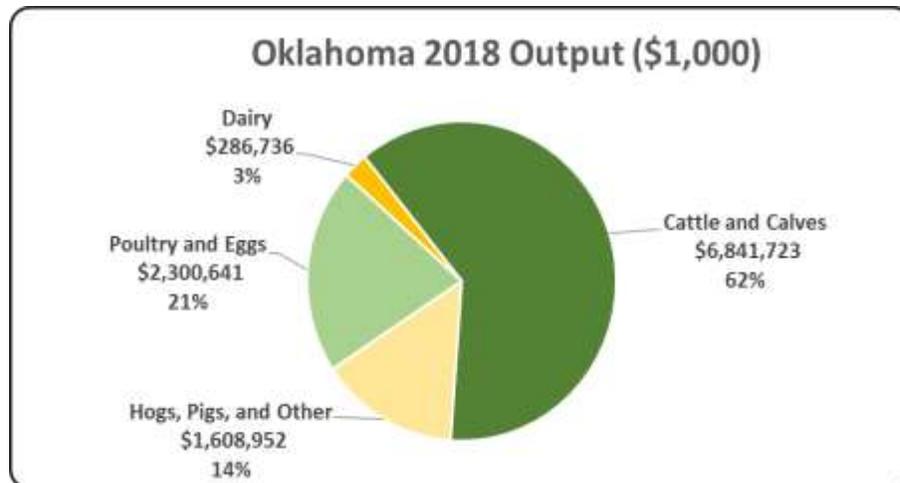
- Increased economic output by \$1.5 billion
- Boosted household earnings by \$308.4 million
- Added 9,885 jobs
- Paid an additional \$70.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 11,038,052	\$ 1,488,626	15.59%
Earnings (\$1,000)	\$ 2,302,533	\$ 308,413	15.47%
Employment (Jobs)	72,225	9,885	15.86%
Income Taxes Paid (\$1,000)	\$ 528,431	\$ 70,781	15.47%
Property Taxes Paid in 2017 (\$1,000)	\$ 151,165		

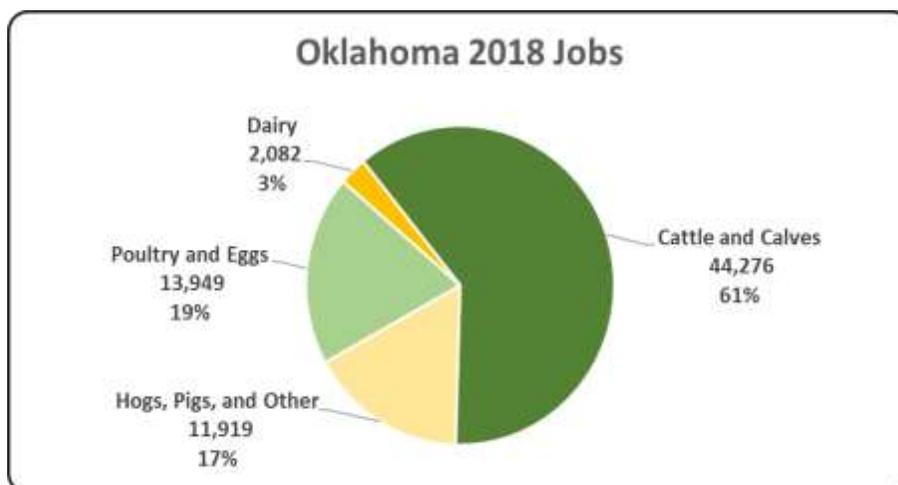
Oklahoma Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Oklahoma economy. Animal agriculture’s impact on Oklahoma total economic output is about \$11.0 billion.



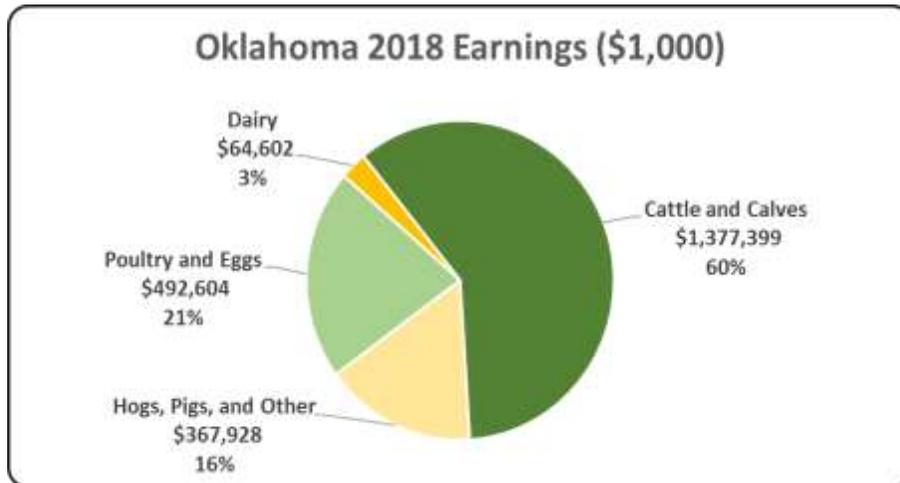
Oklahoma Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Oklahoma in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Oklahoma total jobs, contributing 72,225 jobs within and outside of animal agriculture.



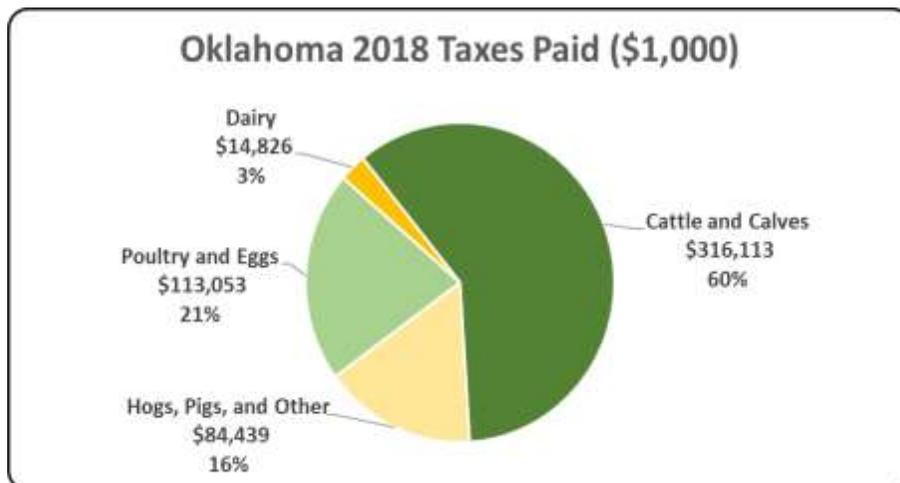
Oklahoma Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Oklahoma economy in terms of earnings. Oklahoma’s animal agriculture contributed about \$2.3 billion to household earnings in 2018.



Oklahoma Taxes Paid by Animal Agriculture

Oklahoma’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$528.4 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$151.2 million in property taxes paid by all of Oklahoma agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



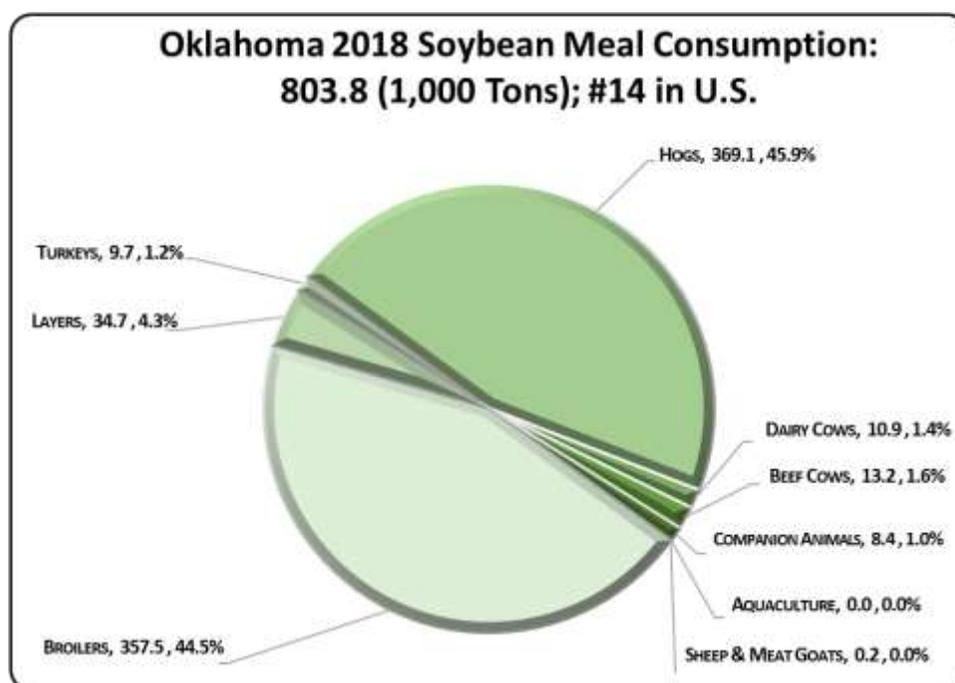
Oklahoma Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Oklahoma's animal agriculture consumed almost 803.8 thousand tons of soybean meal in 2018, placing the state as #14 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Oklahoma consumed 61.9 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (369.1 thousand tons)
2. Broilers (357.5 thousand tons)
3. Egg-Laying Hens (34.7 thousand tons)

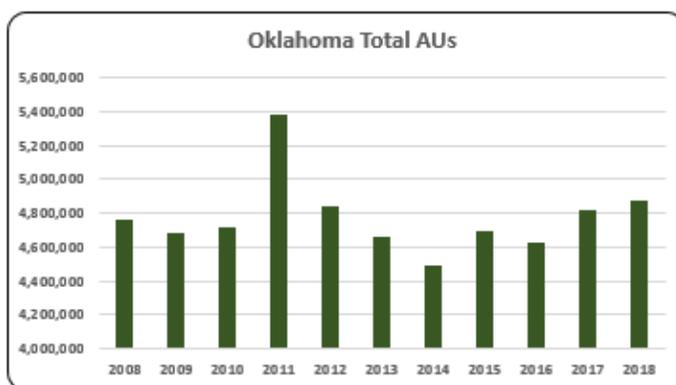
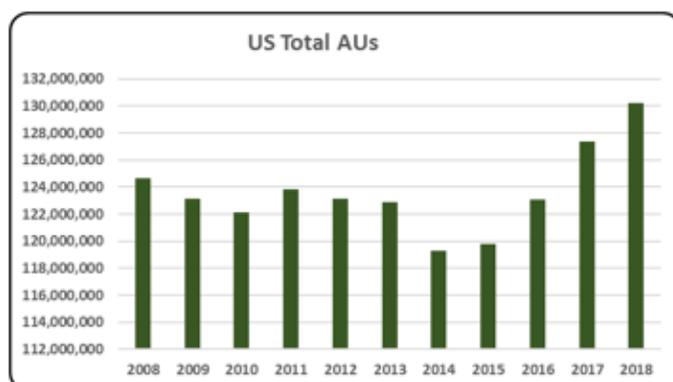


Oklahoma Animal Unit (AU) Trends

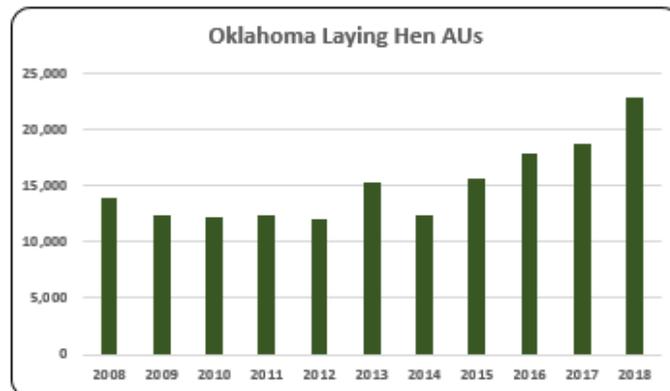
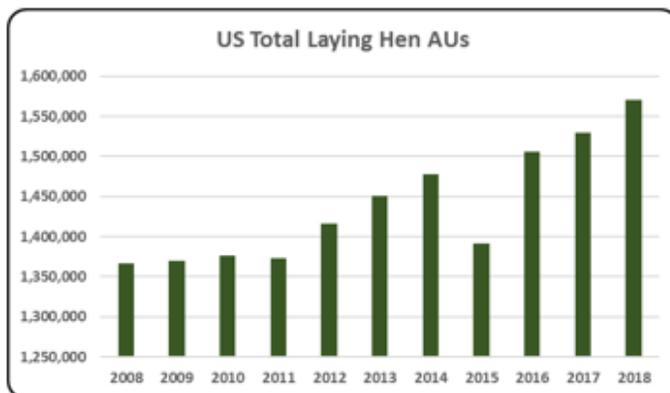
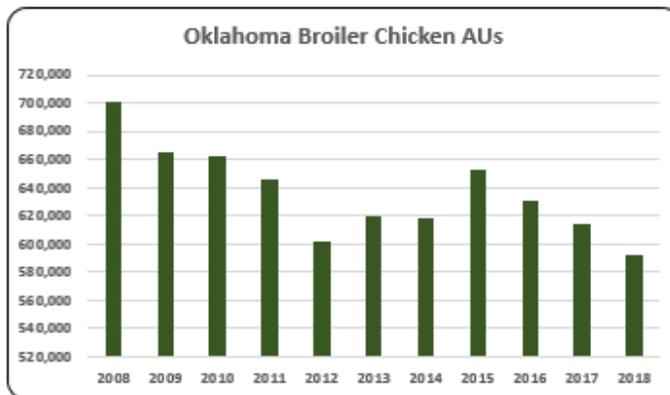
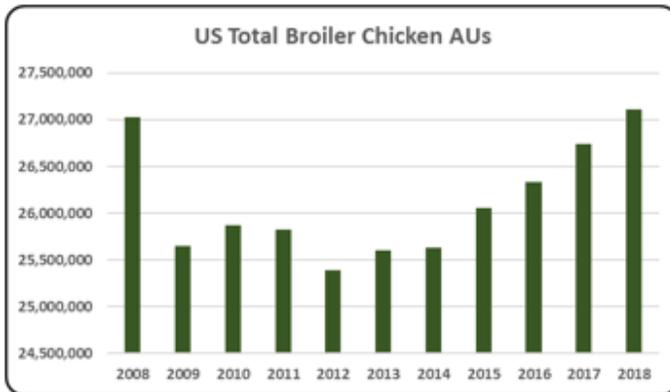
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Oklahoma. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Oklahoma and to give perspective on Oklahoma's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

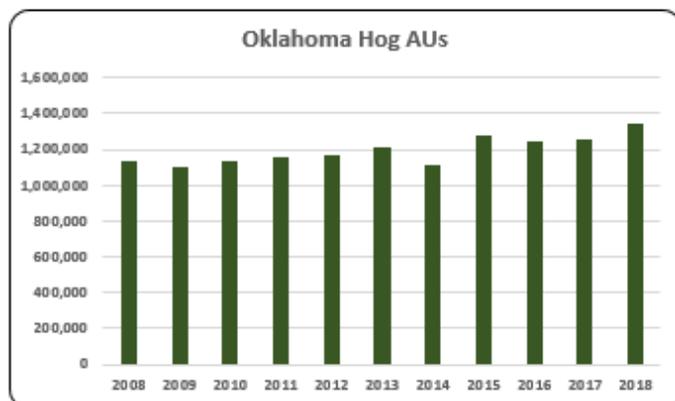
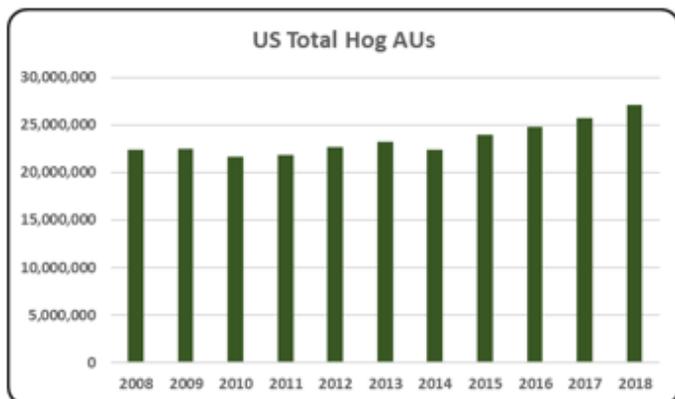
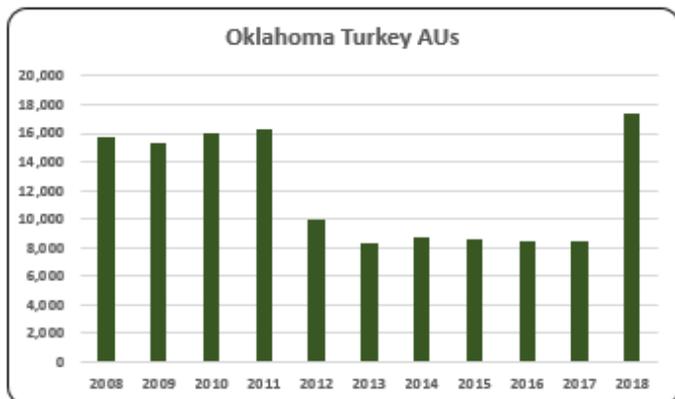
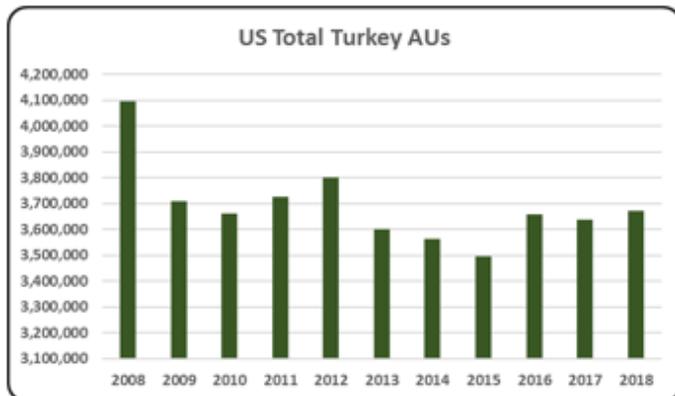
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Oklahoma, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (2.8 million AUs), Hogs (1,344,300 AUs), and Broilers (591,453 AUs). Total animal units in Oklahoma during 2018 were 4.9 million AUs.



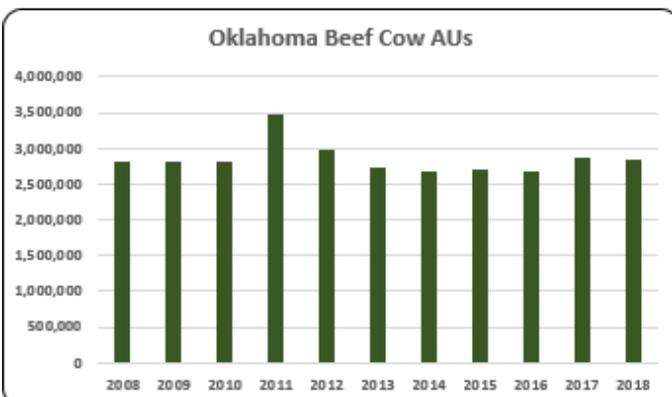
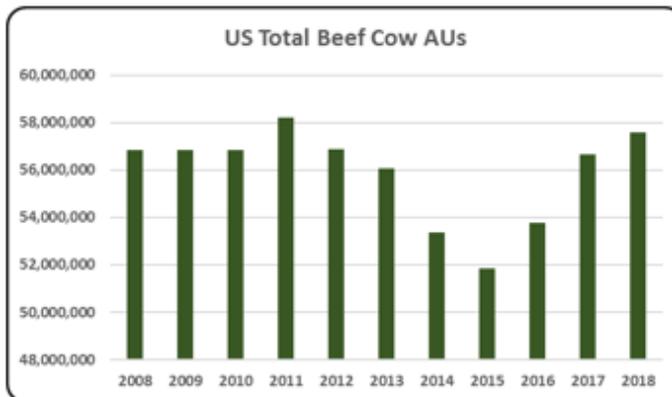
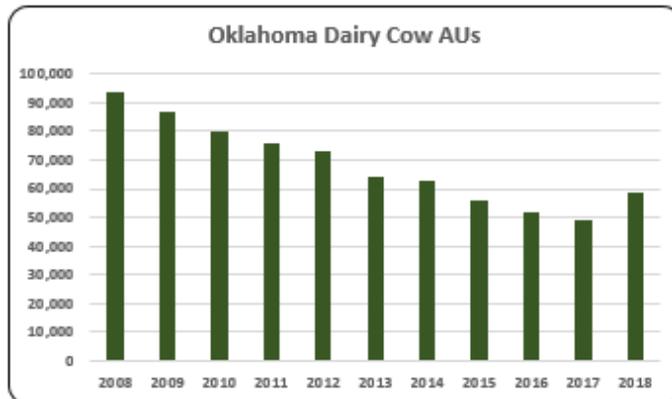
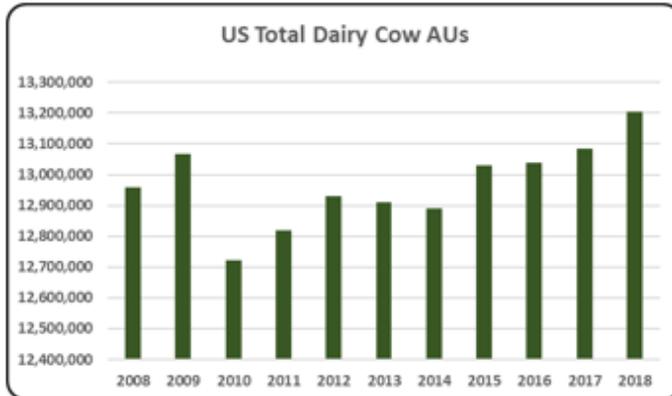
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 4.9 million AUs in Oklahoma in 2018 representing 3.8% of all AUs in the country.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler AUs decreased 15.7% since a decade ago in 2008. There were 591,453 broiler AUs in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- On average, there were 15,073 laying hen AUs in Oklahoma from 2008 to 2018. The laying hen industry in Oklahoma saw an increase of 63.0% throughout the last decade with 22,820 AUs in 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Numbers increased from 15,739 turkey AUs in 2008 to 17,428 turkey AUs in 2018. The average of turkey AUs for this decade was 12,126 AUs. From 2017 to 2018 turkey AUs increased by 107.2% in Oklahoma.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog numbers in Oklahoma 2018 were at nearly 1.3 million AUs. This represented 27.6% of AUs in the state for 2018.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- The Oklahoma dairy cow inventory showed a consistent decline throughout the decade from 93,800 dairy cow AUs in 2008 to 58,800 dairy cow AUs in 2018. In 2018 there was an increase from 2017 by 9,900 AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cows in Oklahoma are the largest in terms of AUs of the species included in the study. Beef cows in 2018 represented 58.3% (2.8 million AUs) of total AUs in the state.

Oklahoma Additional Information and Methodology

Animal agriculture is an important part of Oklahoma's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Oklahoma, of interest is the degree to which the industry impacts the Oklahoma economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Oklahoma animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Oklahoma's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

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Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Oklahoma, \$1.73 to \$2.74 million in total economic activity, \$0.40 to \$0.59 in household wages and 13 to 17 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.448	\$ 0.493	15.8
	Hogs, Pigs, and Other	\$ 1.730	\$ 0.396	12.8
	Poultry and Eggs	\$ 2.736	\$ 0.586	16.6
	Dairy	\$ 2.222	\$ 0.501	16.1

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	2,802,750	2,802,750	2,802,750	3,476,250	2,976,000	2,733,750	2,680,500	2,689,800	2,675,175	2,874,150	2,844,150
	Hog and Pig AUs	1,129,050	1,103,100	1,138,650	1,159,350	1,167,150	1,215,900	1,113,150	1,277,250	1,244,250	1,257,000	1,344,300
	Broiler AUs	701,175	664,985	662,132	645,072	601,458	619,464	618,539	652,210	630,257	614,621	591,453
	Turkey AUs	15,739	15,386	16,031	16,316	9,978	8,363	8,777	8,579	8,373	8,413	17,428
	Egg Layer AUs	14,004	12,385	12,303	12,375	11,991	15,283	12,373	15,619	17,826	18,821	22,820
	Dairy AUs	93,800	86,800	79,800	75,600	72,800	64,400	63,000	56,000	51,800	49,000	58,800
	Total Animal Units	4,756,519	4,685,406	4,711,663	5,384,963	4,839,377	4,657,160	4,496,339	4,699,459	4,627,681	4,822,005	4,878,951
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,938,825	\$ 1,892,957	\$ 2,155,295	\$ 2,686,218	\$ 2,571,177	\$ 2,580,613	\$ 3,307,542	\$ 3,172,893	\$ 2,553,546	\$ 2,857,810	\$ 2,794,479
	Hogs and Pigs (\$1,000)	\$ 514,635	\$ 470,649	\$ 656,887	\$ 902,933	\$ 855,855	\$ 947,769	\$ 1,004,253	\$ 878,267	\$ 828,114	\$ 918,094	\$ 921,129
	Broilers (\$1,000)	\$ 579,738	\$ 557,723	\$ 724,446	\$ 729,259	\$ 670,350	\$ 825,702	\$ 852,115	\$ 770,524	\$ 651,562	\$ 745,389	\$ 737,097
	Turkeys (\$1,000)	\$ 22,528	\$ 21,351	\$ 31,496	\$ 24,766	\$ 26,629	\$ 19,302	\$ 12,770	\$ 7,954	\$ 8,994	\$ 6,090	\$ 11,634
	Eggs (\$1,000)	\$ 80,888	\$ 70,175	\$ 84,499	\$ 88,168	\$ 91,776	\$ 97,227	\$ 102,284	\$ 114,807	\$ 79,048	\$ 78,838	\$ 92,177
	Milk (\$1,000)	\$ 214,322	\$ 146,292	\$ 172,620	\$ 203,060	\$ 172,659	\$ 167,485	\$ 188,034	\$ 135,222	\$ 122,484	\$ 139,776	\$ 129,050
	Other	\$ 4,752	\$ 4,540	\$ 5,534	\$ 4,890	\$ 5,617	\$ 5,904	\$ 6,430	\$ 6,841	\$ 6,953	\$ 7,825	\$ 8,686
	Sheep and Lambs (\$1,000)	\$ 3,088	\$ 2,975	\$ 4,067	\$ 3,521	\$ 4,346	\$ 3,961	\$ 3,814	\$ 3,553	\$ 2,993	\$ 3,193	\$ 3,382
	Aquaculture (\$1,000)	\$ 1,664	\$ 1,565	\$ 1,467	\$ 1,369	\$ 1,271	\$ 1,943	\$ 2,615	\$ 3,288	\$ 3,960	\$ 4,632	\$ 5,304
Total (\$1,000)	\$ 3,355,688	\$ 3,163,687	\$ 3,830,778	\$ 4,639,294	\$ 4,394,063	\$ 4,644,002	\$ 5,473,427	\$ 5,086,508	\$ 4,250,701	\$ 4,753,822	\$ 4,694,252	

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	49,043	45,871	40,939	45,642
	Cattle feedlots (112112)	1,799	956	372	93
	Dairy cattle and milk production (11212)	1,037	721	309	252
	Hog and pig farming (1122)	940	986	623	716
	Poultry and egg production (1123)	1,504	2,358	1,472	1,381
	Sheep and goat farming (1124)	1,426	2,446	2,269	2,859
	Animal aquaculture and other animal production (1125,1129)	7,792	8,513	8,660	8,080
Value of Sales (\$1,000)	Cattle and Calves	2,448,916	3,062,020	3,402,919	3,729,662
	Hogs and Pigs	462,849	555,521	656,407	1,030,645
	Poultry and Eggs	508,373	748,776	961,302	934,854
	Milk*			164,341	173,116
	Aquaculture	3,467	3,253	1,271	4,632
	Other (calculated)	50,715	57,091	25,609	75,852
	Total	3,474,320	4,426,661	5,211,849	5,948,761
Input Purchases	Livestock and poultry purchased	(Farms) 27,203	24,499	24,658	27,604
		\$1,000 1,244,354	1,463,556	1,696,662	1,728,859
	Breeding livestock purchased	(Farms) 16,355	15,462	15,940	19,157
		\$1,000 80,813	187,690	173,024	280,359
	Other livestock and poultry purchased	(Farms) 14,409	12,523	12,687	12,610
		\$1,000 1,163,542	1,275,865	1,523,638	1,448,500
Feed purchased	(Farms) 64,090	57,396	61,650	64,196	
	\$1,000 917,560	1,307,568	2,017,049	1,683,093	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 6,841,723	\$ 1,377,399	44,276	\$ 316,113
	Hogs, Pigs, and Other	\$ 1,608,952	\$ 367,928	11,919	\$ 84,439
	Poultry and Eggs	\$ 2,300,641	\$ 492,604	13,949	\$ 113,053
	Dairy	\$ 286,736	\$ 64,602	2,082	\$ 14,826
	Total	\$ 11,038,052	\$ 2,302,533	72,225	\$ 528,431
Change from 2008 to 2018	Cattle and Calves	\$ 1,169,029	\$ 235,353	7,565	\$ 54,013
	Hogs, Pigs, and Other	\$ 534,905	\$ 122,320	3,962	\$ 28,072
	Poultry and Eggs	\$ 67,042	\$ 14,355	406	\$ 3,294
	Dairy	\$ (282,349)	\$ (63,614)	(2,050)	\$ (14,599)
	Total	\$ 1,488,626	\$ 308,413	9,885	\$ 70,781
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.448	\$ 0.493	15.8	
	Hogs, Pigs, and Other	\$ 1.730	\$ 0.396	12.8	
	Poultry and Eggs	\$ 2.736	\$ 0.586	16.6	
	Dairy	\$ 2.222	\$ 0.501	16.1	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			2.8%	
	Total			23.0%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: OREGON

Oregon Executive Summary

The use of soybean meal as a key feed ingredient is a moderate part of Oregon animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Oregon. The success of Oregon animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Oregon during 2018 animal agriculture contributed:

- \$3.0 billion in economic output
- 21,172 jobs
- \$634.3 million in earnings
- \$175.4 million in income taxes paid at local, state, and federal levels
- \$151.4 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Oregon has increased economic output by over \$267.1 million, boosted household earnings by \$53.8 million, contributed 1,882 additional jobs and paid \$14.9 million in additional tax revenues.

Oregon's animal agriculture consumed almost 163.0 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (69.5 thousand tons)
- Dairy Cows (43.3 thousand tons)
- Egg-Laying Hens (21.4 thousand tons)

This report examines animal agriculture in Oregon over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Oregon, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Oregon and beyond.

Oregon Economic Impact of Animal Agriculture

Animal agriculture is a moderate part of Oregon's economy. In 2018, Oregon's animal agriculture contributed the following to the economy:

- About \$3.0 billion in economic output
- \$634.3 million in household earnings
- 21,172 jobs
- \$175.4 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Oregon's animal agriculture has:

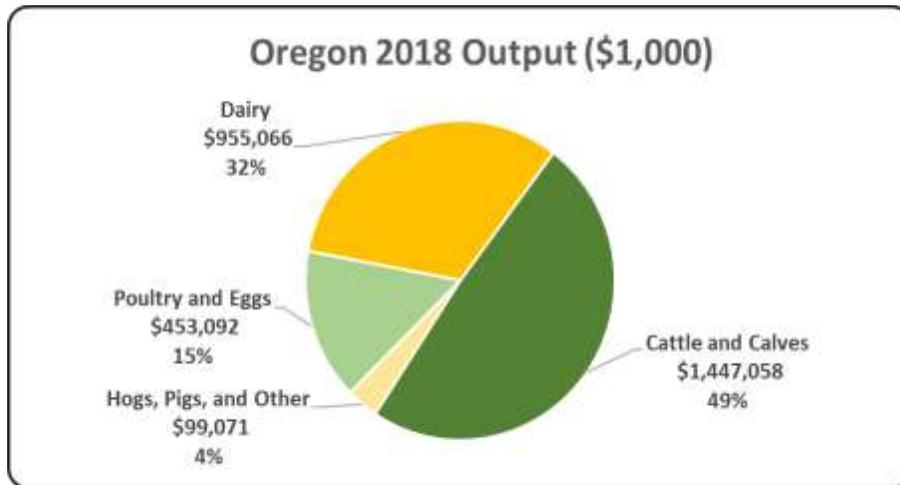
- Increased economic output by \$267.1 million
- Boosted household earnings by \$53.8 million
- Added 1,882 jobs
- Paid an additional \$14.9 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,954,287	\$ 267,052	9.94%
Earnings (\$1,000)	\$ 634,275	\$ 53,789	9.27%
Employment (Jobs)	21,172	1,882	9.76%
Income Taxes Paid (\$1,000)	\$ 175,377	\$ 14,873	9.27%
Property Taxes Paid in 2017 (\$1,000)	\$ 151,432		

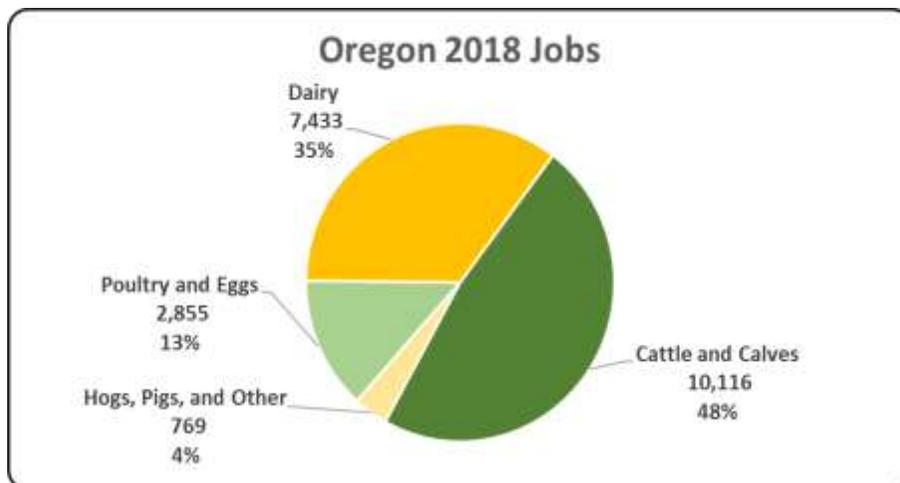
Oregon Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Oregon economy. Animal agriculture’s impact on Oregon total economic output is about \$3.0 billion.



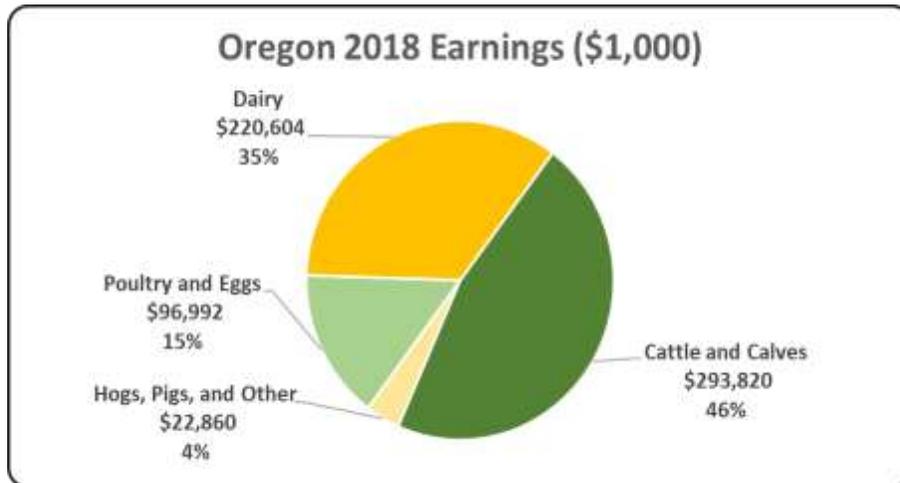
Oregon Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Oregon in terms of animal agriculture jobs. As shown, animal agriculture contributes 21,172 jobs within and outside of animal agriculture.



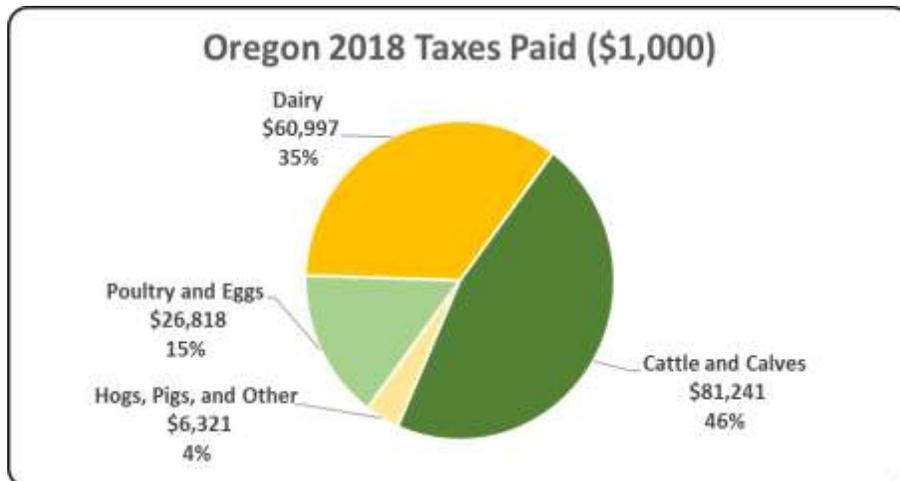
Oregon Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Oregon economy in terms of earnings. Oregon’s animal agriculture contributed about \$634.3 million to household earnings in 2018.



Oregon Taxes Paid by Animal Agriculture

Oregon’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$175.4 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$151.4 million in property taxes paid by all of Oregon agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



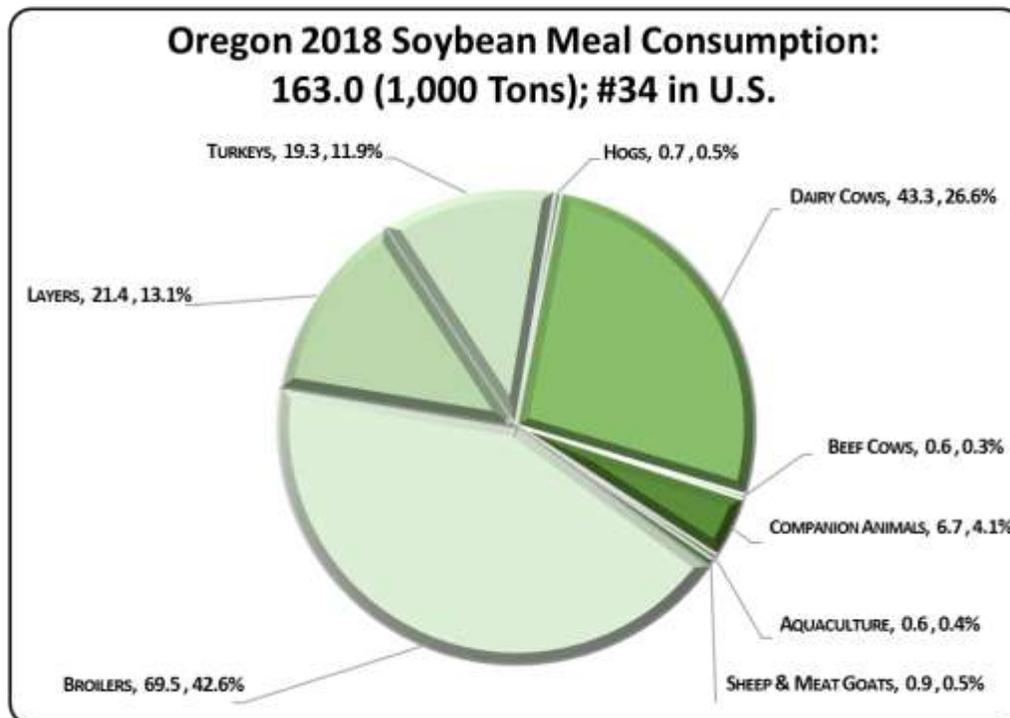
Oregon Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Oregon's animal agriculture consumed almost 163.0 thousand tons of soybean meal in 2018, placing the state as #34 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Oregon consumed 8,700 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (69.5 thousand tons)
2. Dairy Cows (43.3 thousand tons)
3. Egg-Laying Hens (21.4 thousand tons)

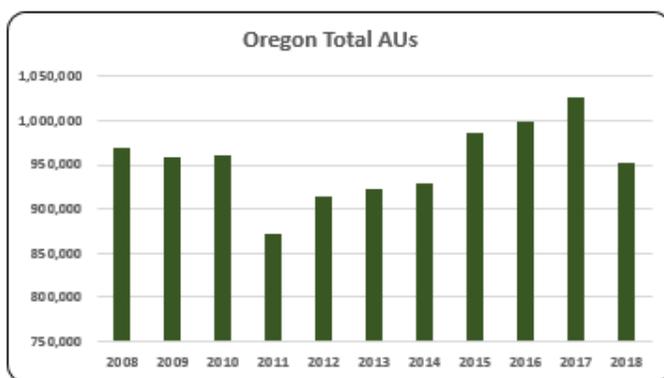
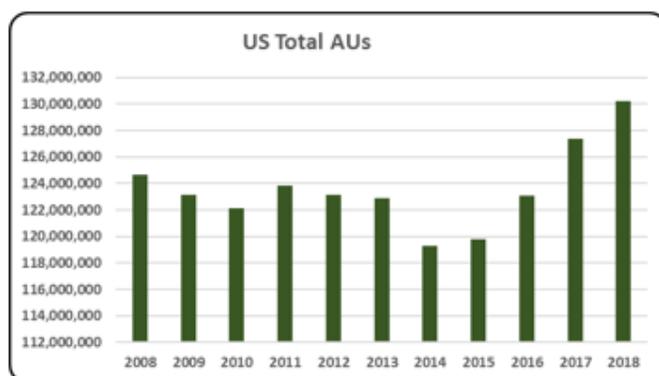


Oregon Animal Unit (AU) Trends

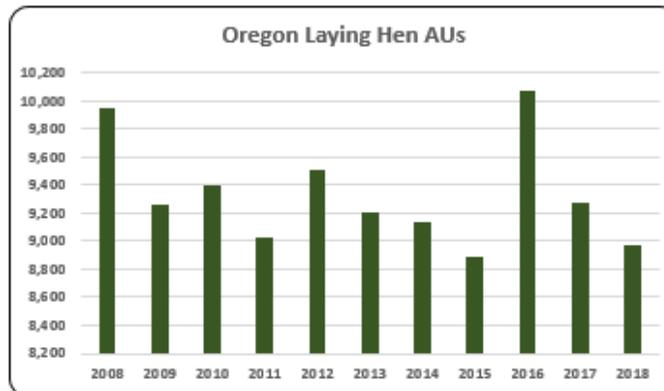
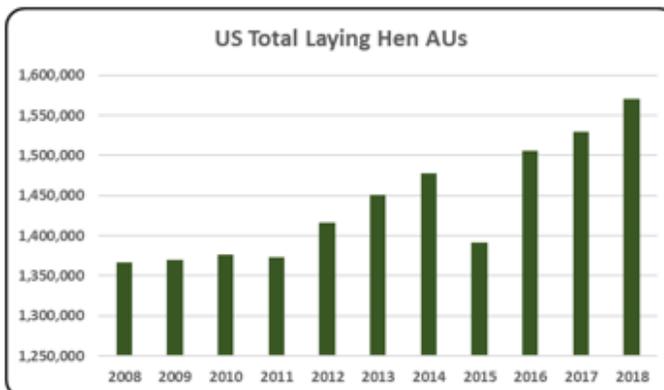
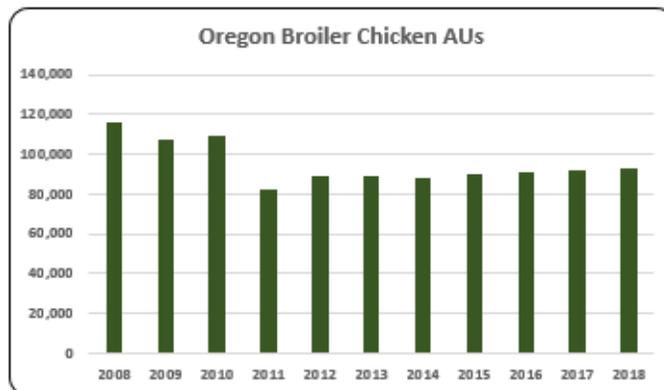
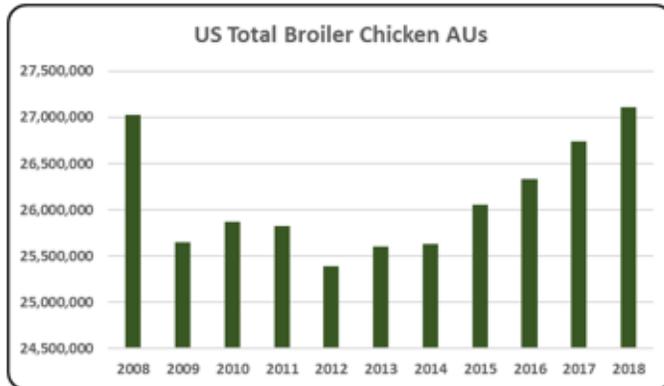
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Oregon. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Oregon and to give perspective on Oregon's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

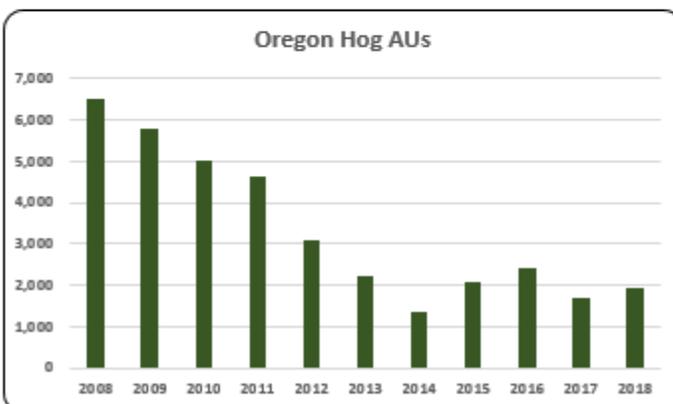
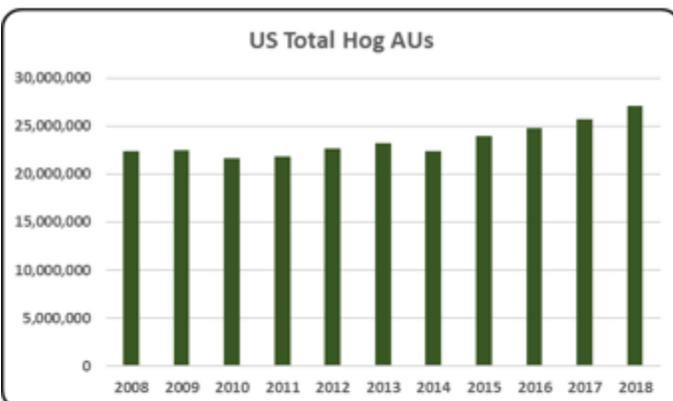
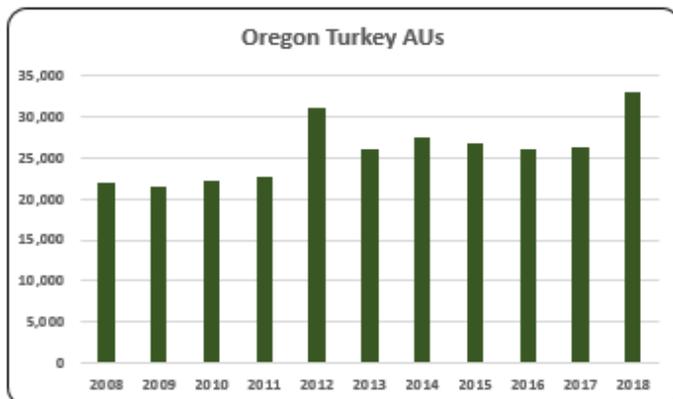
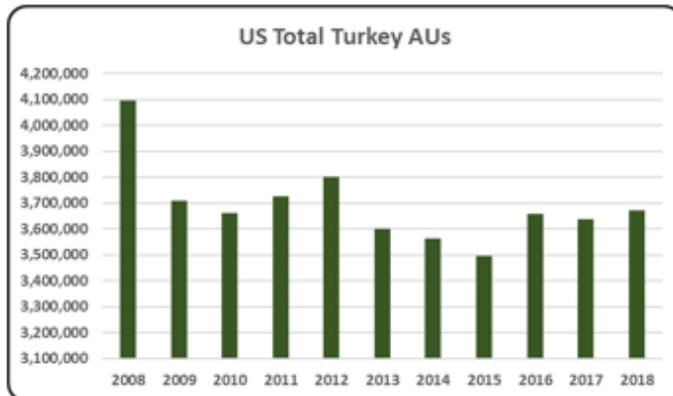
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Oregon, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (642,750 AUs), Dairy Cows (173,600 AUs), and Broilers (92,339 AUs). Total animal units in Oregon during 2018 were 952,794 AUs.



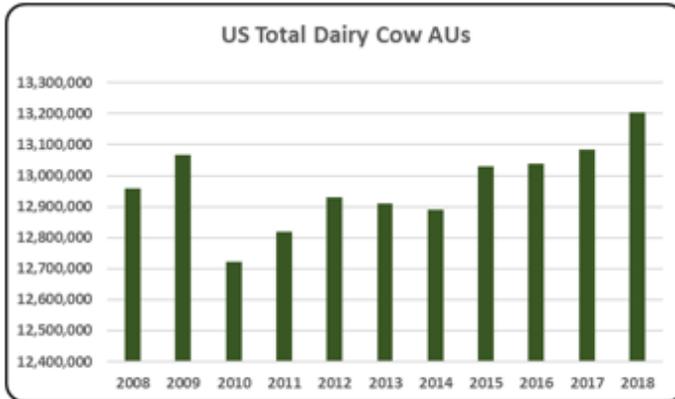
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 952,794 AUs in Oregon in 2018. Overall animal units decreased 1.7% from 2008 to 2018.



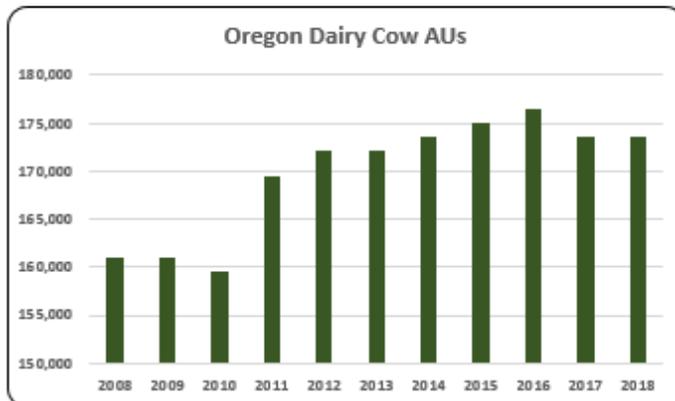
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler animal units represented 9.7% (92,339 AUs) of all animal units in Oregon in 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 8,976 layer AUs in Oregon in 2018. Only 0.9% of total AUs came from laying hens in 2018 in Oregon. Layer AUs decreased 9.7% from 2008 to 2018.



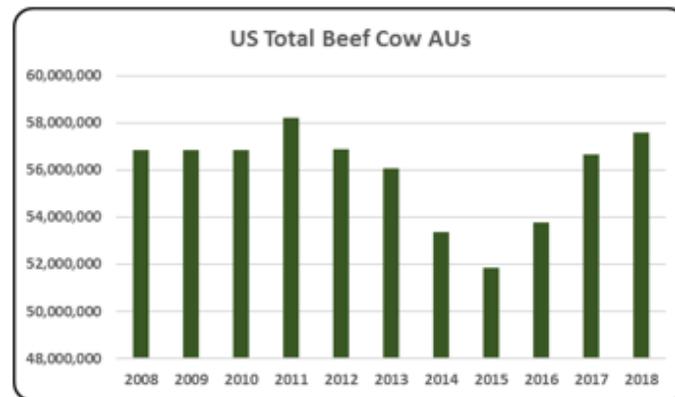
- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey numbers increased by 51.5% in Oregon from 2008 to 2018. There were 25,963 turkey AUs on average from 2008 to 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog animal unit numbers declined in Oregon from a decade ago in 2008 with a 70.1% decline. The total number of hog AUs in 2018 was 1,950.



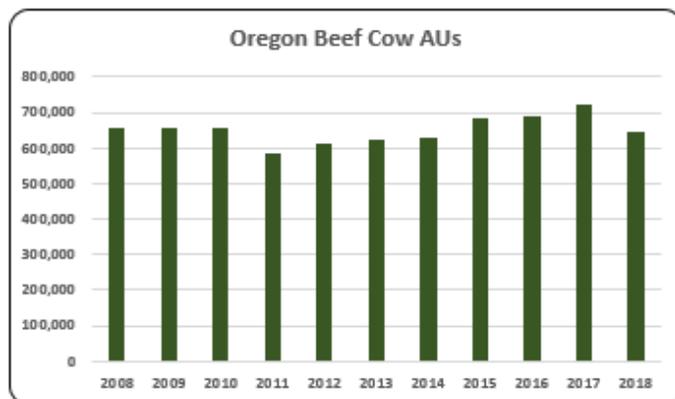
- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.



- Dairy cow animal units in Oregon increased from 161,000 dairy cow AUs in 2008 to 173,600 dairy cow AUs in 2018.



- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.



- Beef cow production is the largest AU sector in the state of Oregon. The average number of beef cow AUs from 2008 to 2018 was 650,114.

- v.

Oregon Additional Information and Methodology

Animal agriculture is a moderate part of Oregon's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Oregon, of interest is the degree to which the industry impacts the Oregon economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Oregon animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Oregon's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Oregon which have occurred. As shown in this state report, Oregon has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Oregon. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Oregon Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Oregon’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Oregon, \$1.56 to \$2.22 million in total economic activity, \$0.36 to \$0.47 in household wages and 12 to 16 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.219	\$ 0.451	15.5
	Hogs, Pigs, and Other	\$ 1.565	\$ 0.361	12.1
	Poultry and Eggs	\$ 1.959	\$ 0.419	12.3
	Dairy	\$ 2.018	\$ 0.466	15.7

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	654,300	654,300	654,300	583,350	609,900	624,300	629,850	682,650	691,800	723,750	642,750
	Hog and Pig AUs	6,525	5,775	5,025	4,605	3,075	2,220	1,365	2,070	2,430	1,665	1,950
	Broiler AUs	115,767	107,637	109,084	82,196	88,841	88,531	88,028	90,300	90,975	92,279	92,339
	Turkey AUs	21,904	21,413	22,309	22,707	31,194	26,145	27,440	26,823	26,177	26,303	33,179
	Egg Layer AUs	9,942	9,264	9,400	9,028	9,509	9,200	9,137	8,886	10,066	9,279	8,976
	Dairy AUs	161,000	161,000	159,600	169,400	172,200	172,200	173,600	175,000	176,400	173,600	173,600
	Total Animal Units	969,438	959,388	959,719	871,286	914,719	922,596	929,421	985,730	997,848	1,026,875	952,794
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 432,677	\$ 427,549	\$ 490,900	\$ 634,386	\$ 675,073	\$ 712,765	\$ 914,324	\$ 880,723	\$ 701,147	\$ 695,260	\$ 652,063
	Hogs and Pigs (\$1,000)	\$ 5,809	\$ 4,239	\$ 4,968	\$ 5,169	\$ 3,322	\$ 2,122	\$ 2,017	\$ 2,190	\$ 2,315	\$ 1,796	\$ 1,849
	Broilers (\$1,000)	\$ 92,722	\$ 79,999	\$ 83,602	\$ 73,193	\$ 88,522	\$ 107,863	\$ 113,156	\$ 98,719	\$ 87,774	\$ 103,067	\$ 123,979
	Turkeys (\$1,000)	\$ 48,191	\$ 45,672	\$ 43,833	\$ 34,466	\$ 37,059	\$ 26,862	\$ 17,771	\$ 24,867	\$ 28,120	\$ 19,039	\$ 22,149
	Eggs (\$1,000)	\$ 64,775	\$ 47,765	\$ 51,756	\$ 52,462	\$ 54,128	\$ 56,228	\$ 65,778	\$ 115,960	\$ 42,447	\$ 50,366	\$ 85,136
	Milk (\$1,000)	\$ 412,482	\$ 307,976	\$ 415,027	\$ 530,506	\$ 497,574	\$ 532,968	\$ 655,350	\$ 474,486	\$ 469,333	\$ 500,742	\$ 473,297
	Other	\$ 28,138	\$ 30,991	\$ 36,341	\$ 37,266	\$ 42,859	\$ 41,902	\$ 45,659	\$ 51,890	\$ 54,416	\$ 58,043	\$ 61,475
	Sheep and Lambs (\$1,000)	\$ 11,369	\$ 12,792	\$ 16,712	\$ 16,207	\$ 20,369	\$ 15,315	\$ 14,975	\$ 17,110	\$ 15,539	\$ 15,069	\$ 14,404
	Aquaculture (\$1,000)	\$ 16,769	\$ 18,199	\$ 19,629	\$ 21,060	\$ 22,490	\$ 26,587	\$ 30,684	\$ 34,780	\$ 38,877	\$ 42,974	\$ 47,071
	Total (\$1,000)	\$ 1,084,794	\$ 944,192	\$ 1,126,427	\$ 1,367,448	\$ 1,398,537	\$ 1,480,709	\$ 1,814,055	\$ 1,648,835	\$ 1,385,552	\$ 1,428,313	\$ 1,419,948

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	11,231	12,071	11,420	11,872
	Cattle feedlots (112112)	1,593	778	140	150
	Dairy cattle and milk production (11212)	521	432	344	269
	Hog and pig farming (1122)	534	425	447	434
	Poultry and egg production (1123)	622	891	965	736
	Sheep and goat farming (1124)	1,816	2,103	1,871	2,569
	Animal aquaculture and other animal production (1125,1129)	6,781	5,403	3,892	4,894
Value of Sales (\$1,000)	Cattle and Calves	543,231	800,336	894,485	977,404
	Hogs and Pigs	3,540	5,662	3,195	3,431
	Poultry and Eggs	86,506	119,812	127,481	126,466
	Milk*			519,790	507,116
	Aquaculture	17,054	16,270	22,490	42,974
	Other (calculated)	56,328	66,189	55,405	66,075
	Total	706,659	1,008,269	1,622,846	1,723,466
Input Purchases	Livestock and poultry purchased	(Farms) 11,223	9,557	10,191	10,985
		\$1,000 201,604	281,444	293,739	302,430
	Breeding livestock purchased	(Farms) 5,484	4,840	4,937	5,151
		\$1,000 22,334	33,064	42,659	49,731
	Other livestock and poultry purchased	(Farms) 7,244	6,048	6,774	7,371
		\$1,000 179,270	248,380	251,080	252,699
Feed purchased	(Farms) 24,322	21,691	21,341	23,893	
	\$1,000 259,418	454,733	628,524	599,459	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,447,058	\$ 293,820	10,116	\$ 81,241
	Hogs, Pigs, and Other	\$ 99,071	\$ 22,860	769	\$ 6,321
	Poultry and Eggs	\$ 453,092	\$ 96,992	2,855	\$ 26,818
	Dairy	\$ 955,066	\$ 220,604	7,433	\$ 60,997
	Total	\$ 2,954,287	\$ 634,275	21,172	\$ 175,377
Change from 2008 to 2018	Cattle and Calves	\$ 299,575	\$ 60,828	2,094	\$ 16,819
	Hogs, Pigs, and Other	\$ 35,602	\$ 8,215	276	\$ 2,271
	Poultry and Eggs	\$ (28,494)	\$ (6,100)	(180)	\$ (1,687)
	Dairy	\$ (39,631)	\$ (9,154)	(308)	\$ (2,531)
	Total	\$ 267,052	\$ 53,789	1,882	\$ 14,873
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.219	\$ 0.451	15.5	
	Hogs, Pigs, and Other	\$ 1.565	\$ 0.361	12.1	
	Poultry and Eggs	\$ 1.959	\$ 0.419	12.3	
	Dairy	\$ 2.018	\$ 0.466	15.7	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			7.5%	
	Total			27.7%	
Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.					

2008-2018 Animal Agriculture: PENNSYLVANIA

Pennsylvania Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Pennsylvania animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture success in the State of Pennsylvania. The success of Pennsylvania animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Pennsylvania during 2018:

- \$8.7 billion in economic output
- 55,716 jobs
- \$1.9 billion in earnings
- \$440.5 million in income taxes paid at local, state, and federal levels
- \$252.7 million in the form of property taxes

Pennsylvania's animal agriculture consumed almost 911.5 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (347.8 thousand tons)
- Egg-Laying Hens (225.8 thousand tons)
- Dairy Cows (134.8 thousand tons)

This report examines animal agriculture in Pennsylvania over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Pennsylvania, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Pennsylvania and beyond.

Pennsylvania Economic Impact of Animal Agriculture

Animal agriculture is an important part of Pennsylvania's economy. In 2018, Pennsylvania's animal agriculture contributed the following to the economy:

- About \$8.7 billion in economic output
- \$1.9 billion in household earnings
- 55,716 jobs
- \$440.5 million in income taxes

During the last decade, contractions in Pennsylvania's animal agriculture has:

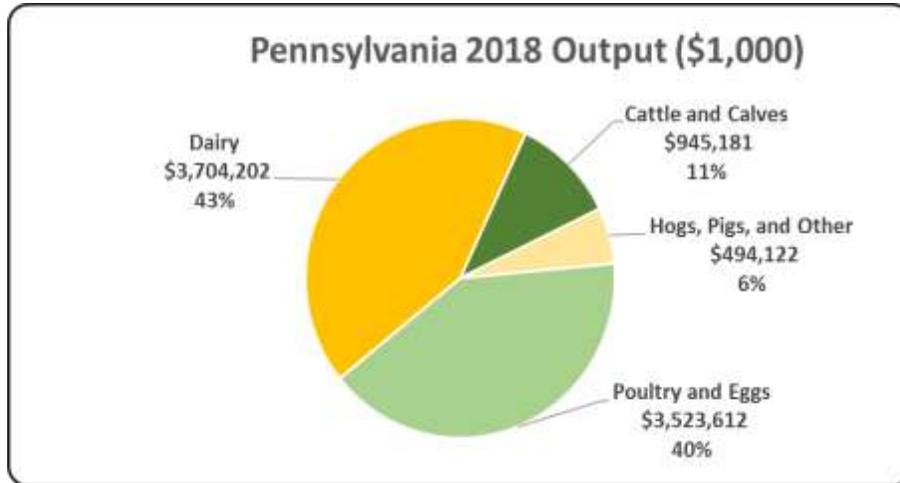
- Decreased economic output by \$885.7 million
- Reduced household earnings by \$207.1 million
- Shrunk by 6,824 jobs
- Paid \$48.2 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 8,667,117	\$ (885,730)	-9.27%
Earnings (\$1,000)	\$ 1,892,802	\$ (207,102)	-9.86%
Employment (Jobs)	55,716	(6,824)	-10.91%
Income Taxes Paid (\$1,000)	\$ 440,455	\$ (48,193)	-9.86%
Property Taxes Paid in 2017 (\$1,000)	\$ 252,731		

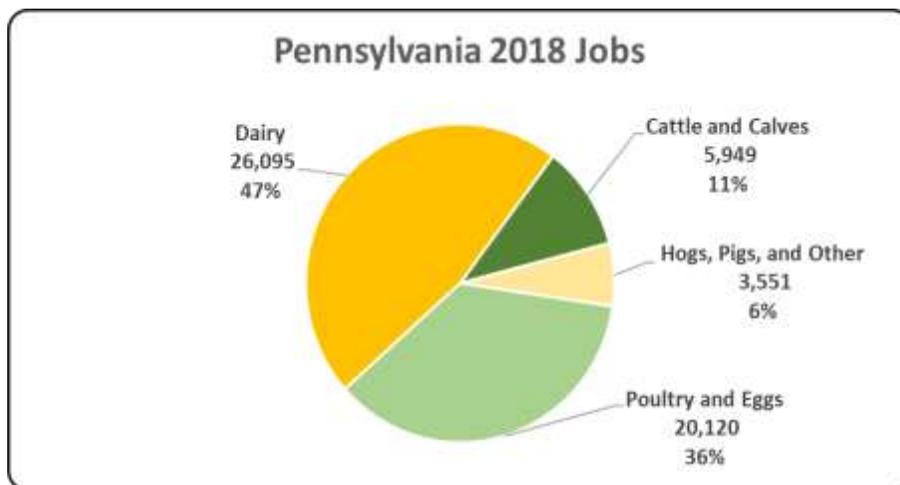
Pennsylvania Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Pennsylvania economy. Animal agriculture’s impact on Pennsylvania total economic output is about \$8.7 billion.



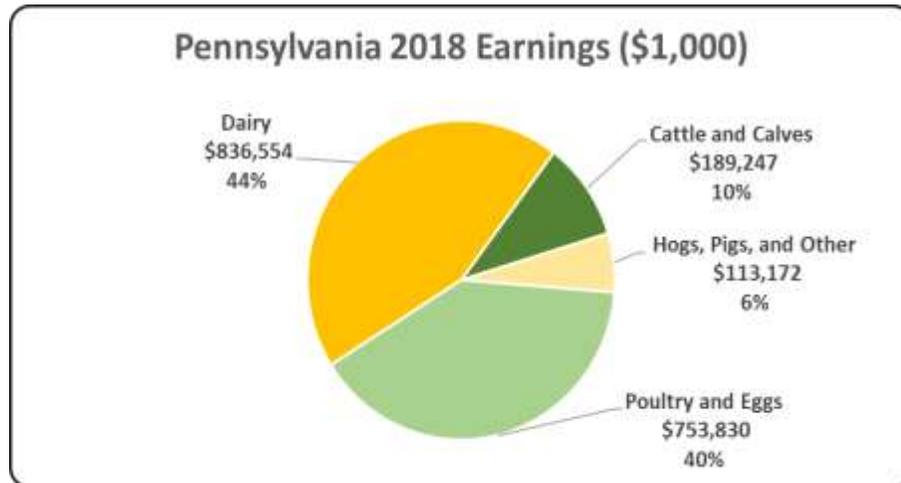
Pennsylvania Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Pennsylvania in terms of animal agriculture jobs. As shown, animal agriculture contributes 55,716 jobs within and outside of animal agriculture.



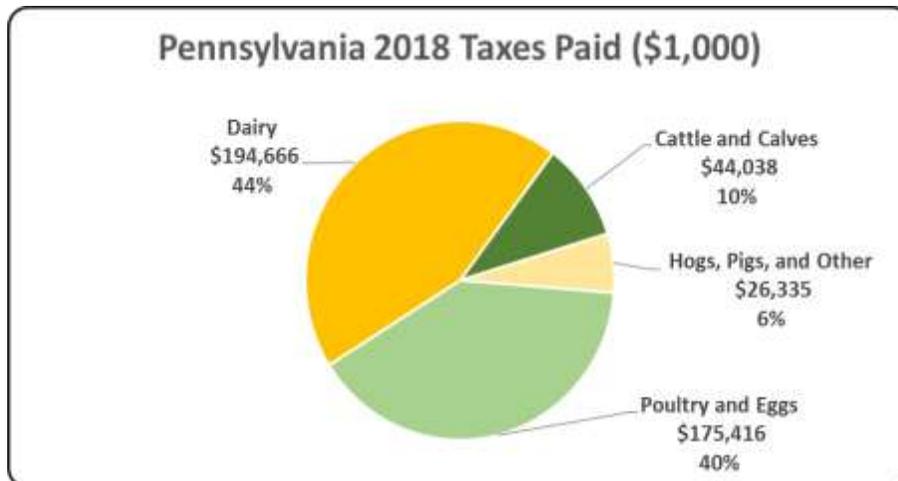
Pennsylvania Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Pennsylvania economy in terms of earnings. Pennsylvania’s animal agriculture contributed about \$1.9 billion to household earnings in 2018.



Pennsylvania Taxes Paid by Animal Agriculture

Pennsylvania’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$440.5 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$252.7 million in property taxes paid by all of Pennsylvania agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



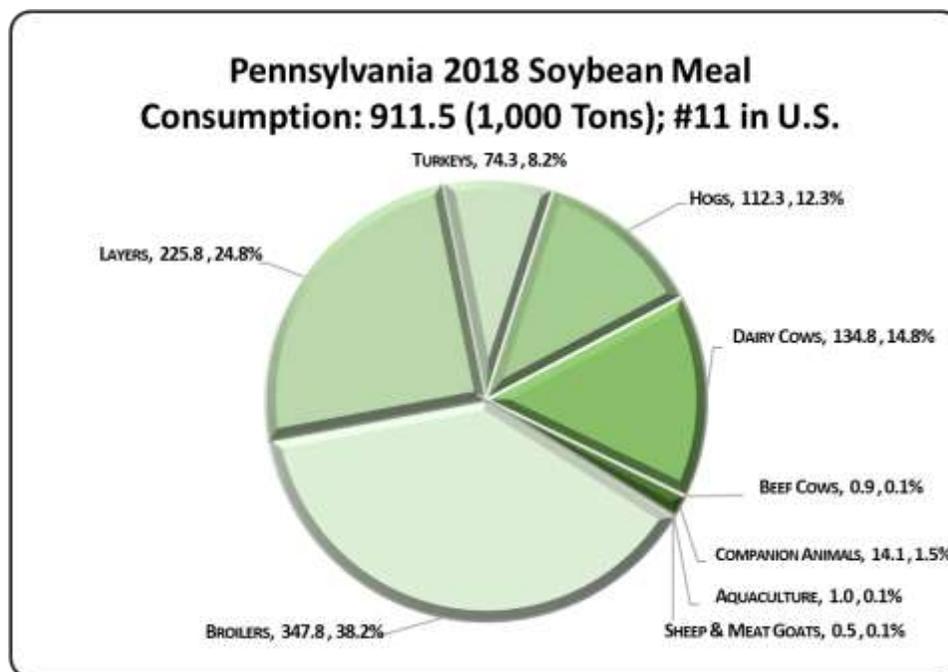
Pennsylvania Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Pennsylvania's animal agriculture consumed almost 911.5 thousand tons of soybean meal in 2018, placing the state as #11 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Pennsylvania consumed 141.8 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (347.8 thousand tons)
2. Egg-Laying Hens (225.8 thousand tons)
3. Dairy Cows (134.8 thousand tons)

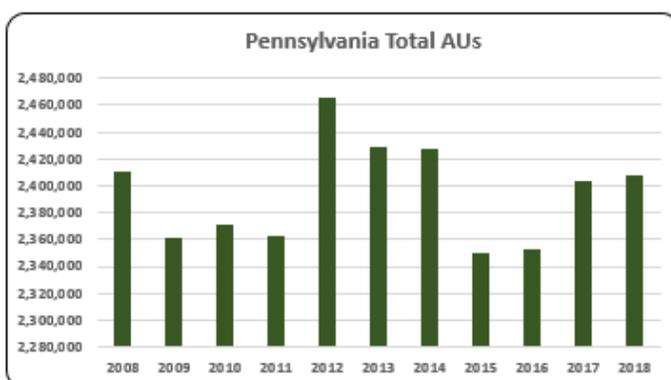
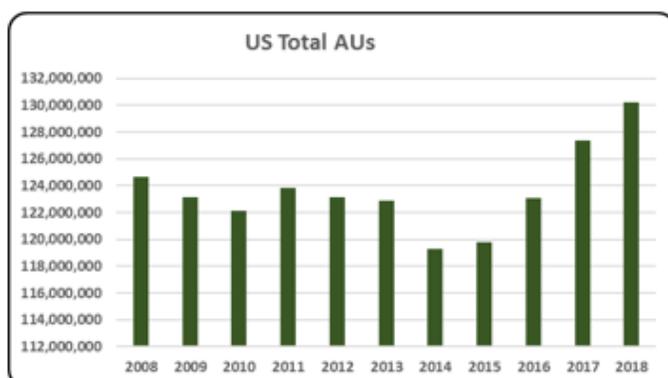


Pennsylvania Animal Unit (AU) Trends

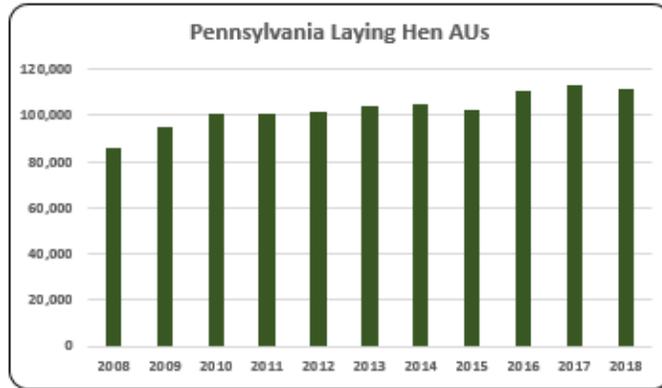
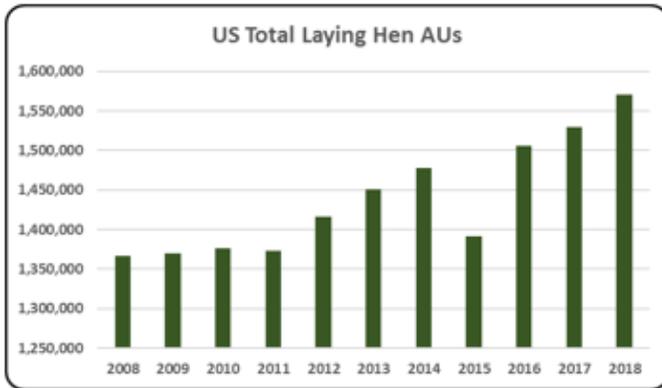
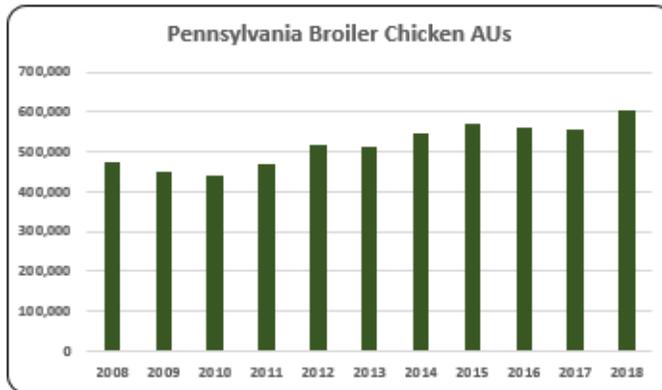
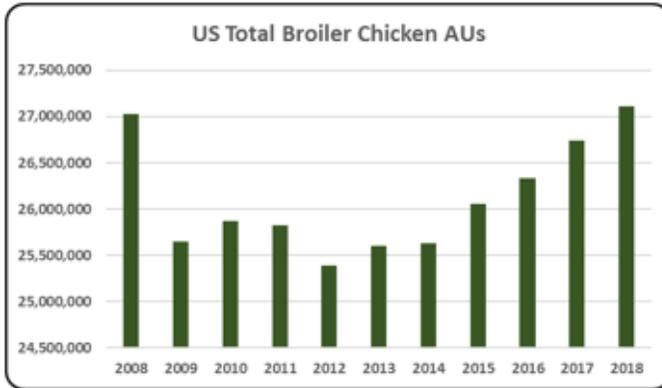
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Pennsylvania. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Pennsylvania and to give perspective on Pennsylvania's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

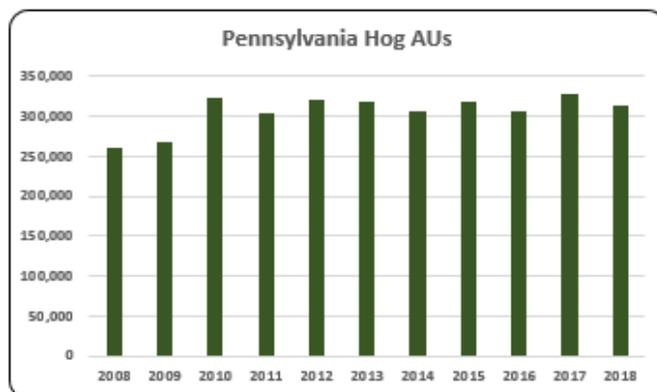
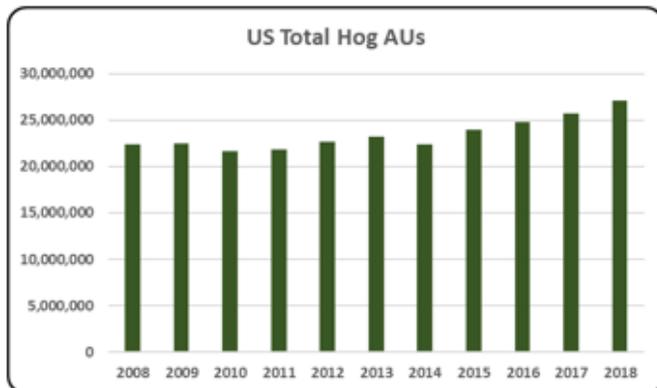
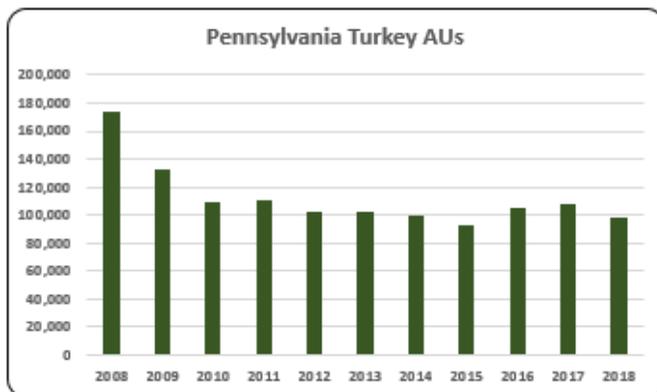
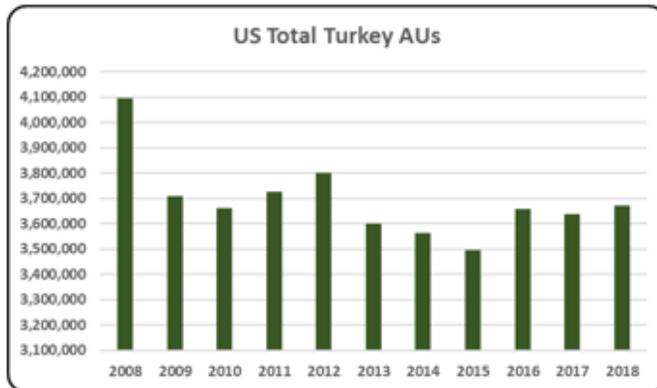
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Pennsylvania, the largest three segments of animal agriculture in terms of AUs during 2018 were: Dairy Cows (735,000 AUs), Broilers (601,371 AUs), and Beef Cows (549,345 AUs). Total animal units in Pennsylvania during 2018 were 2.4 million AUs.



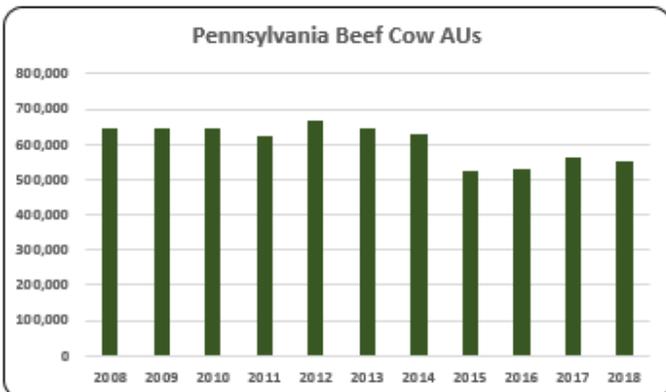
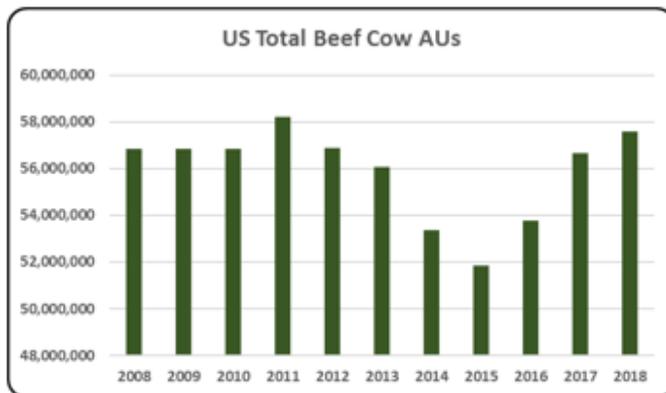
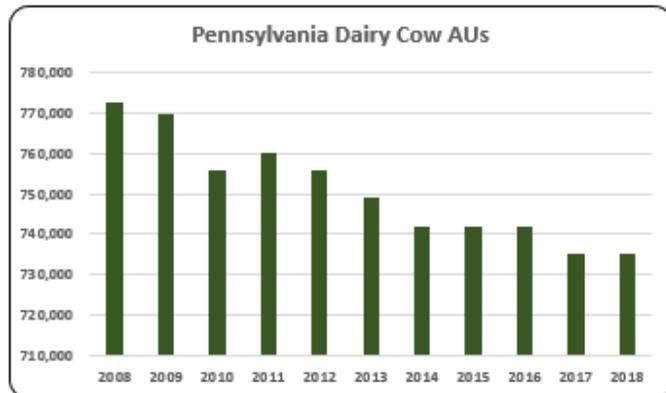
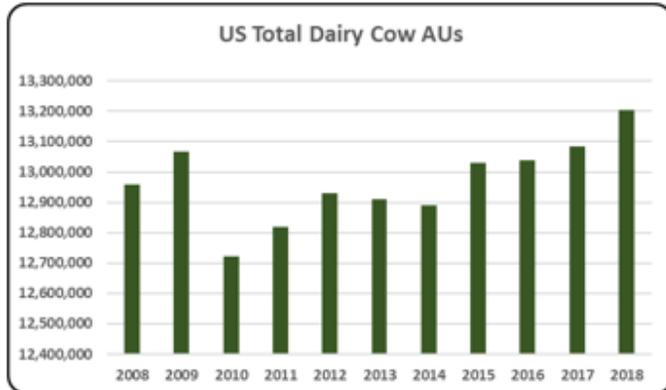
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 2.4 million AUs in Pennsylvania in 2018 representing 1.9% of all AUs in the U.S. Animal units decreased 0.1% since 2008 in Pennsylvania.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- On average, there were 517,790 broiler AUs from 2008 to 2018 in Pennsylvania. Broiler AUs showed a 26.8% increase from 2008 (474,428 AUs) to 2018 (601,371 AUs).
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In general, laying hen AUs in Pennsylvania showed an upward trend, increasing 29.3% from 2008 to 2018. There were 111,548 layer AUs in 2018. Pennsylvania accounted for 7.1% of all layer AUs in the U.S. in 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs declined 43.8% during the last decade in Pennsylvania. From 2008 to 2018, on average, there were 111,891 turkey AUs.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- There were 312,885 hog AUs in 2018 in Pennsylvania. Hog AUs increased 20.5% from 2008 to 2018. Hogs contributed 13.0% of the total Pennsylvania AU numbers in 2018.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cows AUs were 735,000 in Pennsylvania in 2018. This is a 4.9% decrease from a decade earlier in 2008. This is 30.5% of all AUs in the state in 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- The average number of beef cow AUs was 605,490 during the last decade from 2008 to 2018. Beef cow AUs declined 14.7% during this time frame in Pennsylvania.

Pennsylvania Additional Information and Methodology

Animal agriculture is an important part of Pennsylvania's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Pennsylvania, of interest is the degree to which the industry impacts the Pennsylvania economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Pennsylvania animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Pennsylvania's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Pennsylvania which have occurred. As shown in this state report, Pennsylvania has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Pennsylvania. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Pennsylvania Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Pennsylvania's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Pennsylvania, \$1.65 to \$2.50 million in total economic activity, \$0.36 to \$0.53 in household wages and 11 to 15 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.798	\$ 0.360	11.3
	Hogs, Pigs, and Other	\$ 1.650	\$ 0.378	11.9
	Poultry and Eggs	\$ 2.497	\$ 0.534	14.3
	Dairy	\$ 2.067	\$ 0.467	14.6

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	643,800	643,800	643,800	621,150	668,670	643,875	630,525	521,835	530,190	563,400	549,345	
	Hog and Pig AUs	259,620	268,170	322,350	303,000	319,800	317,400	306,600	318,825	306,375	328,425	312,885	
	Broiler AUs	474,428	451,660	439,361	467,504	516,394	513,064	544,903	572,262	558,124	556,615	601,371	
	Turkey AUs	174,119	132,322	108,642	109,945	102,594	101,641	98,892	92,891	104,655	107,321	97,783	
	Egg Layer AUs	86,307	94,668	100,632	100,620	101,595	103,713	104,642	102,422	110,873	113,025	111,548	
	Dairy AUs	772,800	770,000	756,000	760,200	756,000	749,000	742,000	742,000	742,000	742,000	735,000	735,000
	Total Animal Units	2,411,075	2,360,620	2,370,785	2,362,419	2,465,053	2,428,692	2,427,562	2,350,234	2,352,217	2,403,786	2,407,932	
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 387,801	\$ 352,719	\$ 407,598	\$ 515,506	\$ 616,659	\$ 596,590	\$ 702,225	\$ 697,740	\$ 560,868	\$ 567,112	\$ 525,831	
	Hogs and Pigs (\$1,000)	\$ 160,086	\$ 159,524	\$ 251,409	\$ 308,968	\$ 315,230	\$ 327,724	\$ 378,883	\$ 306,567	\$ 262,927	\$ 306,551	\$ 272,183	
	Broilers (\$1,000)	\$ 429,272	\$ 399,875	\$ 404,446	\$ 399,973	\$ 481,050	\$ 580,231	\$ 635,216	\$ 573,616	\$ 497,072	\$ 564,182	\$ 637,595	
	Turkeys (\$1,000)	\$ 133,209	\$ 89,514	\$ 95,191	\$ 114,129	\$ 117,625	\$ 109,158	\$ 128,105	\$ 132,886	\$ 156,331	\$ 130,535	\$ 99,603	
	Eggs (\$1,000)	\$ 488,056	\$ 367,224	\$ 408,227	\$ 490,511	\$ 524,878	\$ 599,377	\$ 717,181	\$ 1,008,202	\$ 364,362	\$ 475,528	\$ 673,940	
	Milk (\$1,000)	\$ 2,115,000	\$ 1,519,344	\$ 1,964,871	\$ 2,330,887	\$ 2,095,600	\$ 2,279,232	\$ 2,740,648	\$ 1,998,000	\$ 1,861,040	\$ 2,034,468	\$ 1,791,720	
	Other	\$ 22,211	\$ 24,115	\$ 27,609	\$ 31,418	\$ 33,985	\$ 32,054	\$ 31,674	\$ 29,960	\$ 29,289	\$ 28,171	\$ 27,213	
	Sheep and Lambs (\$1,000)	\$ 5,901	\$ 5,351	\$ 6,392	\$ 7,749	\$ 7,862	\$ 6,998	\$ 7,685	\$ 7,039	\$ 7,435	\$ 7,384	\$ 7,493	
	Aquaculture (\$1,000)	\$ 16,310	\$ 18,764	\$ 21,217	\$ 23,670	\$ 26,123	\$ 25,056	\$ 23,989	\$ 22,921	\$ 21,854	\$ 20,787	\$ 19,720	
Total (\$1,000)	\$ 3,735,636	\$ 2,912,314	\$ 3,559,351	\$ 4,191,393	\$ 4,185,027	\$ 4,524,366	\$ 5,333,932	\$ 4,746,971	\$ 3,731,889	\$ 4,106,547	\$ 4,028,085		

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,677	8,350	7,665	7,116
	Cattle feedlots (112112)	3,197	1,611	726	558
	Dairy cattle and milk production (11212)	8,678	7,434	6,598	5,749
	Hog and pig farming (1122)	1,366	1,072	765	759
	Poultry and egg production (1123)	1,655	2,691	2,141	1,932
	Sheep and goat farming (1124)	1,524	2,010	2,073	2,410
	Animal aquaculture and other animal production (1125,1129)	6,736	8,062	6,868	6,631
Value of Sales (\$1,000)	Cattle and Calves	441,671	556,192	717,085	625,530
	Hogs and Pigs	269,318	336,437	457,916	572,495
	Poultry and Eggs	745,624	1,015,843	1,362,039	1,684,535
	Milk*			1,966,892	1,979,362
	Aquaculture	15,325	44,519	26,123	20,787
	Other (calculated)	70,115	95,916	49,123	94,847
	Total	1,542,053	2,048,907	4,579,178	4,977,556
Input Purchases	Livestock and poultry purchased	(Farms) 17,996	15,367	18,409	16,458
		\$1,000 333,396	482,913	502,633	578,448
	Breeding livestock purchased	(Farms) 8,990	6,716	8,489	7,347
		\$1,000 66,562	76,826	114,511	118,545
	Other livestock and poultry purchased	(Farms) 11,417	10,712	12,736	11,617
		\$1,000 266,834	406,087	388,122	459,903
Feed purchased	(Farms) 36,011	32,576	37,228	34,261	
	\$1,000 937,355	1,267,184	1,832,951	1,504,261	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 945,181	\$ 189,247	5,949	\$ 44,038
	Hogs, Pigs, and Other	\$ 494,122	\$ 113,172	3,551	\$ 26,335
	Poultry and Eggs	\$ 3,523,612	\$ 753,830	20,120	\$ 175,416
	Dairy	\$ 3,704,202	\$ 836,554	26,095	\$ 194,666
	Total	\$ 8,667,117	\$ 1,892,802	55,716	\$ 440,455
Change from 2008 to 2018	Cattle and Calves	\$ 112,145	\$ 22,454	706	\$ 5,225
	Hogs, Pigs, and Other	\$ 134,575	\$ 30,822	967	\$ 7,172
	Poultry and Eggs	\$ 388,766	\$ 83,171	2,220	\$ 19,354
	Dairy	\$ (1,521,216)	\$ (343,550)	(10,717)	\$ (79,944)
	Total	\$ (885,730)	\$ (207,102)	(6,824)	\$ (48,193)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.798	\$ 0.360	11.3	
	Hogs, Pigs, and Other	\$ 1.650	\$ 0.378	11.9	
	Poultry and Eggs	\$ 2.497	\$ 0.534	14.3	
	Dairy	\$ 2.067	\$ 0.467	14.6	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.1%	
	Total			23.3%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: RHODE ISLAND

Rhode Island Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Rhode Island animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Rhode Island. The success of Rhode Island animal agriculture in turn has a small impact on the rest of the state and regional economies. For example, in the State of Rhode Island during 2018 animal agriculture contributed:

- \$34.4 million in economic output
- 154 jobs
- \$7.1 million in earnings
- \$1.8 million in income taxes paid at local, state, and federal levels
- \$7.0 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Rhode Island has increased economic output by over \$2.4 million, boosted household earnings by \$0.5 million, contributed 9 additional jobs and paid \$128,000 in additional tax revenues.

Rhode Island's animal agriculture consumed almost 6,100 tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (2,900 tons)
- Turkeys (1,000 tons)
- Companion Animals (900 tons)

This report examines animal agriculture in Rhode Island over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Rhode Island, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a minor contributor to the economic well-being of the people of Rhode Island and beyond.

Rhode Island Economic Impact of Animal Agriculture

Animal agriculture is a small part of Rhode Island's economy. In 2018, Rhode Island's animal agriculture contributed the following to the economy:

- About \$34.4 million in economic output
- \$7.1 million in household earnings
- 154 jobs
- \$1.8 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Rhode Island's animal agriculture has:

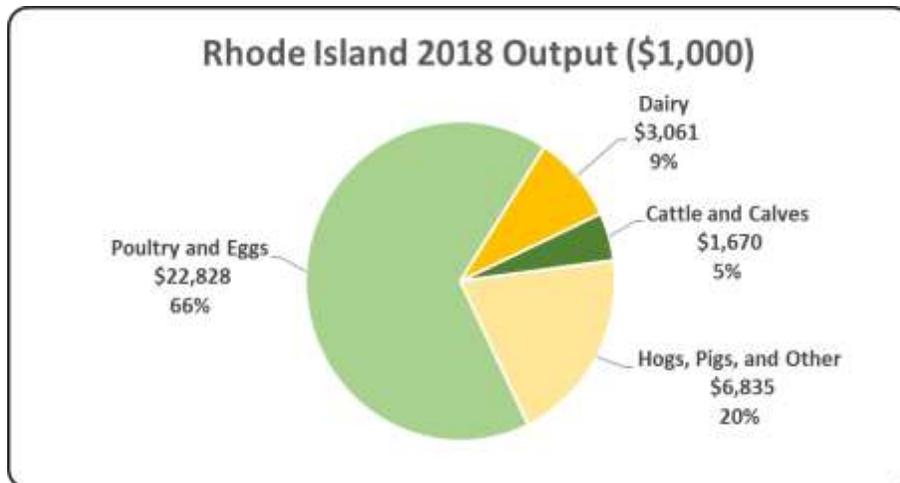
- Increased economic output by \$2.4 million
- Boosted household earnings by \$0.5 million
- Added 9 jobs
- Paid an additional \$128,000 in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 34,394	\$ 2,381	7.44%
Earnings (\$1,000)	\$ 7,136	\$ 512	7.73%
Employment (Jobs)	154	9	6.55%
Income Taxes Paid (\$1,000)	\$ 1,789	\$ 128	7.73%
Property Taxes Paid in 2017 (\$1,000)	\$ 6,974		

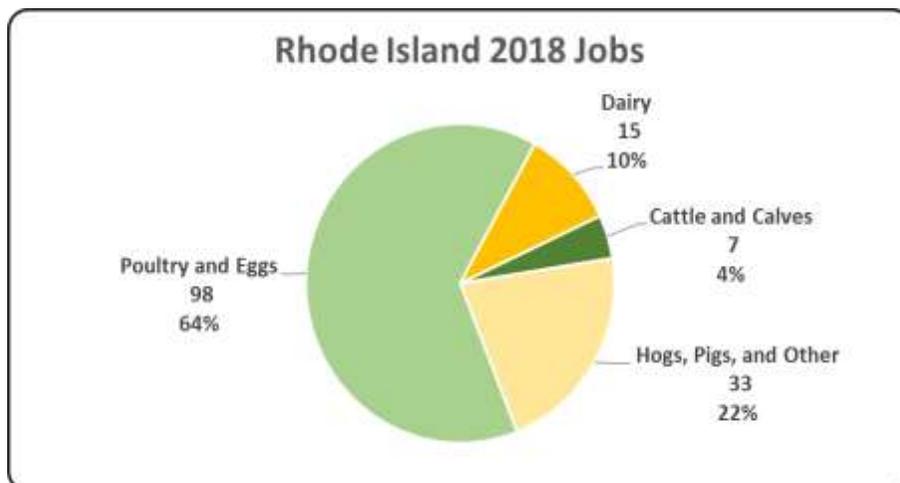
Rhode Island Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Rhode Island economy. Animal agriculture’s impact on Rhode Island total economic output is about \$34.4 million.



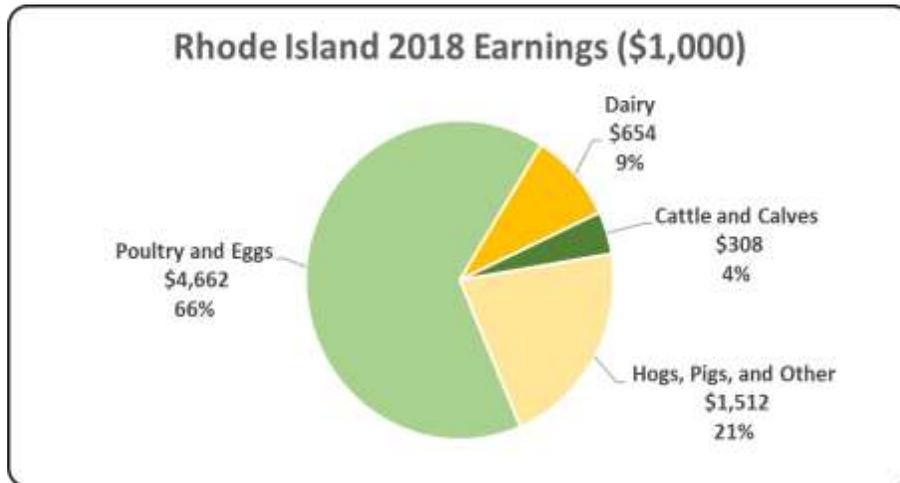
Rhode Island Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Rhode Island in terms of animal agriculture jobs. As shown, animal agriculture contributes 154 jobs within and outside of animal agriculture.



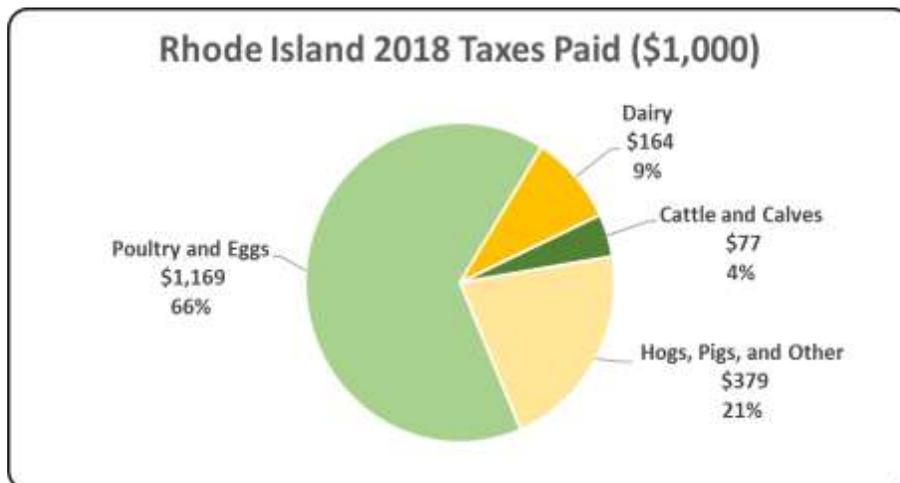
Rhode Island Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Rhode Island economy in terms of earnings. Rhode Island’s animal agriculture contributed about \$7.1 million to household earnings in 2018.



Rhode Island Taxes Paid by Animal Agriculture

Rhode Island’s animal agriculture is also a small source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$1.8 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$7.0 million in property taxes paid by all of Rhode Island agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



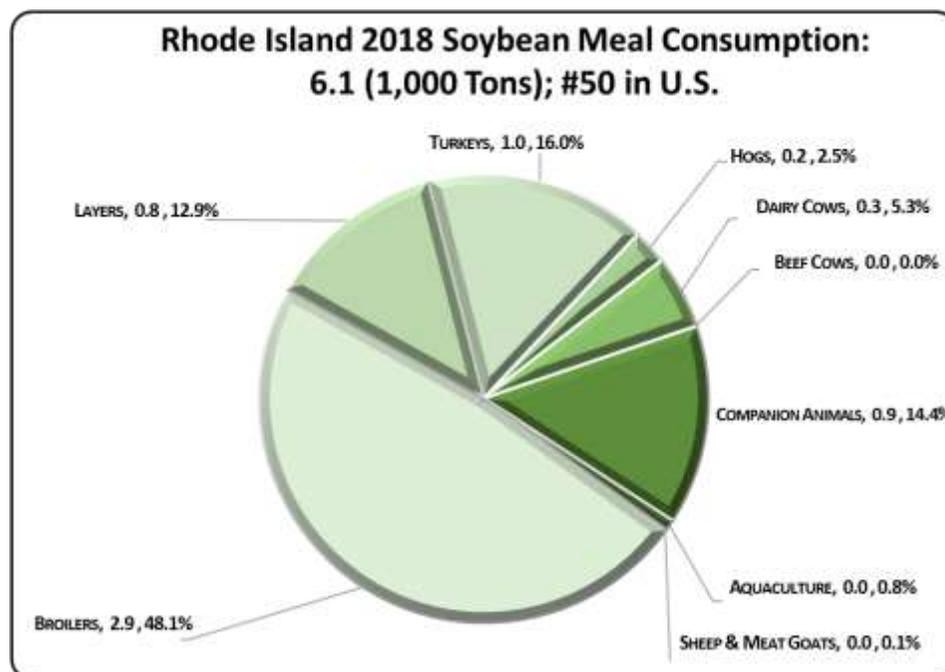
Rhode Island Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Rhode Island's animal agriculture consumed almost 6,100 tons of soybean meal in 2018, placing the state as #50 in the nation in terms of soybean meal consumption (see figure below). The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (2,900 tons)
2. Turkeys (1,000 tons)
3. Companion Animals (900 tons)

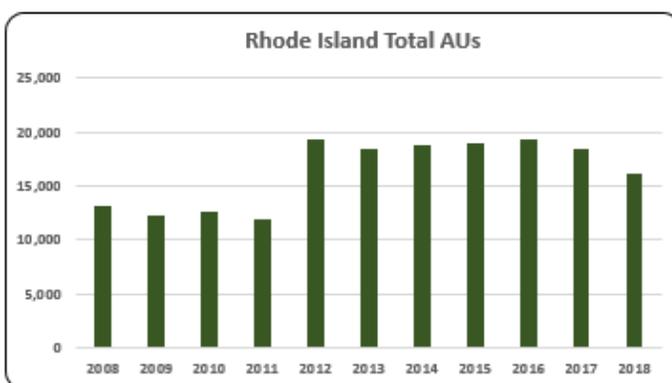
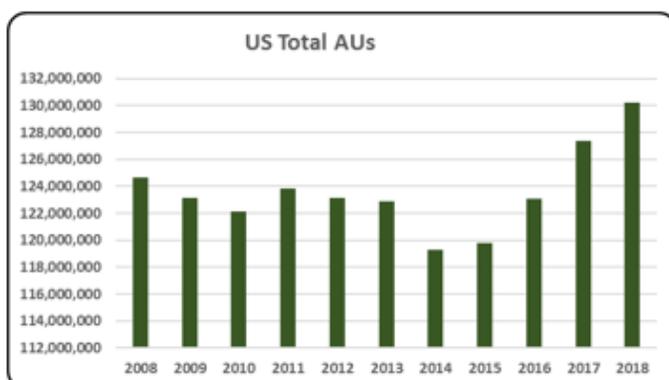


Rhode Island Animal Unit (AU) Trends

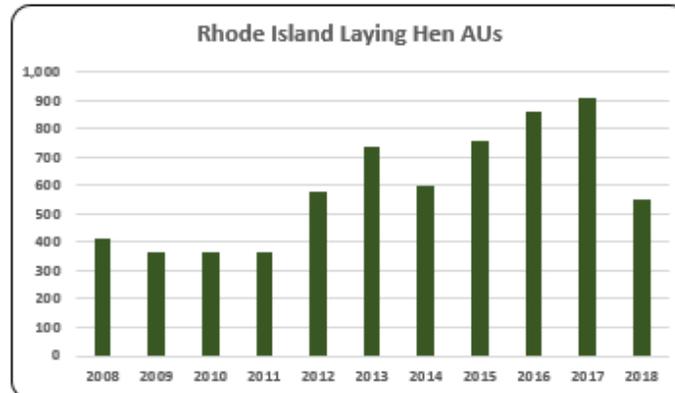
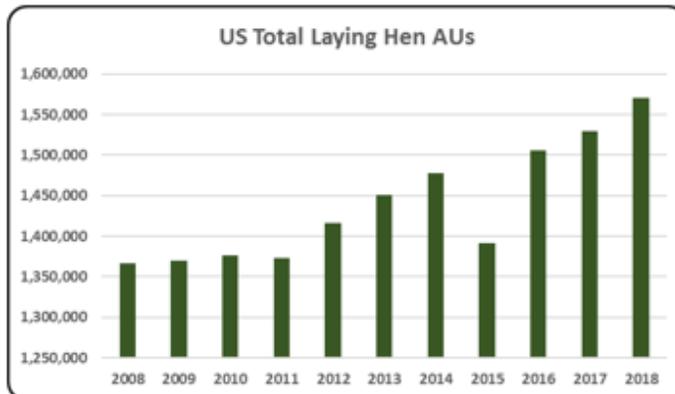
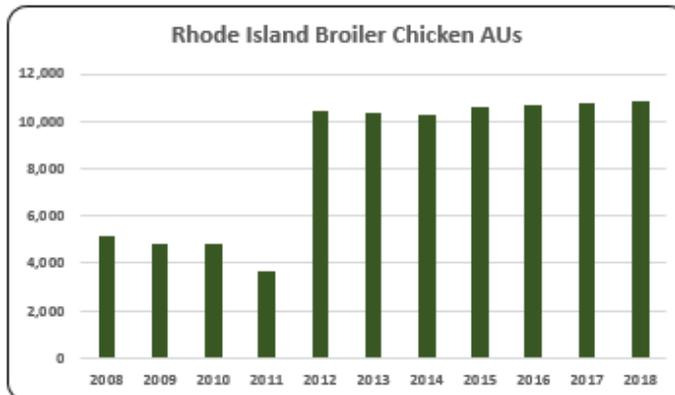
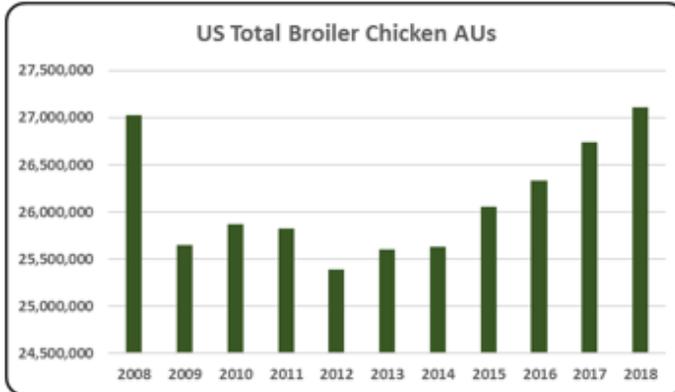
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Rhode Island. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Rhode Island and to give perspective on Rhode Island's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

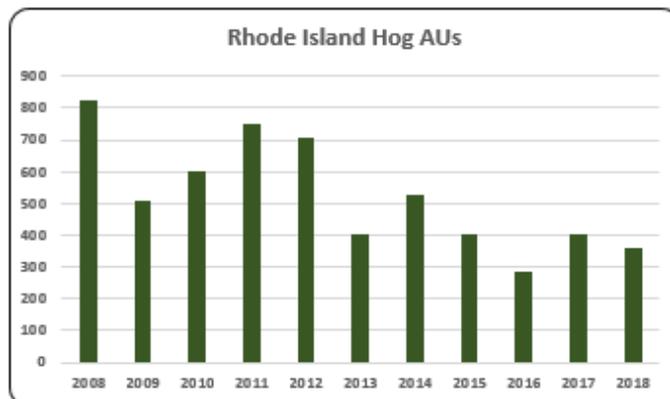
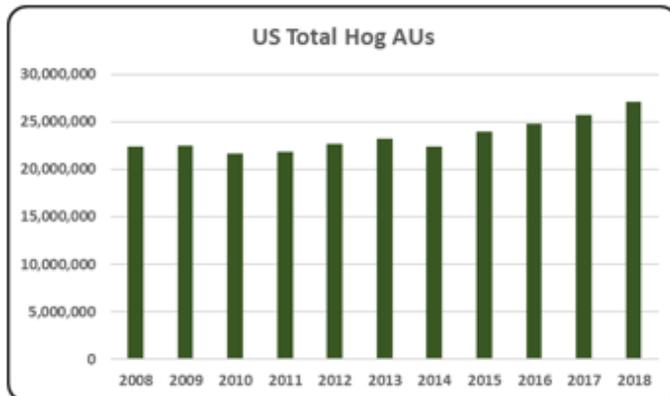
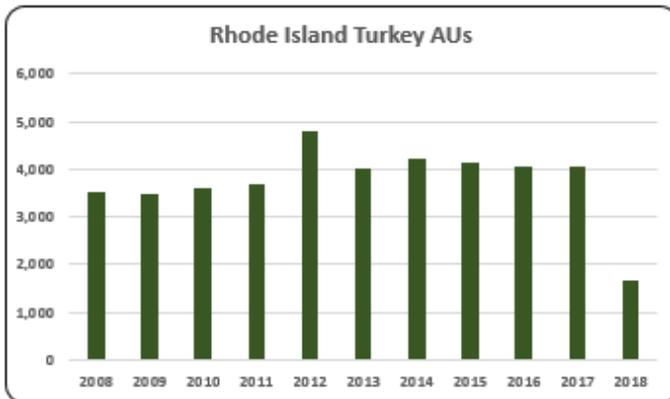
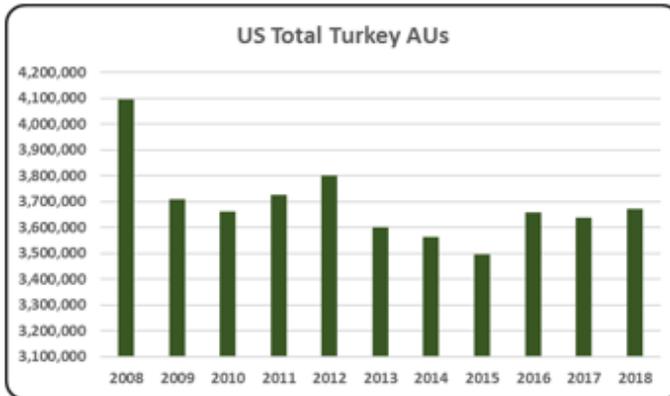
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Rhode Island, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (10,808 AUs), Beef Cows (1,695 AUs), and Turkeys (1,678 AUs). Total animal units in Rhode Island during 2018 were 16,211 AUs.



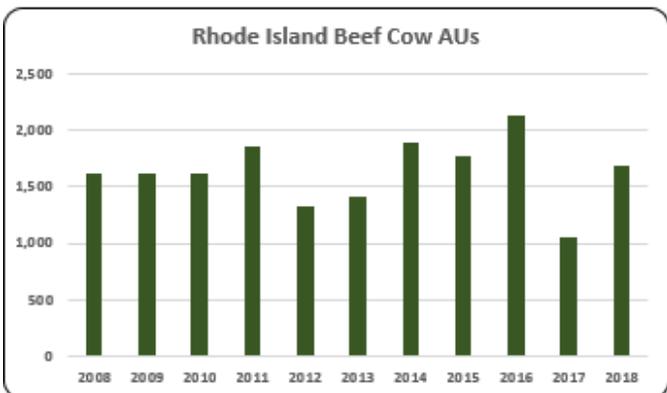
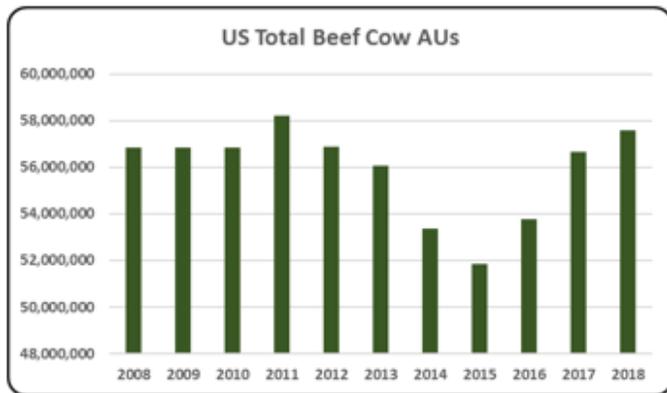
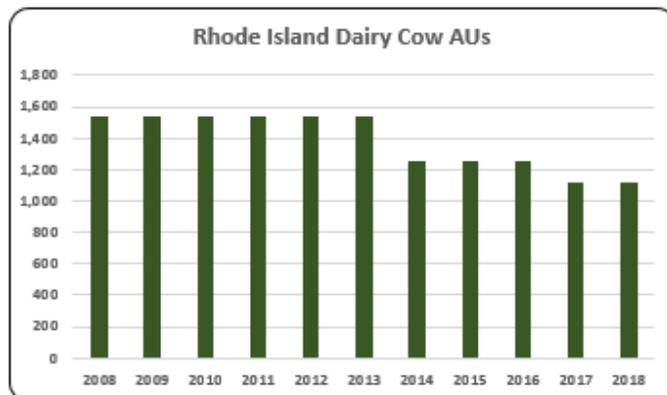
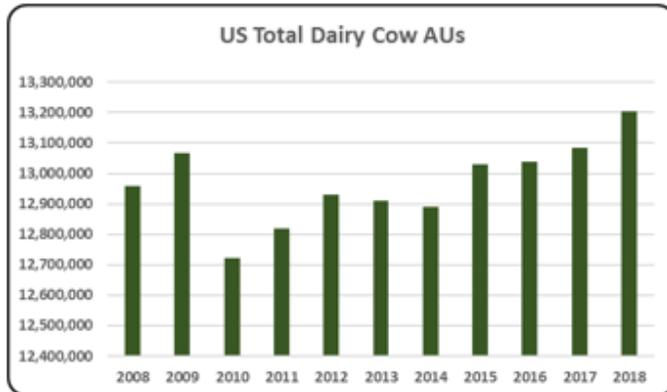
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Rhode Island has a very little animal production contributing only 0.01% (16,211) of all AUs in the U.S. in 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broilers are the largest animal sector in Rhode Island with 66.7% of all animal units in the state in 2018. There were 10,808 broiler AUs in the state in 2018, a record number for the time period studied.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 551 layer AUs in Rhode Island in 2018. Laying hen AUs increased 33.8% from 2008 to 2018. From 2017 to 2018 there was a decrease in layer AUs.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- On average, there were 3,754 turkey AUs from 2008 to 2018 in Rhode Island. 2012 was a record year for turkey numbers with 4,817 turkey AUs.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog production was the smallest animal sector in the state in terms of animal units with an average of 525 hog AUs during last decade. There were 360 hog AUs in the state in 2018.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy production declined 27.3% from 2008 to 2018 in Rhode Island. On average, there were 1,387 dairy cow AUs during the last decade.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- 10.5% (1,695 AUs) of all Rhode Island AUs were beef cows in 2018. Beef cow AUs increased 4.6% in the last decade.

Rhode Island Additional Information and Methodology

Animal agriculture is a small part of Rhode Island's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Rhode Island, of interest is the degree to which the industry impacts the Rhode Island economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Rhode Island animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Rhode Island's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Rhode Island which have occurred. As shown in this state report, Rhode Island has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Rhode Island. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Rhode Island Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Rhode Island’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Rhode Island, \$1.35 to \$1.52 million in total economic activity, \$0.25 to \$0.33 in household wages and 6 to 8 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.374	\$ 0.254	5.6
	Hogs, Pigs, and Other	\$ 1.355	\$ 0.300	6.6
	Poultry and Eggs	\$ 1.444	\$ 0.295	6.2
	Dairy	\$ 1.521	\$ 0.325	7.6

Appendix

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	1,620	1,620	1,620	1,860	1,335	1,410	1,890	1,770	2,130	1,050	1,695
	Hog and Pig AUs	825	510	600	750	705	405	525	405	285	405	360
	Broiler AUs	5,145	4,784	4,848	3,653	10,398	10,362	10,303	10,569	10,648	10,801	10,808
	Turkey AUs	3,541	3,462	3,607	3,671	4,817	4,037	4,237	4,142	4,042	4,062	1,678
	Egg Layer AUs	412	364	362	364	580	739	599	756	862	910	551
	Dairy AUs	1,540	1,540	1,540	1,540	1,540	1,540	1,260	1,260	1,260	1,120	1,120
	Total Animal Units	13,084	12,280	12,577	11,838	19,375	18,493	18,814	18,901	19,227	18,347	16,211
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 834	\$ 738	\$ 706	\$ 1,029	\$ 1,452	\$ 1,512	\$ 1,929	\$ 1,850	\$ 1,489	\$ 1,267	\$ 1,216
	Hogs and Pigs (\$1,000)	\$ 289	\$ 176	\$ 275	\$ 364	\$ 368	\$ 361	\$ 537	\$ 350	\$ 213	\$ 334	\$ 277
	Broilers (\$1,000)	\$ 4,121	\$ 3,556	\$ 3,716	\$ 3,253	\$ 10,361	\$ 12,625	\$ 13,244	\$ 11,554	\$ 10,273	\$ 12,063	\$ 6,120
	Turkeys (\$1,000)	\$ 4,310	\$ 4,085	\$ 7,087	\$ 5,572	\$ 5,992	\$ 4,343	\$ 2,873	\$ 3,840	\$ 4,342	\$ 2,940	\$ 1,120
	Eggs (\$1,000)	\$ 3,586	\$ 2,552	\$ 2,801	\$ 3,072	\$ 3,445	\$ 3,892	\$ 6,230	\$ 10,385	\$ 4,084	\$ 5,522	\$ 8,569
	Milk (\$1,000)	\$ 4,000	\$ 2,783	\$ 3,510	\$ 4,314	\$ 3,623	\$ 3,728	\$ 4,514	\$ 3,005	\$ 2,425	\$ 2,418	\$ 2,012
	Other	\$ 1,339	\$ 1,496	\$ 1,669	\$ 1,815	\$ 1,976	\$ 2,459	\$ 2,927	\$ 3,404	\$ 3,872	\$ 4,300	\$ 4,768
	Sheep and Lambs (\$1,000)	\$ 37	\$ 41	\$ 59	\$ 52	\$ 59	\$ 73	\$ 72	\$ 80	\$ 80	\$ 39	\$ 39
	Aquaculture (\$1,000)	\$ 1,302	\$ 1,455	\$ 1,609	\$ 1,763	\$ 1,917	\$ 2,386	\$ 2,855	\$ 3,323	\$ 3,792	\$ 4,261	\$ 4,730
	Total (\$1,000)	\$ 18,478	\$ 15,385	\$ 19,764	\$ 19,419	\$ 27,216	\$ 28,919	\$ 32,254	\$ 34,388	\$ 26,698	\$ 28,844	\$ 24,082

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	78	102	154	124
	Cattle feedlots (112112)	12	8	7	-
	Dairy cattle and milk production (11212)	30	34	13	15
	Hog and pig farming (1122)	20	31	20	17
	Poultry and egg production (1123)	26	49	88	59
	Sheep and goat farming (1124)	30	53	54	85
	Animal aquaculture and other animal production (1125,1129)	148	237	244	213
Value of Sales (\$1,000)	Cattle and Calves	735	846	1,180	1,074
	Hogs and Pigs	227	354	601	withheld
	Poultry and Eggs	1,766	1,908	2,177	1,420
	Milk*			3,902	4,563
	Aquaculture	863	1,653	1,917	4,261
	Other (calculated)	958	946	513	5,771
	Total	4,549	5,707	10,290	17,089
Input Purchases	Livestock and poultry purchased	(Farms) 169	203	349	238
		\$1,000 730	748	1,023	741
	Breeding livestock purchased	(Farms) 75	90	136	72
		\$1,000 118	214	314	288
	Other livestock and poultry purchased	(Farms) 122	143	287	194
		\$1,000 612	534	709	453
Feed purchased	(Farms) 425	583	693	586	
	\$1,000 3,121	5,171	6,287	4,490	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,670	\$ 308	7	\$ 77
	Hogs, Pigs, and Other	\$ 6,835	\$ 1,512	33	\$ 379
	Poultry and Eggs	\$ 22,828	\$ 4,662	98	\$ 1,169
	Dairy	\$ 3,061	\$ 654	15	\$ 164
	Total	\$ 34,394	\$ 7,136	154	\$ 1,789
Change from 2008 to 2018	Cattle and Calves	\$ 301	\$ 56	1	\$ 14
	Hogs, Pigs, and Other	\$ 4,199	\$ 929	20	\$ 233
	Poultry and Eggs	\$ 2,091	\$ 427	9	\$ 107
	Dairy	\$ (4,211)	\$ (900)	(21)	\$ (226)
	Total	\$ 2,381	\$ 512	9	\$ 128
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.374	\$ 0.254	5.6	
	Hogs, Pigs, and Other	\$ 1.355	\$ 0.300	6.6	
	Poultry and Eggs	\$ 1.444	\$ 0.295	6.2	
	Dairy	\$ 1.521	\$ 0.325	7.6	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.9%
	Total				25.1%
Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.					

2008-2018 Animal Agriculture: SOUTH CAROLINA

South Carolina Executive Summary

The use of soybean meal as a key feed ingredient is an important part of South Carolina animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of South Carolina. The success of South Carolina animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of South Carolina during 2018 animal agriculture contributed:

- \$3.2 billion in economic output
- 21,784 jobs
- \$700.1 million in earnings
- \$165.9 million in income taxes paid at local, state, and federal levels
- \$58.5 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in South Carolina has increased economic output by over \$207.4 million, boosted household earnings by \$43.6 million, contributed 1,203 additional jobs and paid \$10.3 million in additional tax revenues.

South Carolina's animal agriculture consumed almost 462.0 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (398.7 thousand tons)
- Egg-Laying Hens (29.3 thousand tons)
- Hogs (11.6 thousand tons)

This report examines animal agriculture in South Carolina over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in South Carolina, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of South Carolina and beyond.

South Carolina Economic Impact of Animal Agriculture

Animal agriculture is an important part of South Carolina's economy. In 2018, South Carolina's animal agriculture contributed the following to the economy:

- About \$3.2 billion in economic output
- \$700.1 million in household earnings
- 21,784 jobs
- \$165.9 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade South Carolina's animal agriculture has:

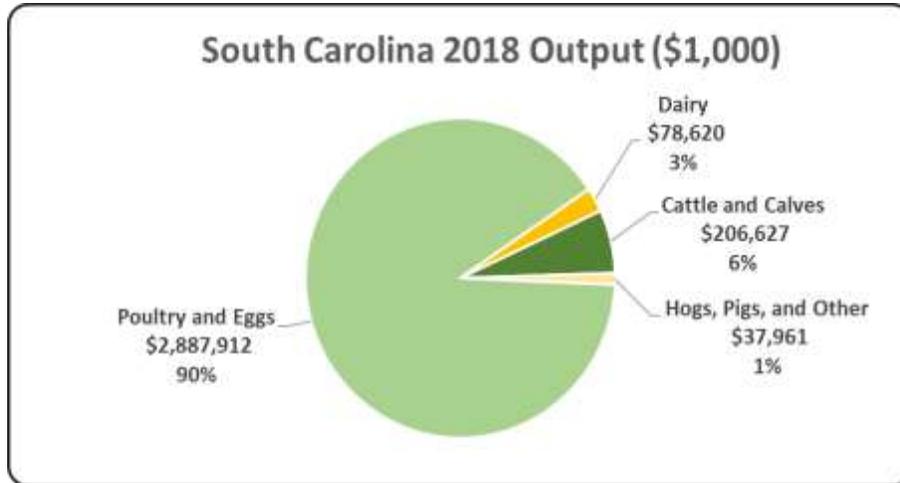
- Increased economic output by \$207.4 million
- Boosted household earnings by \$43.6 million
- Added 1,203 jobs
- Paid an additional \$10.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 3,211,120	\$ 207,421	6.91%
Earnings (\$1,000)	\$ 700,063	\$ 43,604	6.64%
Employment (Jobs)	21,784	1,203	5.84%
Income Taxes Paid (\$1,000)	\$ 165,915	\$ 10,334	6.64%
Property Taxes Paid in 2017 (\$1,000)	\$ 58,496		

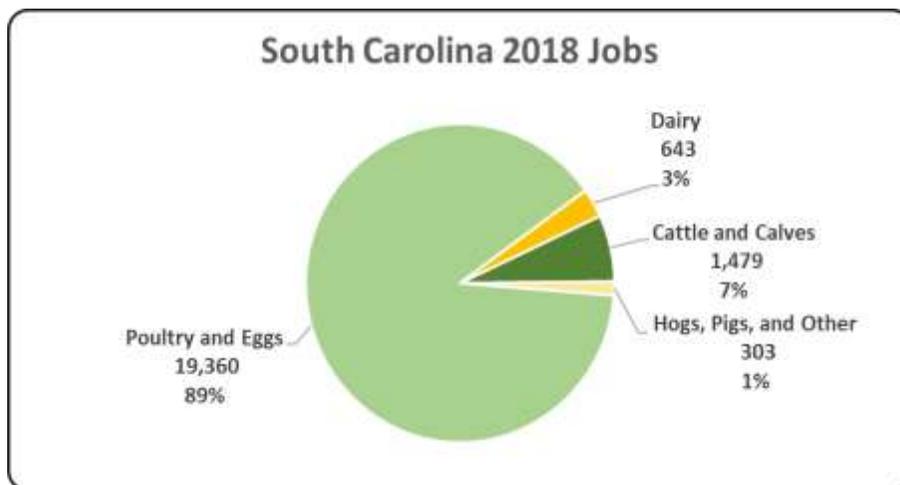
South Carolina Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the South Carolina economy. Animal agriculture’s impact on South Carolina total economic output is about \$3.2 billion.



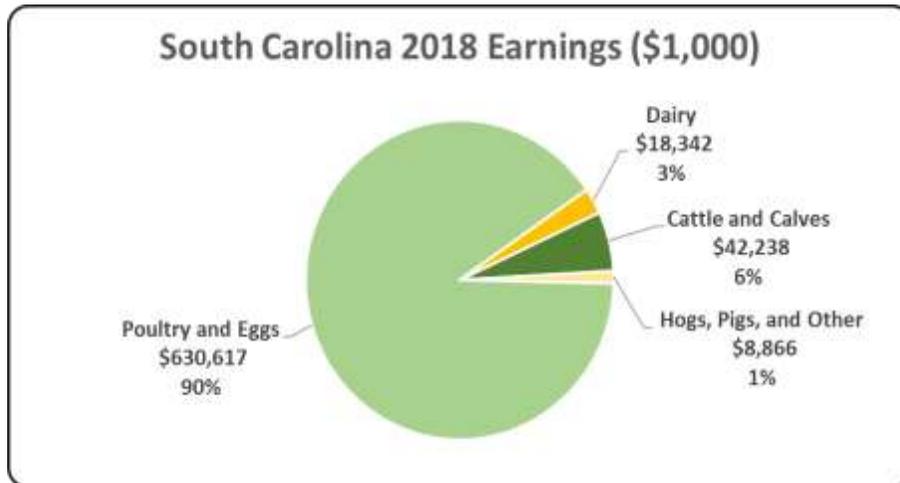
South Carolina Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to South Carolina in terms of animal agriculture jobs. As shown, animal agriculture contributes 21,784 jobs within and outside of animal agriculture.



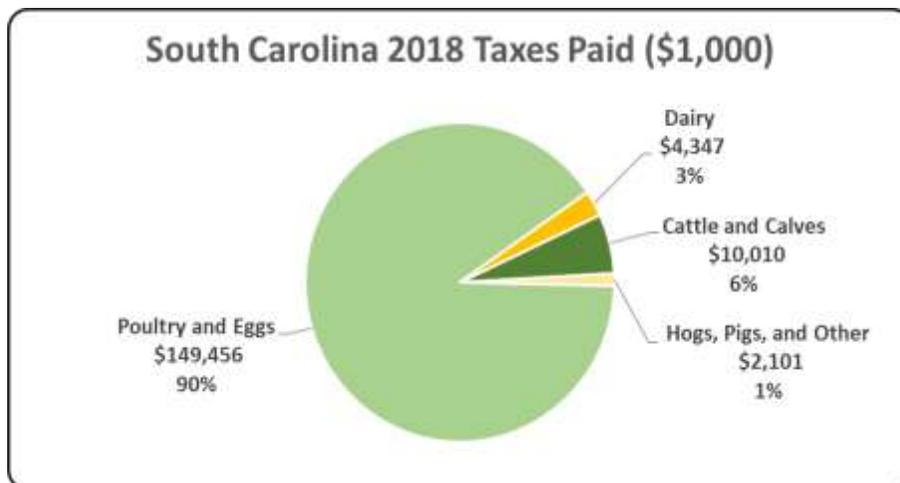
South Carolina Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the South Carolina economy in terms of earnings. South Carolina’s animal agriculture contributed about \$700.1 million to household earnings in 2018.



South Carolina Taxes Paid by Animal Agriculture

South Carolina’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$165.9 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$58.5 million in property taxes paid by all of South Carolina agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



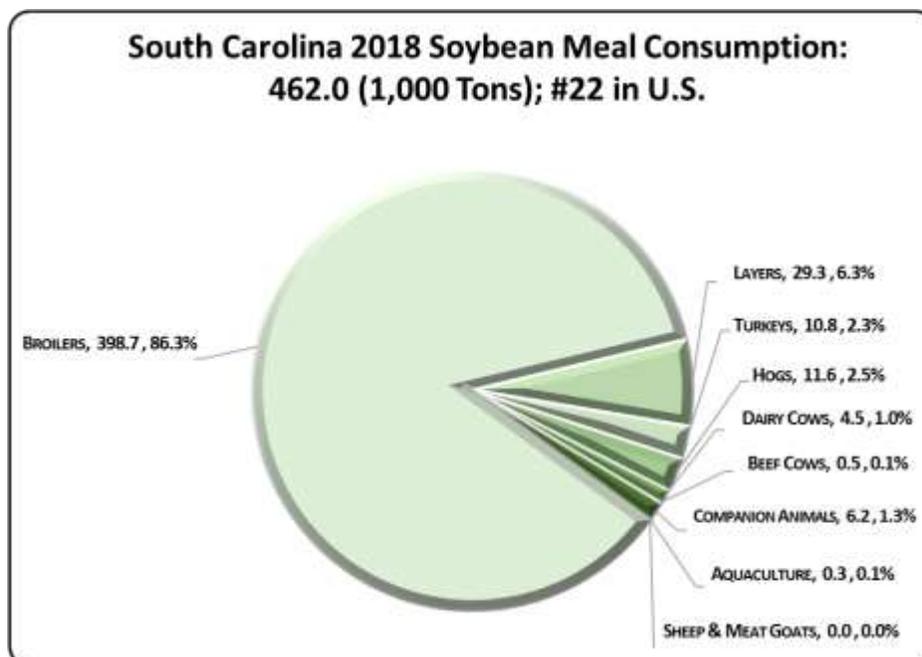
South Carolina Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

South Carolina's animal agriculture consumed almost 462.0 thousand tons of soybean meal in 2018, placing the state as #22 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in South Carolina consumed 4,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (398.7 thousand tons)
2. Egg-Laying Hens (29.3 thousand tons)
3. Hogs (11.6 thousand tons)

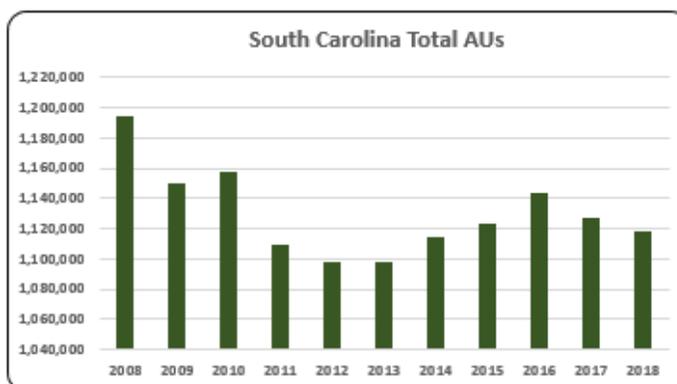
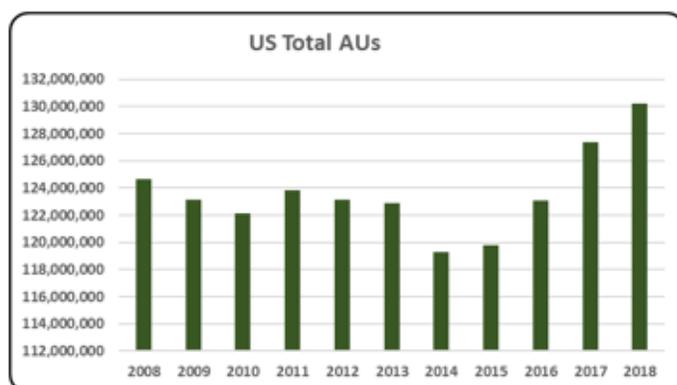


South Carolina Animal Unit (AU) Trends

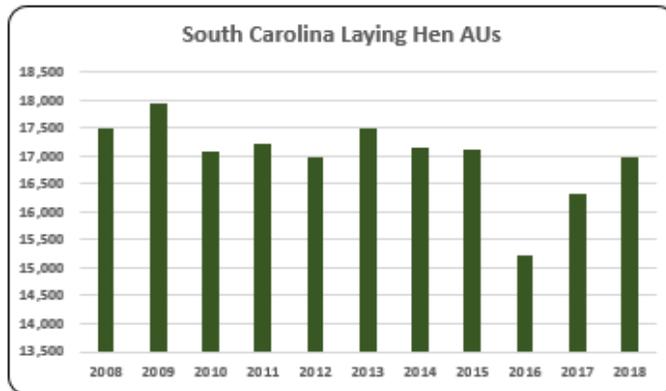
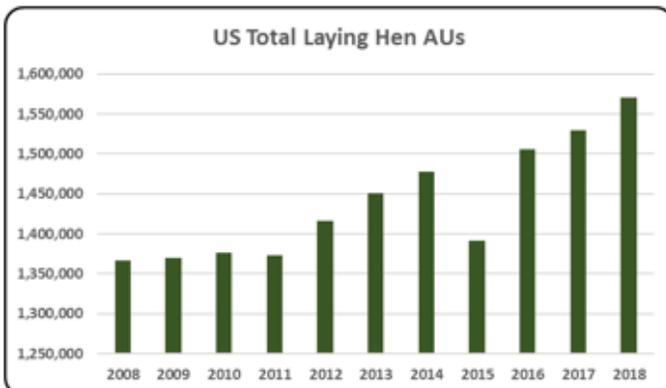
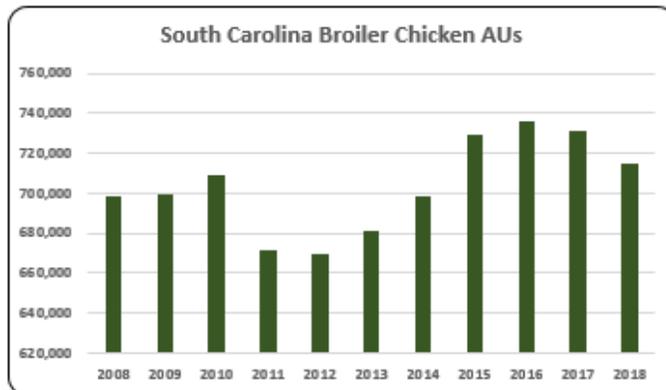
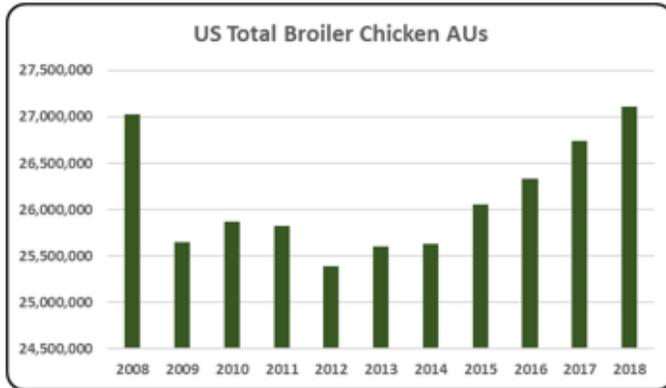
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of South Carolina. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to South Carolina and to give perspective on South Carolina's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

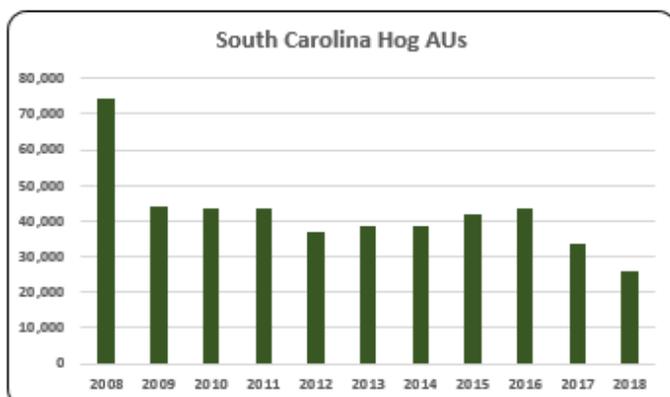
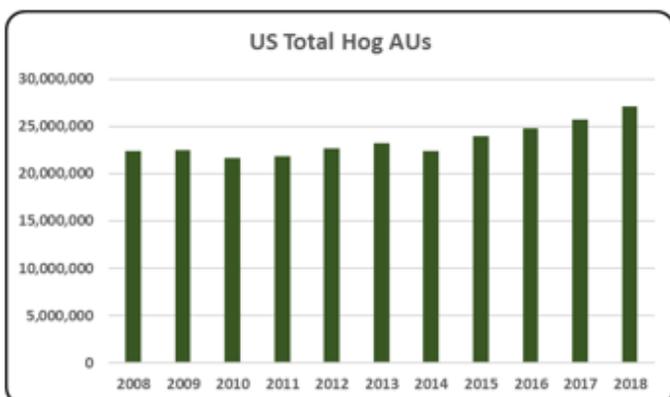
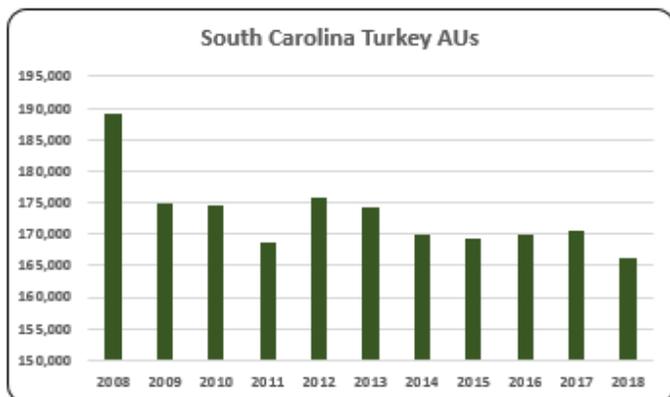
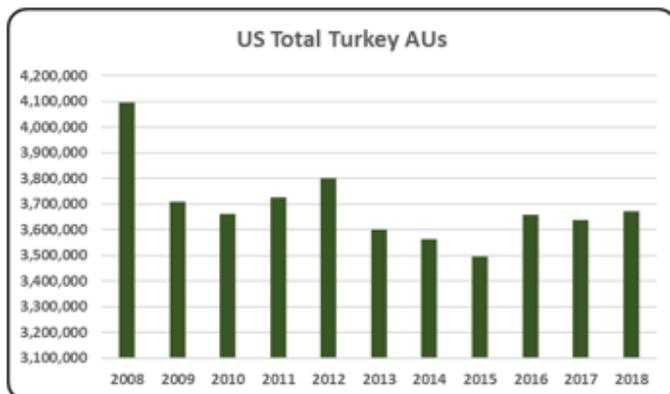
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In South Carolina, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (714,673 AUs), Beef Cows (174,300 AUs), and Turkeys (166,134 AUs). Total animal units in South Carolina during 2018 were 1.1 million AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Total animal units in South Carolina were 1.1 million in 2018. South Carolina was home to 0.9% of total U.S. AUs in 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broilers contributed 63.9% (714,673 AUs) of total AUs in South Carolina in 2018. Broiler numbers increased 2.3% from 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens represented only 1.5% (16,988 AUs) of all South Carolina’s animal units in 2018. Laying hen numbers in 2018 decreased 2.9% compared to 2008.

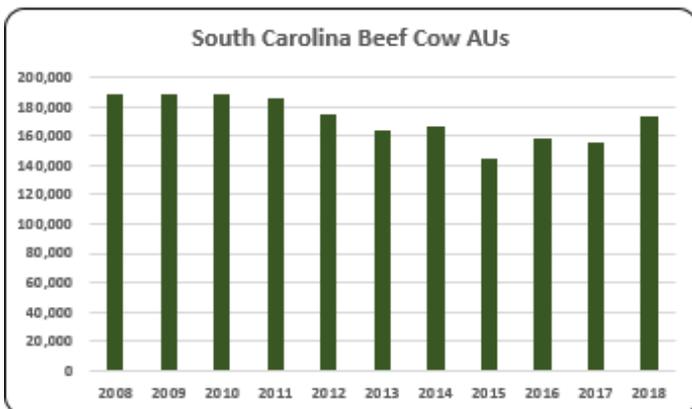
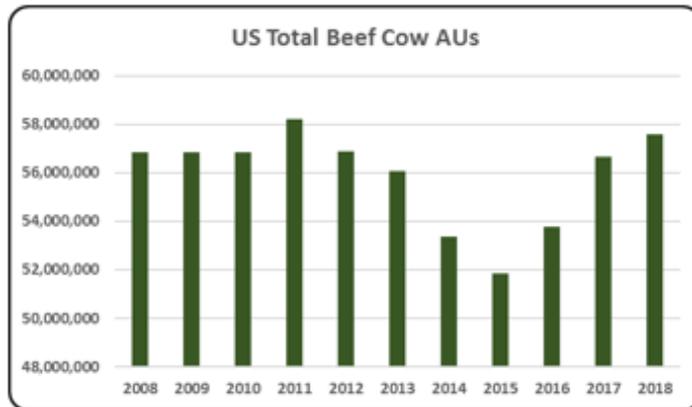
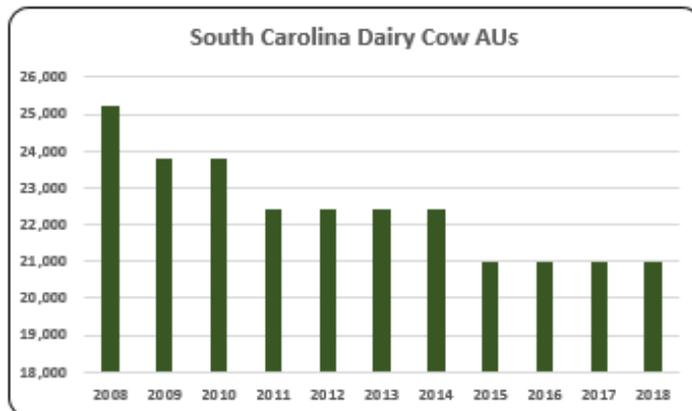
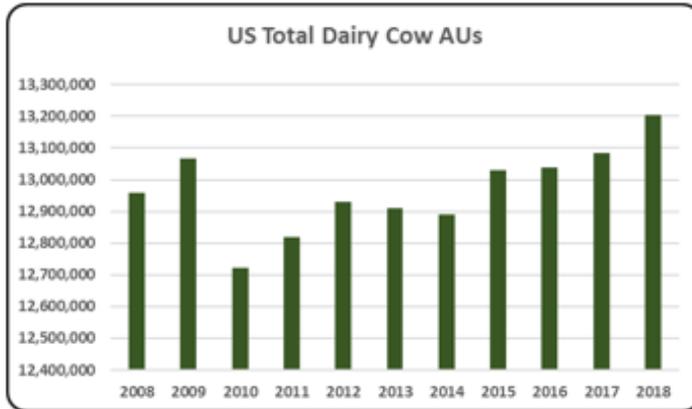


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

- There were 166,134 turkey AUs in South Carolina in 2018, which is 12.2% less than in 2008.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- The average number of hog AUs from 2008 to 2018 in South Carolina was 42,164 AUs. Hog numbers decreased 65.4% from 74,175 hog AUs in 2008 to 25,650 hog AUs in 2018.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- 2018 dairy cow AUs were at 21,000, the same as in 2017, in South Carolina. Dairy cow AUs dropped 16.7% from 2008 to 2018. South Carolina saw the decade high dairy cow AUs in 2008 with 25,200 dairy cow AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- About 15.6% (174,300 AUs) of total AUs in South Carolina for 2018 were beef cows. Beef cow AUs trended downward during last decade with an 8.0% reduction.

South Carolina Additional Information and Methodology

Animal agriculture is an important part of South Carolina's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in South Carolina, of interest is the degree to which the industry impacts the South Carolina economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for South Carolina animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted South Carolina's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in South Carolina which have occurred. As shown in this state report, South Carolina has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in South Carolina. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

South Carolina Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on South Carolina's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in South Carolina, \$1.53 to \$2.00 million in total economic activity, \$0.33 to \$0.44 in household wages and 12 to 15 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.621	\$ 0.331	11.6
	Hogs, Pigs, and Other	\$ 1.528	\$ 0.357	12.2
	Poultry and Eggs	\$ 2.002	\$ 0.437	13.4
	Dairy	\$ 1.867	\$ 0.436	15.3

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	189,450	189,450	189,450	186,600	175,350	164,400	166,950	144,750	158,625	155,100	174,300
	Hog and Pig AUs	74,175	43,875	43,575	43,575	37,125	38,325	38,775	41,775	43,350	33,600	25,650
	Broiler AUs	698,521	699,705	709,217	671,211	669,689	681,380	698,786	729,153	735,450	730,632	714,673
	Turkey AUs	189,260	174,959	174,708	168,582	175,876	174,241	169,979	169,375	169,776	170,438	166,134
	Egg Layer AUs	17,486	17,932	17,080	17,212	16,972	17,491	17,134	17,110	15,225	16,333	16,988
	Dairy AUs	25,200	23,800	23,800	22,400	22,400	22,400	22,400	21,000	21,000	21,000	21,000
	Total Animal Units	1,194,093	1,149,721	1,157,830	1,109,580	1,097,413	1,098,237	1,114,025	1,123,164	1,143,426	1,127,103	1,118,744
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 115,953	\$ 113,488	\$ 131,192	\$ 152,030	\$ 157,102	\$ 139,357	\$ 193,129	\$ 173,087	\$ 127,433	\$ 130,606	\$ 127,453
	Hogs and Pigs (\$1,000)	\$ 44,605	\$ 22,035	\$ 29,016	\$ 31,544	\$ 30,712	\$ 30,992	\$ 36,769	\$ 34,036	\$ 29,498	\$ 25,751	\$ 17,800
	Broilers (\$1,000)	\$ 697,452	\$ 695,508	\$ 750,426	\$ 707,549	\$ 768,650	\$ 963,248	\$ 1,051,560	\$ 939,725	\$ 865,562	\$ 978,602	\$ 1,010,281
	Turkeys (\$1,000)	\$ 257,431	\$ 197,767	\$ 236,398	\$ 312,603	\$ 342,461	\$ 306,001	\$ 298,704	\$ 313,341	\$ 321,217	\$ 316,779	\$ 314,066
	Eggs (\$1,000)	\$ 104,178	\$ 85,739	\$ 86,243	\$ 101,561	\$ 109,457	\$ 116,175	\$ 130,092	\$ 167,384	\$ 95,367	\$ 92,710	\$ 118,383
	Milk (\$1,000)	\$ 69,445	\$ 51,675	\$ 56,914	\$ 63,612	\$ 57,132	\$ 60,720	\$ 71,799	\$ 51,678	\$ 44,500	\$ 47,177	\$ 42,108
	Other	\$ 5,067	\$ 5,132	\$ 5,253	\$ 5,278	\$ 5,356	\$ 5,676	\$ 5,941	\$ 6,242	\$ 6,508	\$ 6,781	\$ 7,049
	Sheep and Lambs (\$1,000)	\$ 138	\$ 151	\$ 219	\$ 192	\$ 218	\$ 269	\$ 265	\$ 296	\$ 293	\$ 297	\$ 295
	Aquaculture (\$1,000)	\$ 4,929	\$ 4,982	\$ 5,034	\$ 5,086	\$ 5,138	\$ 5,407	\$ 5,676	\$ 5,946	\$ 6,215	\$ 6,484	\$ 6,753
	Total (\$1,000)	\$ 1,294,131	\$ 1,171,344	\$ 1,295,442	\$ 1,374,177	\$ 1,470,870	\$ 1,622,169	\$ 1,787,995	\$ 1,685,493	\$ 1,490,085	\$ 1,598,406	\$ 1,637,139

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,638	6,931	5,851	6,054	
	Cattle feedlots (112112)	282	168	withheld	10	
	Dairy cattle and milk production (11212)	211	102	80	106	
	Hog and pig farming (1122)	436	300	236	251	
	Poultry and egg production (1123)	836	1,226	1,238	1,086	
	Sheep and goat farming (1124)	491	859	1,100	1,428	
	Animal aquaculture and other animal production (1125,1129)	3,392	3,747	4,157	4,154	
Value of Sales (\$1,000)	Cattle and Calves	76,146	105,282	92,352	109,242	
	Hogs and Pigs	61,589	77,211	93,527	68,599	
	Poultry and Eggs	694,290	1,289,876	1,476,817	1,652,564	
	Milk*			56,008	56,788	
	Aquaculture	3,173	4,775	5,138	6,484	
	Other (calculated)	363	24,496	6,263	18,817	
	Total	835,561	1,501,640	1,730,105	1,912,494	
Input Purchases	Livestock and poultry purchased	(Farms)	4,828	4,097	4,977	5,333
		\$1,000	97,058	170,676	209,463	265,737
	Breeding livestock purchased	(Farms)	2,557	1,977	2,355	2,600
		\$1,000	6,302	14,017	19,545	29,319
	Other livestock and poultry purchased	(Farms)	2,654	2,613	3,309	3,557
		\$1,000	90,756	156,659	189,918	236,418
Feed purchased	(Farms)	13,901	12,517	14,754	15,112	
	\$1,000	369,275	761,414	917,181	755,027	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 206,627	\$ 42,238	1,479	\$ 10,010
	Hogs, Pigs, and Other	\$ 37,961	\$ 8,866	303	\$ 2,101
	Poultry and Eggs	\$ 2,887,912	\$ 630,617	19,360	\$ 149,456
	Dairy	\$ 78,620	\$ 18,342	643	\$ 4,347
	Total	\$ 3,211,120	\$ 700,063	21,784	\$ 165,915
Change from 2008 to 2018	Cattle and Calves	\$ (18,022)	\$ (3,684)	(129)	\$ (873)
	Hogs, Pigs, and Other	\$ (52,724)	\$ (12,314)	(421)	\$ (2,918)
	Poultry and Eggs	\$ 354,499	\$ 77,410	2,376	\$ 18,346
	Dairy	\$ (76,331)	\$ (17,808)	(624)	\$ (4,221)
	Total	\$ 207,421	\$ 43,604	1,203	\$ 10,334
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.621	\$ 0.331	11.6	
	Hogs, Pigs, and Other	\$ 1.528	\$ 0.357	12.2	
	Poultry and Eggs	\$ 2.002	\$ 0.437	13.4	
	Dairy	\$ 1.867	\$ 0.436	15.3	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				3.5%
	Total				23.7%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: SOUTH DAKOTA

South Dakota Executive Summary

The use of soybean meal as a key feed ingredient is an important part of South Dakota animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of South Dakota. The success of South Dakota animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of South Dakota during 2018:

- \$7.6 billion in economic output
- 33,476 jobs
- \$1.6 billion in earnings
- \$324.5 million in income taxes paid at local, state, and federal levels
- \$261.3 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in South Dakota has increased economic output by over \$1.6 billion, boosted household earnings by \$335.8 million, contributed 6,990 additional jobs and paid \$67.8 million in additional tax revenues.

South Dakota's animal agriculture consumed almost 352.3 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (230.4 thousand tons)
- Turkeys (38.6 thousand tons)
- Dairy Cows (30.8 thousand tons)

This report examines animal agriculture in South Dakota over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in South Dakota, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of South Dakota and beyond.

South Dakota Economic Impact of Animal Agriculture

Animal agriculture is an integral part of South Dakota's economy. In 2018, South Dakota's animal agriculture contributed the following to the economy:

- About \$7.6 billion in economic output
- \$1.6 billion in household earnings
- 33,476 jobs
- \$324.5 million in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade South Dakota's animal agriculture has:

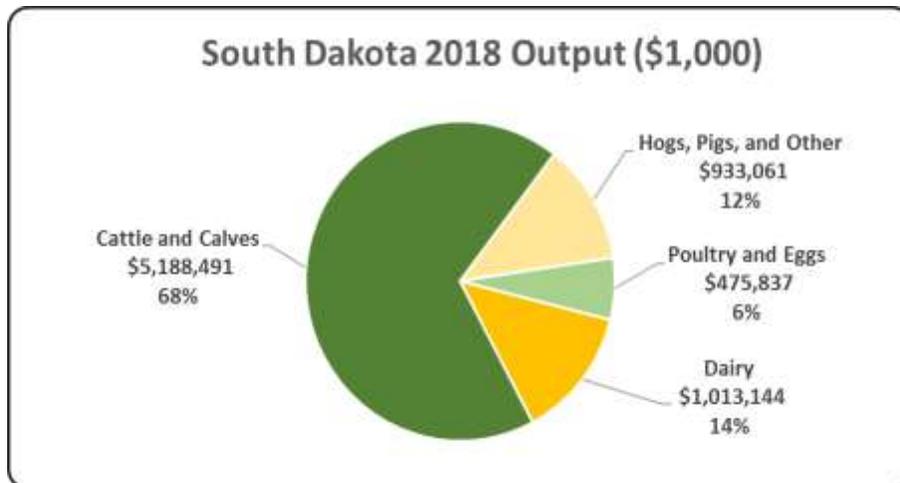
- Increased economic output by \$1.6 billion
- Boosted household earnings by \$335.8 million
- Added 6,990 jobs
- Paid an additional \$67.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 7,610,534	\$ 1,609,238	26.81%
Earnings (\$1,000)	\$ 1,606,461	\$ 335,827	26.43%
Employment (Jobs)	33,476	6,990	26.39%
Income Taxes Paid (\$1,000)	\$ 324,505	\$ 67,837	26.43%
Property Taxes Paid in 2017 (\$1,000)	\$ 261,307		

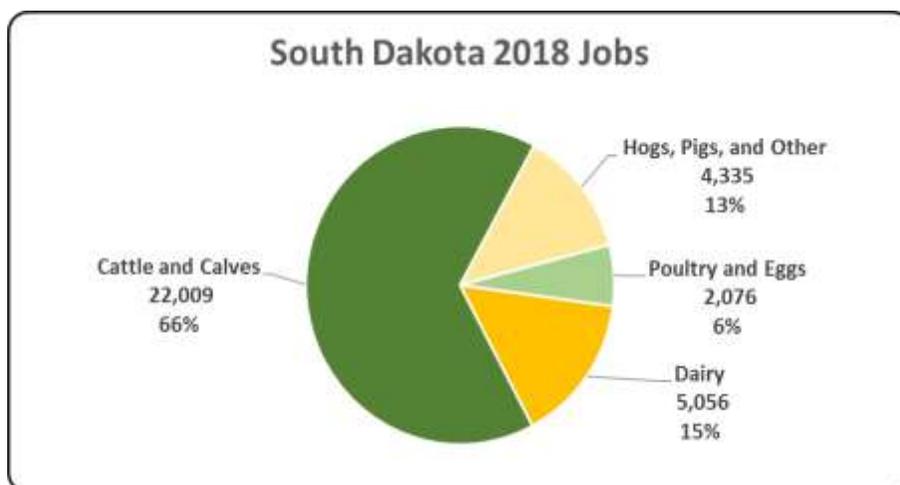
South Dakota Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the South Dakota economy. Animal agriculture’s impact on South Dakota total economic output is about \$7.6 billion.



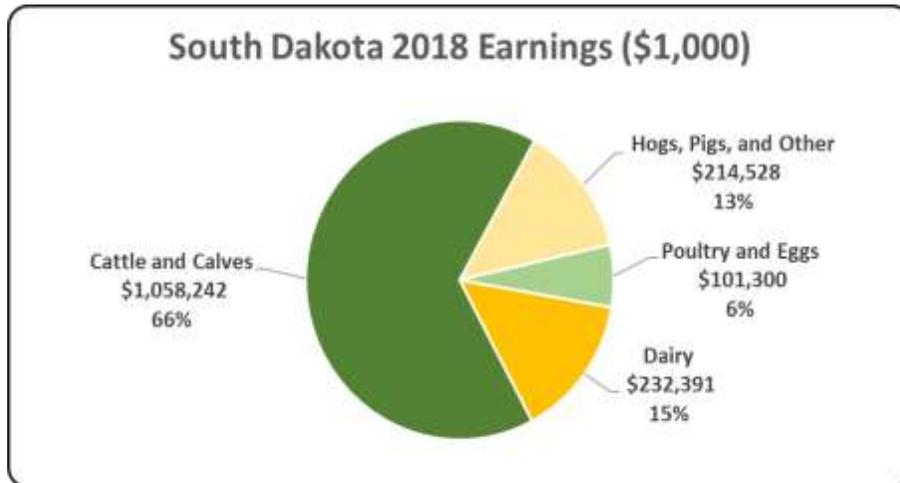
South Dakota Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to South Dakota in terms of animal agriculture jobs. As shown, animal agriculture contributes 33,476 jobs within and outside of animal agriculture.



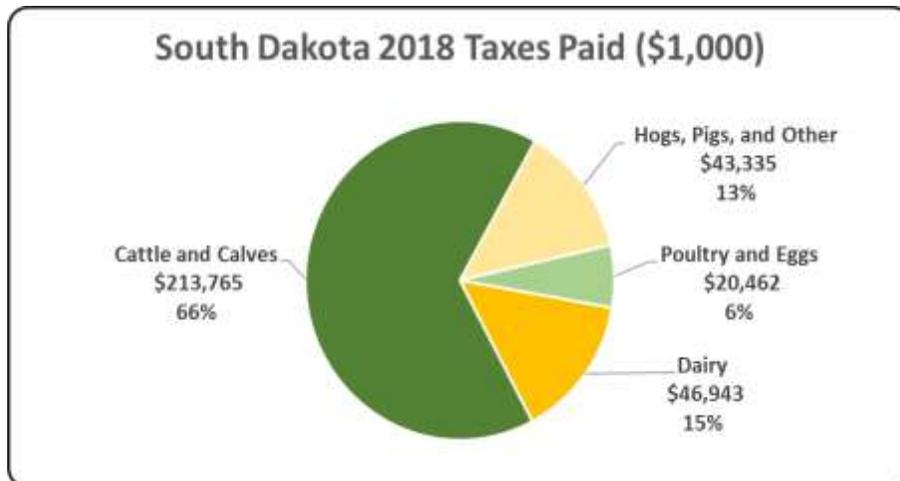
South Dakota Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the South Dakota economy in terms of earnings. South Dakota’s animal agriculture contributed about \$1.6 billion to household earnings in 2018.



South Dakota Taxes Paid by Animal Agriculture

South Dakota’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$324.5 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$261.3 million in property taxes paid by all of South Dakota agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



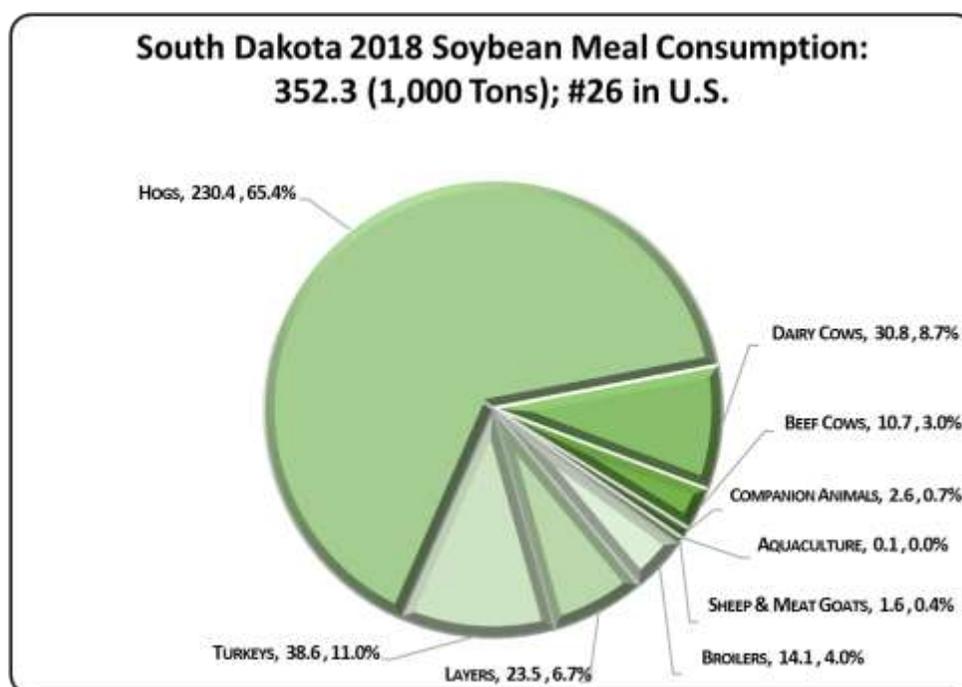
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South Dakota's animal agriculture consumed almost 352.3 thousand tons of soybean meal in 2018, placing the state as #26 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in South Dakota consumed 87,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (230.4 thousand tons)
2. Turkeys (38.6 thousand tons)
3. Dairy Cows (30.8 thousand tons)

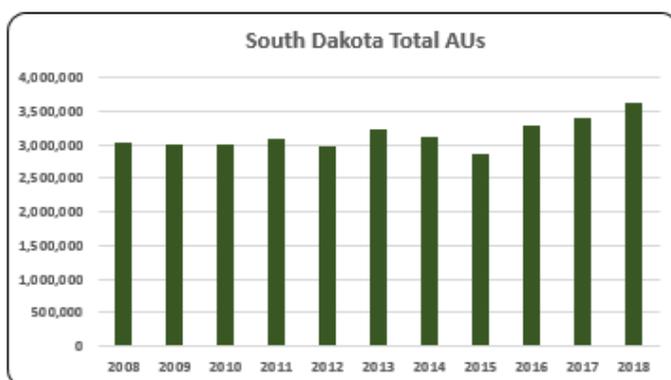
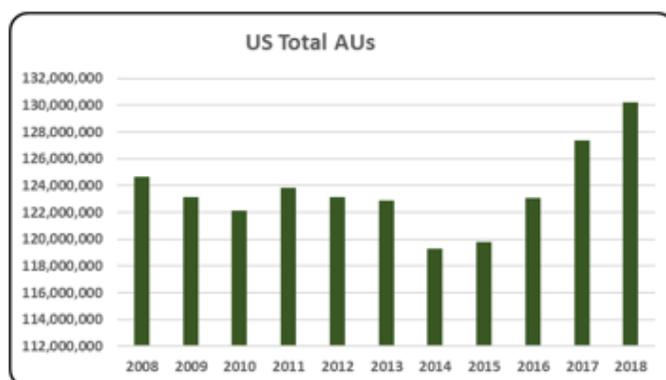


South Dakota Animal Unit (AU) Trends

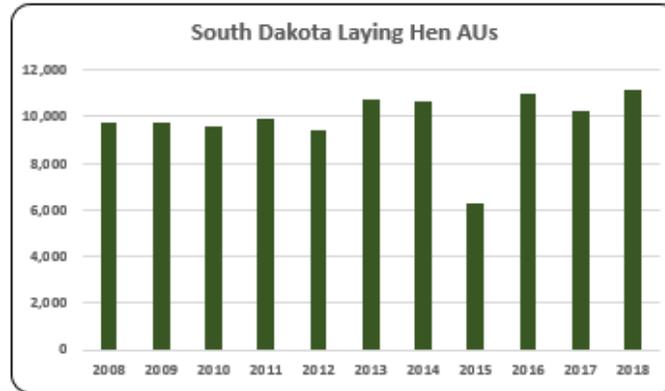
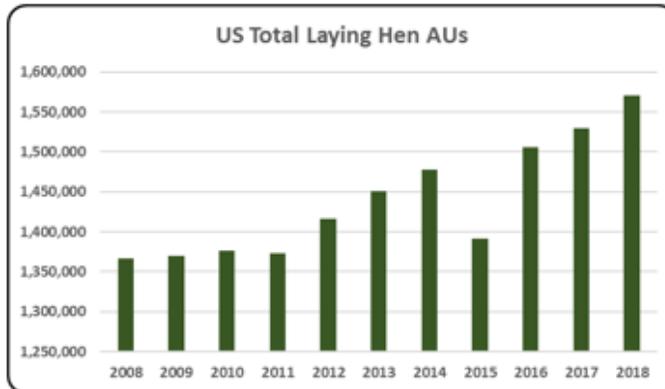
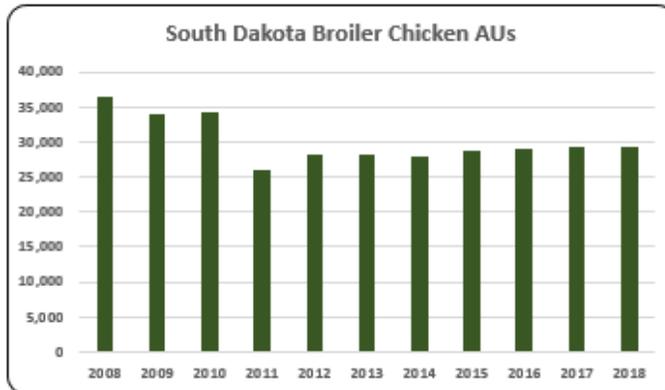
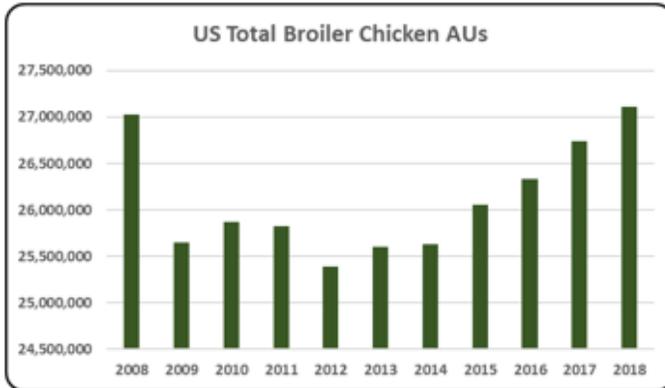
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of South Dakota. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to South Dakota and to give perspective on South Dakota's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

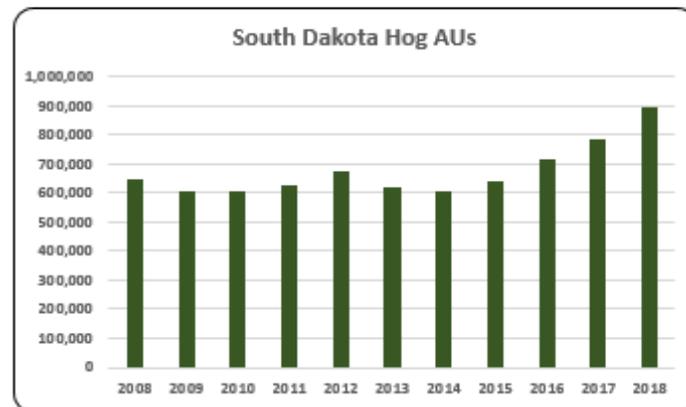
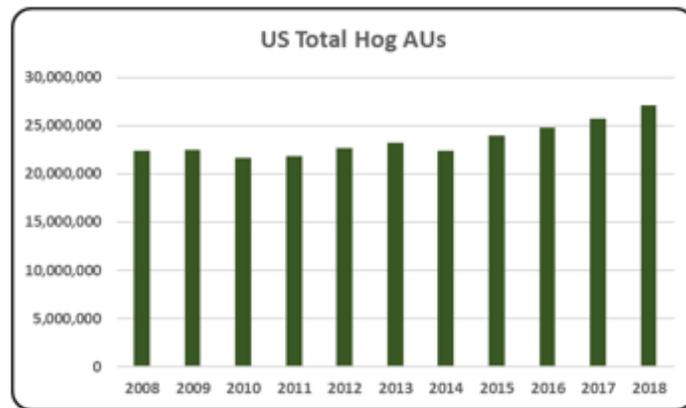
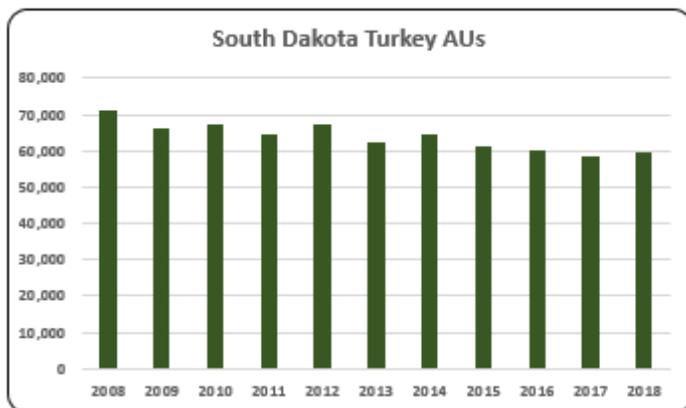
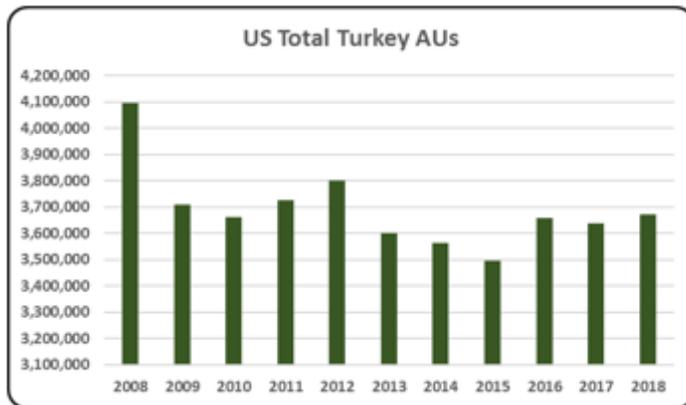
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In South Dakota, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (2.5 million AUs), Hogs (895,200 AUs), and Dairy Cows (166,600 AUs). Total animal units in South Dakota during 2018 were 3.6 million AUs.



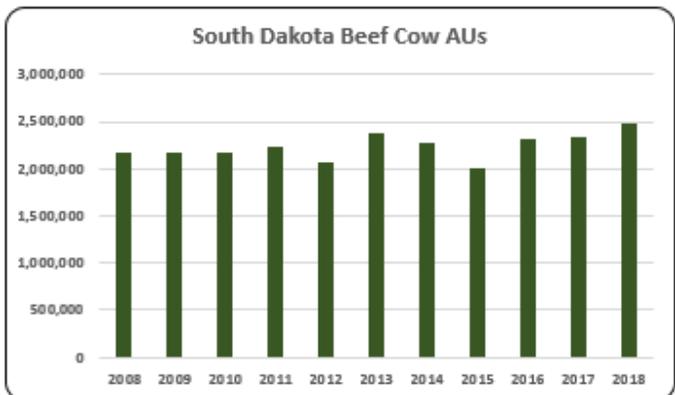
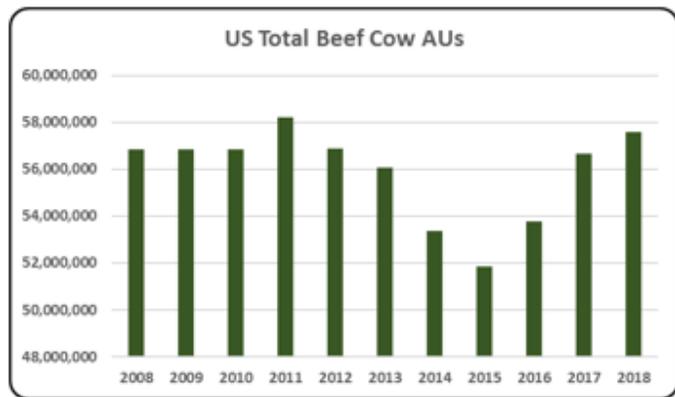
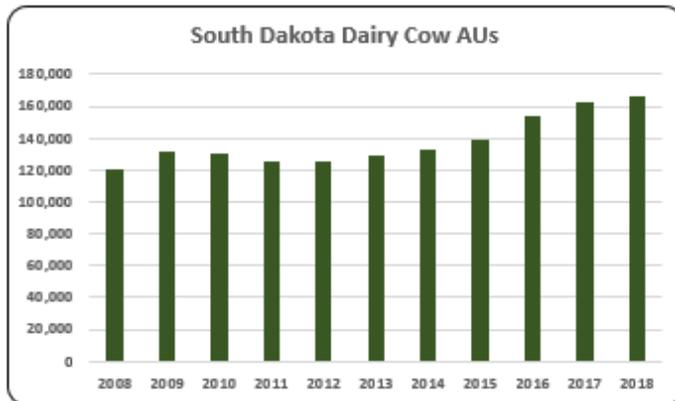
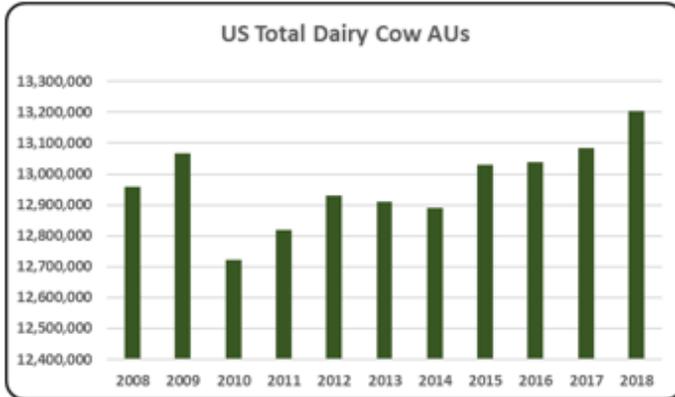
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 3.6 million AUs in South Dakota in 2018. This is the highest animal unit count in more than a decade. Overall AU numbers increased 19.4% from 2008 to 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- There were 36,445 broiler AUs in 2008 compared to 29,389 broiler AUs in 2018 in South Dakota. Broiler AUs decreased by 19.4% between those years.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layers represented the smallest animal sector in South Dakota. There were 11,153 layer AUs in 2018 increasing 14.8% compared to 2008 (9,712 AUs).



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs fluctuated throughout the decade in South Dakota from a high in 2008 (71,162 AUs) to a low in 2017 (58,669 AUs). Turkey AUs averaged 63,946 AUs for the decade.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- In 2018, hogs (895,200 AUs) represented 24.6% of animal units in South Dakota. Hog AUs in 2018 increased 39.0% relative to the level in 2008 (644,250 AUs).



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- There were 166,600 dairy cow AUs in 2018. The number of dairy cow AUs in 2018 increased 38.4% compared to 2008.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cows are the largest AU sector in South Dakota comprising 68.0% (2.5 million AUs) of all South Dakota AUs in 2018.

South Dakota Additional Information and Methodology

Animal agriculture is an important part of South Dakota's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in South Dakota, of interest is the degree to which the industry impacts the South Dakota economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for South Dakota animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted South Dakota's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in South Dakota which have occurred. As shown in this state report, South Dakota has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in South Dakota. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

South Dakota Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on South Dakota’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in South Dakota, \$1.66 to \$2.67 million in total economic activity, \$0.38 to \$0.57 in household wages and 8 to 12 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.288	\$ 0.467	9.7
	Hogs, Pigs, and Other	\$ 1.665	\$ 0.383	7.7
	Poultry and Eggs	\$ 2.671	\$ 0.569	11.7
	Dairy	\$ 2.165	\$ 0.497	10.8

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	2,160,900	2,160,900	2,160,900	2,234,850	2,076,300	2,373,600	2,269,950	1,999,800	2,315,400	2,341,800	2,470,800
	Hog and Pig AUs	644,250	604,500	605,850	627,000	671,700	618,750	603,600	638,550	714,300	786,750	895,200
	Broiler AUs	36,445	33,886	34,341	25,877	28,276	28,177	28,017	28,740	28,955	29,370	29,389
	Turkey AUs	71,162	66,161	67,534	64,501	67,419	62,436	64,495	61,451	60,212	58,669	59,368
	Egg Layer AUs	9,712	9,744	9,544	9,936	9,429	10,772	10,614	6,262	10,993	10,250	11,153
	Dairy AUs	120,400	131,600	130,200	126,000	126,000	128,800	133,000	138,600	154,000	162,400	166,600
	Total Animal Units	3,042,870	3,006,791	3,008,369	3,088,163	2,979,124	3,222,535	3,109,676	2,873,403	3,283,861	3,389,239	3,632,510
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,400,531	\$ 1,317,554	\$ 1,569,641	\$ 1,749,748	\$ 1,952,711	\$ 1,938,119	\$ 2,500,271	\$ 2,380,574	\$ 1,905,222	\$ 2,199,747	\$ 2,267,499
	Hogs and Pigs (\$1,000)	\$ 348,707	\$ 292,574	\$ 417,399	\$ 529,653	\$ 532,239	\$ 503,056	\$ 537,918	\$ 453,938	\$ 446,979	\$ 535,612	\$ 530,360
	Broilers (\$1,000)	\$ 29,190	\$ 25,185	\$ 26,319	\$ 23,042	\$ 28,174	\$ 34,330	\$ 36,015	\$ 31,420	\$ 27,936	\$ 32,804	\$ 22,892
	Turkeys (\$1,000)	\$ 85,704	\$ 73,561	\$ 103,615	\$ 120,750	\$ 134,151	\$ 112,674	\$ 138,801	\$ 147,799	\$ 148,408	\$ 112,397	\$ 91,469
	Eggs (\$1,000)	\$ 55,752	\$ 37,936	\$ 37,696	\$ 44,110	\$ 44,576	\$ 57,804	\$ 63,348	\$ 73,798	\$ 22,482	\$ 40,673	\$ 63,795
	Milk (\$1,000)	\$ 343,036	\$ 261,096	\$ 310,860	\$ 387,711	\$ 393,600	\$ 424,830	\$ 521,170	\$ 436,415	\$ 448,096	\$ 492,184	\$ 467,965
	Other	\$ 22,964	\$ 21,937	\$ 28,316	\$ 28,730	\$ 38,592	\$ 26,051	\$ 30,144	\$ 33,996	\$ 32,117	\$ 30,122	\$ 30,205
	Sheep and Lambs (\$1,000)	\$ 21,617	\$ 20,302	\$ 26,393	\$ 26,520	\$ 36,094	\$ 23,430	\$ 27,401	\$ 31,131	\$ 29,129	\$ 27,012	\$ 26,973
	Aquaculture (\$1,000)	\$ 1,347	\$ 1,635	\$ 1,923	\$ 2,210	\$ 2,498	\$ 2,620	\$ 2,743	\$ 2,865	\$ 2,988	\$ 3,110	\$ 3,232
	Total (\$1,000)	\$ 2,285,884	\$ 2,029,843	\$ 2,493,845	\$ 2,883,744	\$ 3,124,043	\$ 3,096,863	\$ 3,827,667	\$ 3,557,939	\$ 3,031,239	\$ 3,443,539	\$ 3,474,185

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,702	9,031	8,288	8,759	
	Cattle feedlots (112112)	1,463	794	646	702	
	Dairy cattle and milk production (11212)	662	348	276	215	
	Hog and pig farming (1122)	493	313	223	230	
	Poultry and egg production (1123)	125	274	186	99	
	Sheep and goat farming (1124)	710	706	690	650	
	Animal aquaculture and other animal production (1125,1129)	2,076	2,094	2,809	2,211	
Value of Sales (\$1,000)	Cattle and Calves	1,693,838	2,307,618	2,968,996	3,191,493	
	Hogs and Pigs	withheld	381,360	446,756	577,034	
	Poultry and Eggs	70,820	140,798	182,076	166,997	
	Milk*			374,490	495,112	
	Aquaculture	withheld	3,108	2,498	3,110	
	Other (calculated)	337,559	74,304	98,859	121,220	
	Total	2,102,217	2,907,188	4,073,675	4,554,966	
Input Purchases	Livestock and poultry purchased	(Farms)	11,307	10,196	11,987	9,995
		\$1,000	580,920	881,582	978,174	1,047,551
	Breeding livestock purchased	(Farms)	8,111	7,637	8,959	7,679
		\$1,000	64,732	160,850	205,411	221,230
	Other livestock and poultry purchased	(Farms)	5,317	4,644	5,537	4,200
		\$1,000	516,188	720,732	772,763	826,321
Feed purchased	(Farms)	19,389	15,462	18,795	17,045	
	\$1,000	433,345	617,725	1,282,133	1,096,941	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 5,188,491	\$ 1,058,242	22,009	\$ 213,765
	Hogs, Pigs, and Other	\$ 933,061	\$ 214,528	4,335	\$ 43,335
	Poultry and Eggs	\$ 475,837	\$ 101,300	2,076	\$ 20,462
	Dairy	\$ 1,013,144	\$ 232,391	5,056	\$ 46,943
	Total	\$ 7,610,534	\$ 1,606,461	33,476	\$ 324,505
Change from 2008 to 2018	Cattle and Calves	\$ 1,358,720	\$ 277,124	5,764	\$ 55,979
	Hogs, Pigs, and Other	\$ 193,748	\$ 44,546	900	\$ 8,998
	Poultry and Eggs	\$ (68,842)	\$ (14,656)	(300)	\$ (2,960)
	Dairy	\$ 125,613	\$ 28,813	627	\$ 5,820
	Total	\$ 1,609,238	\$ 335,827	6,990	\$ 67,837
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.288	\$ 0.467	9.7	
	Hogs, Pigs, and Other	\$ 1.665	\$ 0.383	7.7	
	Poultry and Eggs	\$ 2.671	\$ 0.569	11.7	
	Dairy	\$ 2.165	\$ 0.497	10.8	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			0.0%	
	Total			20.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: TENNESSEE

Tennessee Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Tennessee animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture success in the State of Tennessee. The success of Tennessee animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Tennessee during 2018 animal agriculture contributed:

- \$2.7 billion in economic output
- 17,072 jobs
- \$574.5 million in earnings
- \$144.8 million in income taxes paid at local, state, and federal levels
- \$131.3 million in the form of property taxes

Tennessee's animal agriculture consumed almost 409.3 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (314.2 thousand tons)
- Egg-Laying Hens (30.9 thousand tons)
- Hogs (27.9 thousand tons)

This report examines animal agriculture in Tennessee over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Tennessee, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Tennessee and beyond.

Tennessee Economic Impact of Animal Agriculture

Animal agriculture is an important but shrinking part of Tennessee's economy. In 2018, Tennessee's animal agriculture contributed the following to the economy:

- About \$2.7 billion in economic output
- \$574.5 million in household earnings
- 17,072 jobs
- \$144.8 million in income taxes

During the last decade, contractions in Tennessee's animal agriculture has:

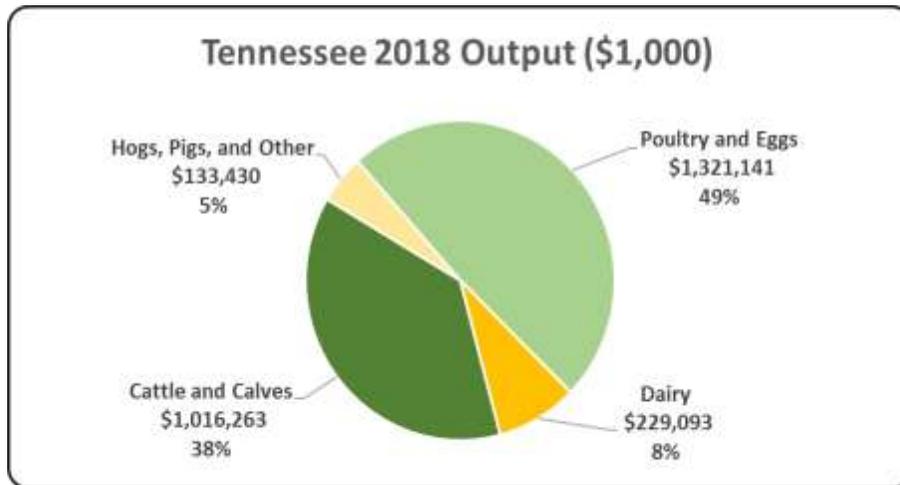
- Decreased economic output by \$332.0 million
- Reduced household earnings by \$73.5 million
- Shrunk by 2,378 jobs
- Paid \$18.5 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,699,927	\$ (332,000)	-10.95%
Earnings (\$1,000)	\$ 574,535	\$ (73,457)	-11.34%
Employment (Jobs)	17,072	(2,378)	-12.23%
Income Taxes Paid (\$1,000)	\$ 144,783	\$ (18,511)	-11.34%
Property Taxes Paid in 2017 (\$1,000)	\$ 131,329		

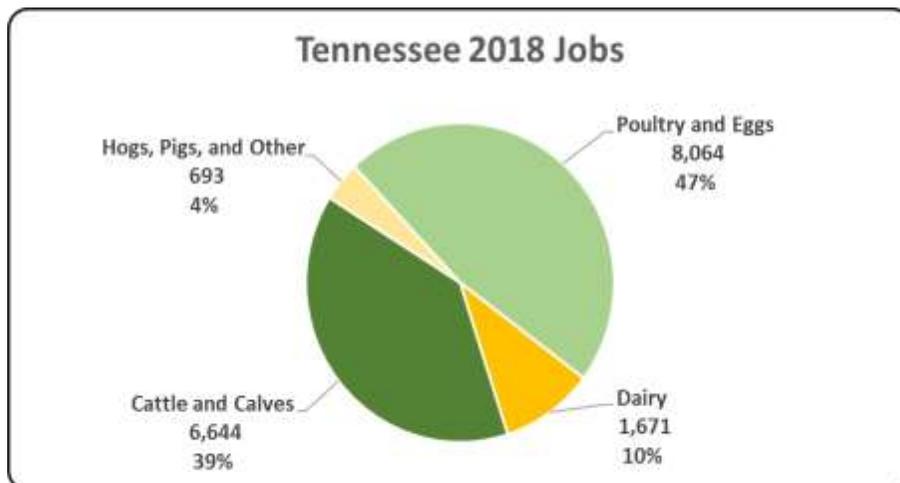
Tennessee Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Tennessee economy. Animal agriculture’s impact on Tennessee total economic output is about \$2.7 billion.



Tennessee Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Tennessee in terms of animal agriculture jobs. As shown, animal agriculture contributes 17,072 jobs within and outside of animal agriculture.



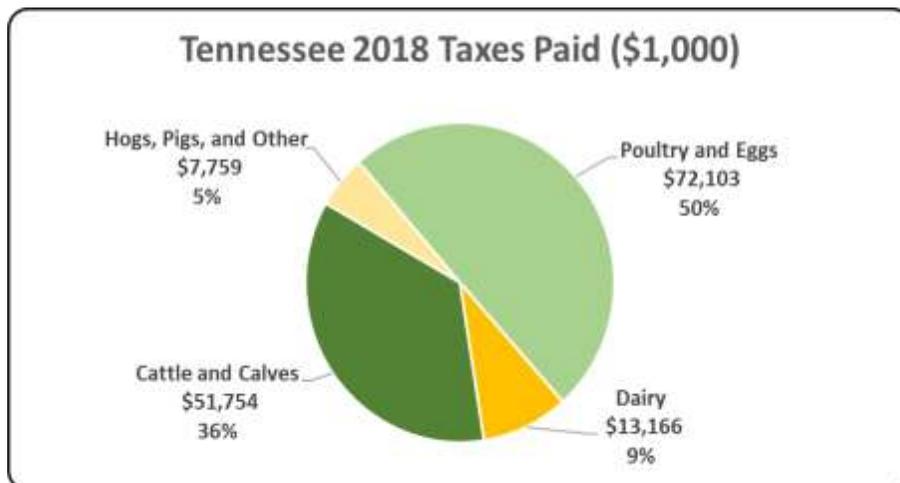
Tennessee Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Tennessee economy in terms of earnings. Tennessee’s animal agriculture contributed about \$574.5 million to household earnings in 2018.



Tennessee Taxes Paid by Animal Agriculture

Tennessee’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$144.8 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$131.3 million in property taxes paid by all of Tennessee agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



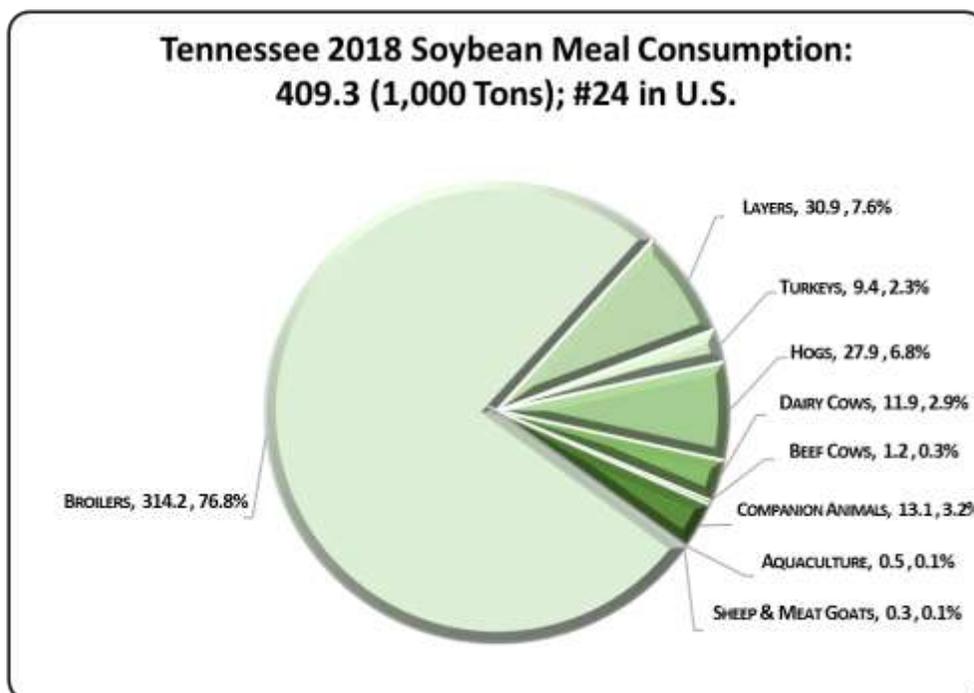
Tennessee Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Tennessee's animal agriculture consumed almost 409.3 thousand tons of soybean meal in 2018, placing the state as #24 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Tennessee consumed 19,000 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (314.2 thousand tons)
2. Egg-Laying Hens (30.9 thousand tons)
3. Hogs (27.9 thousand tons)

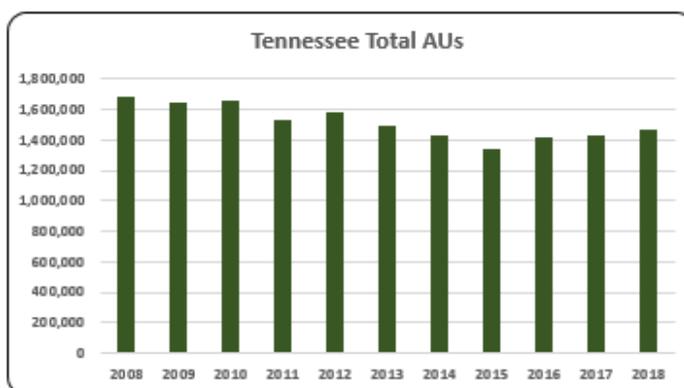
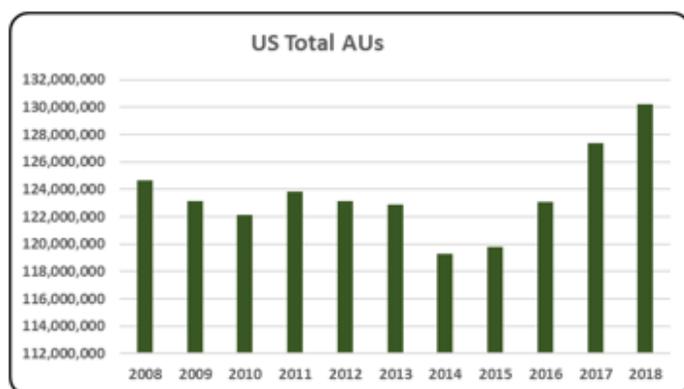


Tennessee Animal Unit (AU) Trends

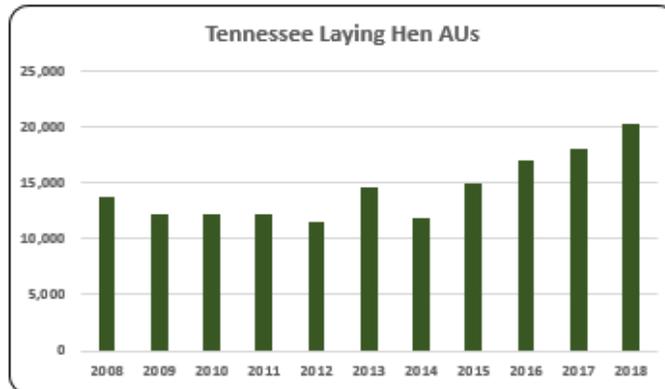
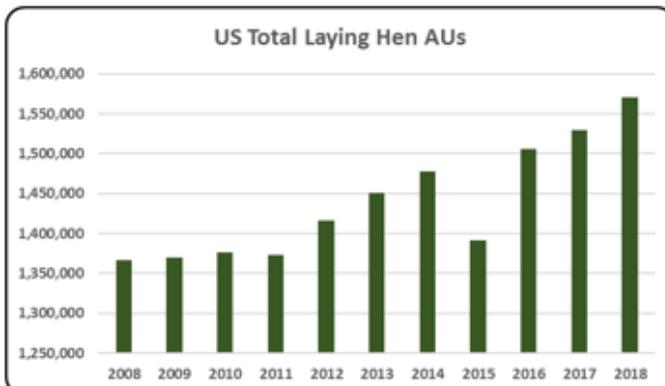
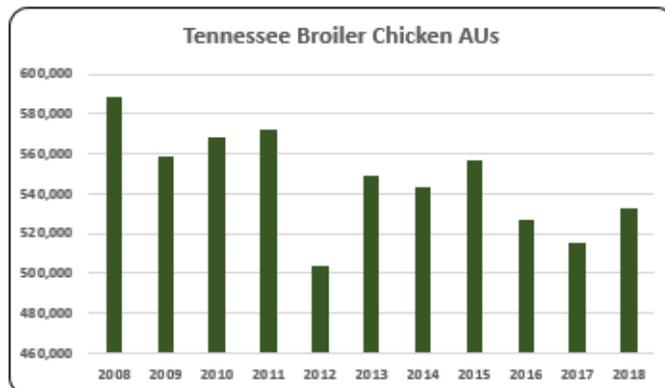
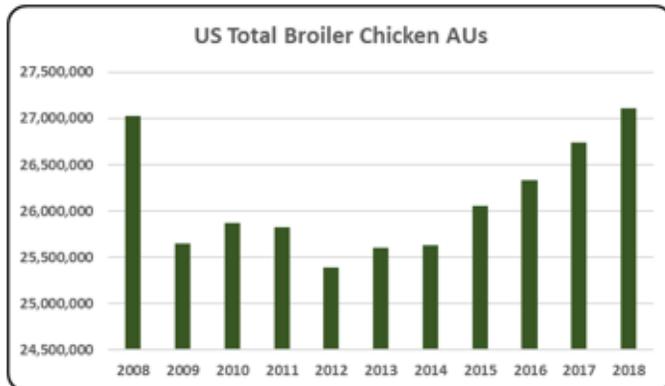
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Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

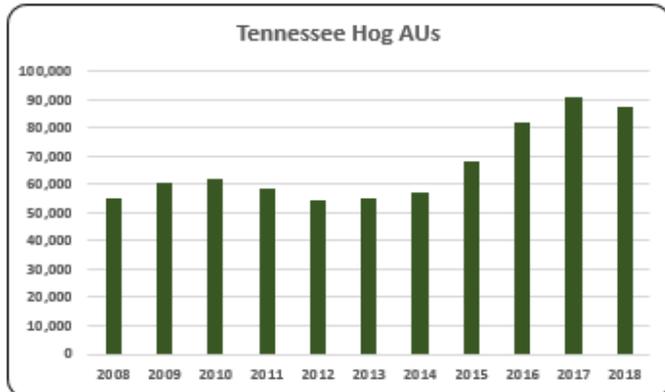
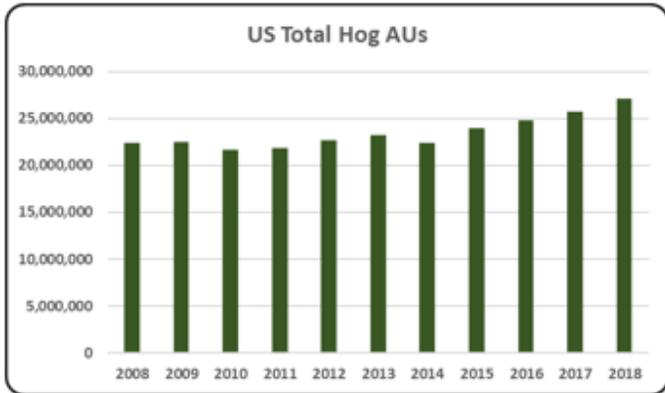
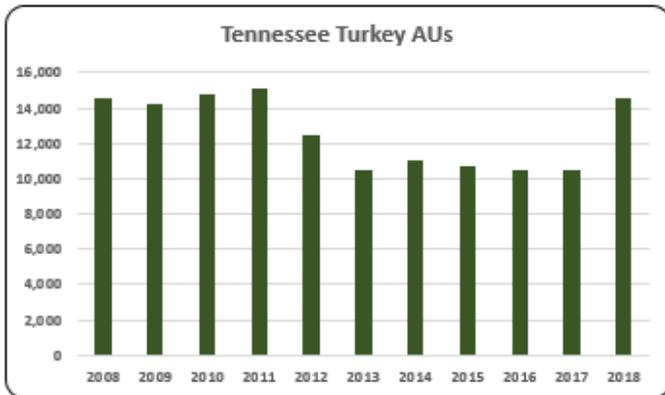
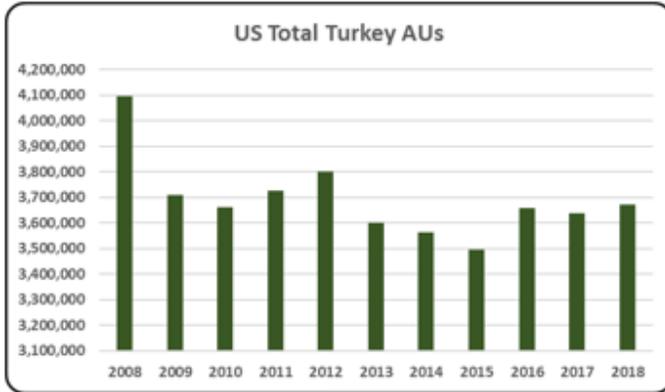
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Tennessee, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (752,700 AUs), Broilers (532,849 AUs), and Hogs (87,225 AUs). Total animal units in Tennessee during 2018 were 1.5 million AUs.



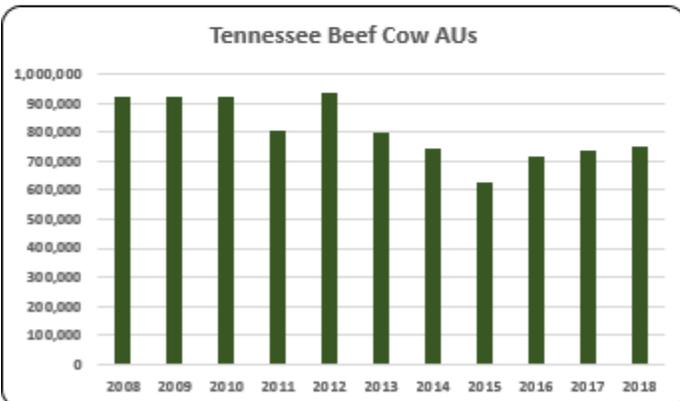
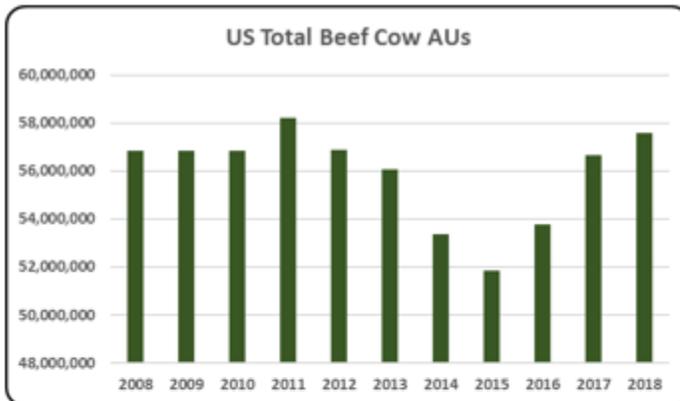
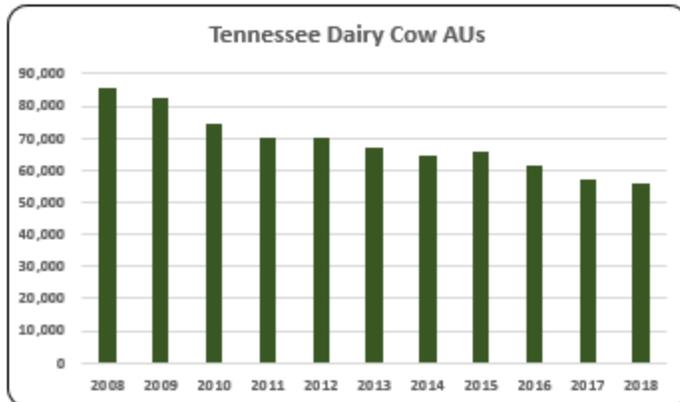
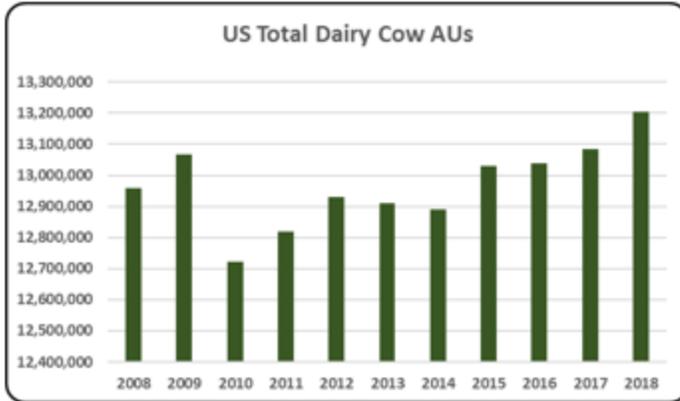
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- Tennessee animal units reached 1.5 million AUs in 2018. Tennessee's AUs represent 1.12% of the U.S. total AUs. Animal unit numbers declined 12.9% from 2008 to 2018 in Tennessee.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- There were 546,720 broiler AUs, on average, during the last decade in Tennessee. Broiler AUs decreased 9.5% from 2008 to 2018.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There was a 47.1% increase in laying hen AUs from 2008 (13,846 AUs) to 2018 (20,366 AUs) in Tennessee.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs decreased 0.1% from 2008 (14,559 AUs) to 2018 (14,539 AUs) in Tennessee.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- The average number of hog AUs was 66,402 during the last decade in Tennessee. The number of hog AUs in 2018 (87,225 AUs) was 59.3% above the number of hog AUs in 2008 (54,750).



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cow numbers consistently declined from 2008 (85,400 AUs) to 2018 (56,000 AUs). The decline represented a 34.4% decrease in the level of dairy cow AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cows accounted for 51.4% of all AUs in Tennessee in 2018. 2018 beef cow AUs were 752,700, dropping 18.4% compared to 2008 (922,350 AUs).

Tennessee Additional Information and Methodology

Animal agriculture is an important part of Tennessee's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Tennessee, of interest is the degree to which the industry impacts the Tennessee economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Tennessee animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Tennessee's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Tennessee which have occurred. As shown in this state report, Tennessee has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Tennessee. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Tennessee Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Tennessee's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Tennessee, \$1.60 to \$2.18 million in total economic activity, \$0.37 to \$0.47 in household wages and 8 to 15 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.974	\$ 0.399	12.9
	Hogs, Pigs, and Other	\$ 1.604	\$ 0.370	8.3
	Poultry and Eggs	\$ 2.182	\$ 0.473	13.3
	Dairy	\$ 2.077	\$ 0.474	15.1

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	922,350	922,350	922,350	807,450	934,050	796,050	741,000	628,500	718,800	735,450	752,700
	Hog and Pig AUs	54,750	60,300	62,250	58,500	54,300	55,350	57,150	67,950	82,050	90,600	87,225
	Broiler AUs	588,834	558,175	568,256	571,761	504,070	548,531	542,799	556,633	526,566	515,440	532,849
	Turkey AUs	14,559	14,232	14,828	15,093	12,501	10,477	10,996	10,749	10,490	10,541	14,539
	Egg Layer AUs	13,846	12,245	12,164	12,235	11,507	14,666	11,874	14,988	17,107	18,061	20,366
	Dairy AUs	85,400	82,600	74,200	70,000	70,000	67,200	64,400	65,800	61,600	57,400	56,000
	Total Animal Units	1,679,739	1,649,903	1,654,048	1,535,039	1,586,428	1,492,274	1,428,219	1,344,620	1,416,613	1,427,491	1,463,679
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 450,099	\$ 441,237	\$ 503,087	\$ 568,034	\$ 594,656	\$ 548,543	\$ 751,415	\$ 773,195	\$ 516,055	\$ 545,407	\$ 514,720
	Hogs and Pigs (\$1,000)	\$ 42,010	\$ 36,343	\$ 52,823	\$ 60,198	\$ 54,349	\$ 59,395	\$ 69,503	\$ 64,056	\$ 74,422	\$ 85,711	\$ 72,280
	Broilers (\$1,000)	\$ 468,510	\$ 442,148	\$ 475,589	\$ 454,226	\$ 436,000	\$ 576,043	\$ 598,207	\$ 528,101	\$ 443,871	\$ 494,496	\$ 525,292
	Turkeys (\$1,000)	\$ 27,230	\$ 25,807	\$ 29,134	\$ 22,909	\$ 24,632	\$ 17,854	\$ 11,812	\$ 9,965	\$ 11,269	\$ 7,630	\$ 9,706
	Eggs (\$1,000)	\$ 42,815	\$ 38,665	\$ 43,922	\$ 59,717	\$ 55,816	\$ 61,387	\$ 67,998	\$ 66,970	\$ 76,518	\$ 68,391	\$ 70,558
	Milk (\$1,000)	\$ 191,496	\$ 128,169	\$ 152,150	\$ 175,770	\$ 157,780	\$ 164,475	\$ 192,210	\$ 139,496	\$ 119,712	\$ 130,977	\$ 110,316
	Other	\$ 5,222	\$ 5,959	\$ 7,434	\$ 7,958	\$ 9,155	\$ 9,076	\$ 9,341	\$ 9,982	\$ 11,050	\$ 11,003	\$ 10,916
	Sheep and Lambs (\$1,000)	\$ 1,737	\$ 1,741	\$ 2,483	\$ 2,274	\$ 2,738	\$ 2,540	\$ 2,686	\$ 3,207	\$ 4,156	\$ 3,990	\$ 3,784
	Aquaculture (\$1,000)	\$ 3,485	\$ 4,218	\$ 4,951	\$ 5,684	\$ 6,417	\$ 6,536	\$ 6,655	\$ 6,774	\$ 6,894	\$ 7,013	\$ 7,132
Total (\$1,000)	\$ 1,227,382	\$ 1,118,328	\$ 1,264,139	\$ 1,348,811	\$ 1,332,388	\$ 1,436,774	\$ 1,700,486	\$ 1,591,765	\$ 1,252,897	\$ 1,343,615	\$ 1,313,788	

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	42,602	41,886	34,457	31,562
	Cattle feedlots (112112)	31	37	37	191
	Dairy cattle and milk production (11212)	947	893	472	430
	Hog and pig farming (1122)	400	504	251	371
	Poultry and egg production (1123)	1,320	1,694	1,480	1,330
	Sheep and goat farming (1124)	1,633	2,023	2,139	3,260
	Animal aquaculture and other animal production (1125,1129)	10,731	9,010	6,769	7,649
Value of Sales (\$1,000)	Cattle and Calves	499,143	633,303	735,511	719,701
	Hogs and Pigs	42,632	33,797	48,245	66,393
	Poultry and Eggs	359,286	572,866	552,015	639,750
	Milk*			145,445	125,373
	Aquaculture	4,799	4,893	withheld	7,013
	Other (calculated)	47,996	44,246	8,906	58,307
	Total	953,856	1,289,105	1,490,122	1,616,537
Input Purchases	Livestock and poultry purchased	(Farms) 21,962	16,930	17,664	19,190
		\$1,000 175,145	213,700	283,304	342,237
	Breeding livestock purchased	(Farms) 12,957	10,548	10,870	12,383
		\$1,000 32,136	47,611	62,754	108,876
	Other livestock and poultry purchased	(Farms) 11,274	8,552	9,202	9,736
		\$1,000 143,009	166,089	220,551	233,361
	Feed purchased	(Farms) 57,492	49,442	48,003	50,219
	\$1,000 386,790	547,993	679,459	533,854	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,016,263	\$ 205,373	6,644	\$ 51,754
	Hogs, Pigs, and Other	\$ 133,430	\$ 30,791	693	\$ 7,759
	Poultry and Eggs	\$ 1,321,141	\$ 286,125	8,064	\$ 72,103
	Dairy	\$ 229,093	\$ 52,246	1,671	\$ 13,166
	Total	\$ 2,699,927	\$ 574,535	17,072	\$ 144,783
Change from 2008 to 2018	Cattle and Calves	\$ (45,749)	\$ (9,245)	(299)	\$ (2,330)
	Hogs, Pigs, and Other	\$ 42,905	\$ 9,901	223	\$ 2,495
	Poultry and Eggs	\$ (83,002)	\$ (17,976)	(507)	\$ (4,530)
	Dairy	\$ (246,154)	\$ (56,136)	(1,796)	\$ (14,146)
	Total	\$ (332,000)	\$ (73,457)	(2,378)	\$ (18,511)
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 1.974	\$ 0.399	12.9	
	Hogs, Pigs, and Other	\$ 1.604	\$ 0.370	8.3	
	Poultry and Eggs	\$ 2.182	\$ 0.473	13.3	
	Dairy	\$ 2.077	\$ 0.474	15.1	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.0%	
	Total			25.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: TEXAS

Texas Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Texas animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture's success in the State of Texas. The success of Texas animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Texas during 2018 animal agriculture contributed:

- \$33.1 billion in economic output
- 215,825 jobs
- \$7.2 billion in earnings
- \$1.5 billion in income taxes paid at local, state, and federal levels
- \$698.2 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Texas has increased economic output by over \$1.5 billion, boosted household earnings by \$358.5 million, contributed 10,183 additional jobs and paid \$72.4 million in additional tax revenues.

Texas's animal agriculture consumed 1.7 million tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (1.1 million tons)
- Egg-Laying Hens (165.3 thousand tons)
- Dairy Cows (148.0 thousand tons)

This report examines animal agriculture in Texas over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Texas, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Texas and beyond.

Texas Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Texas's economy. In 2018, Texas's animal agriculture contributed the following to the economy:

- About \$33.1 billion in economic output
- \$7.2 billion in household earnings
- 215,825 jobs
- \$1.5 billion in income taxes

And the animal agriculture sector has shown substantial growth during challenging economic times. During the last decade Texas's animal agriculture has:

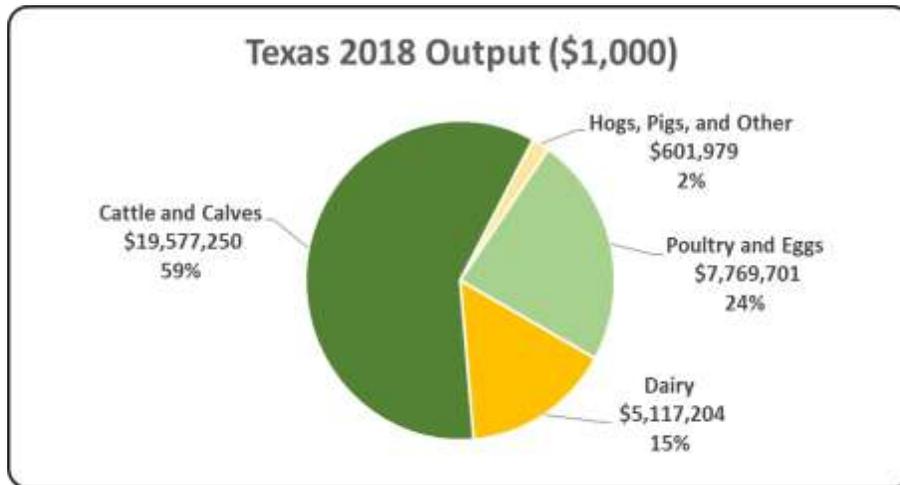
- Increased economic output by \$1.5 billion
- Boosted household earnings by \$358.5 million
- Added 10,183 jobs
- Paid an additional \$72.4 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 33,066,134	\$ 1,544,206	4.90%
Earnings (\$1,000)	\$ 7,191,771	\$ 358,488	5.25%
Employment (Jobs)	215,825	10,183	4.95%
Income Taxes Paid (\$1,000)	\$ 1,452,738	\$ 72,415	5.25%
Property Taxes Paid in 2017 (\$1,000)	\$ 698,248		

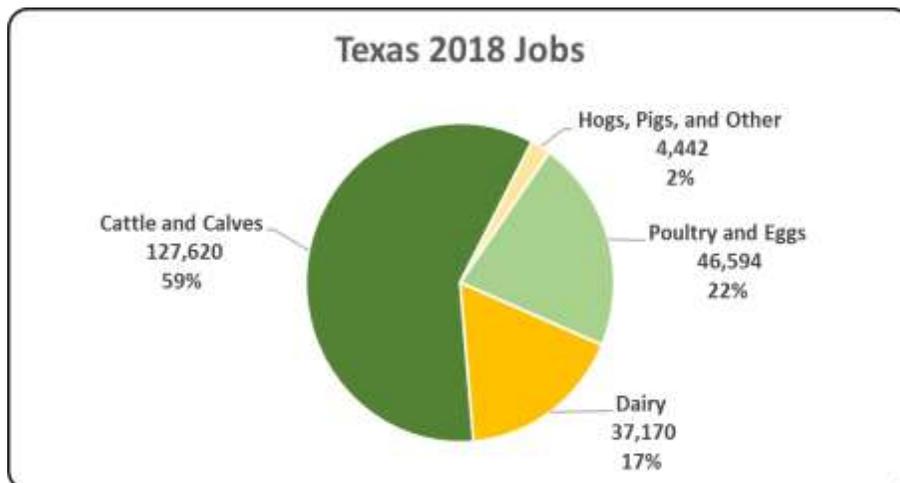
Texas Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Texas economy. Animal agriculture’s impact on Texas total economic output is about \$33.1 billion.



Texas Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Texas in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Texas total jobs, contributing 215,825 jobs within and outside of animal agriculture.



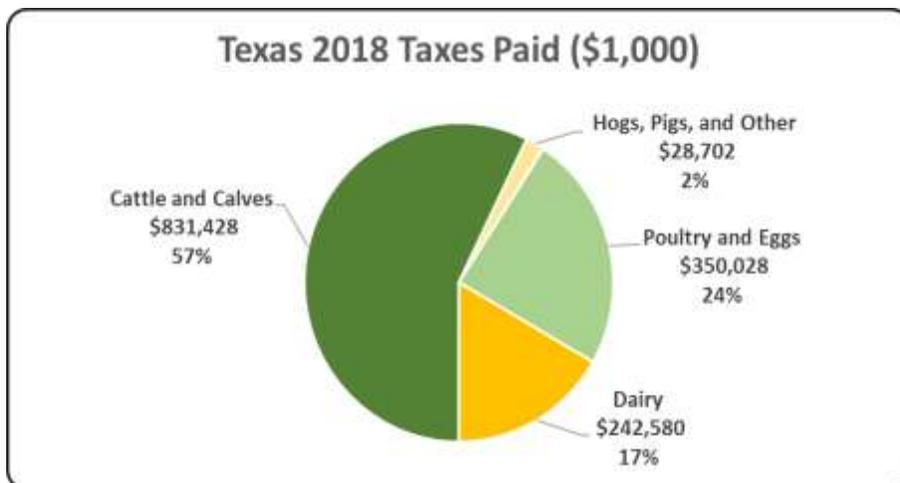
Texas Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Texas economy in terms of earnings. Texas’s animal agriculture contributed about \$7.2 billion to household earnings in 2018.



Texas Taxes Paid by Animal Agriculture

Texas’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$1.5 billion in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$698.2 million in property taxes paid by all of Texas agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



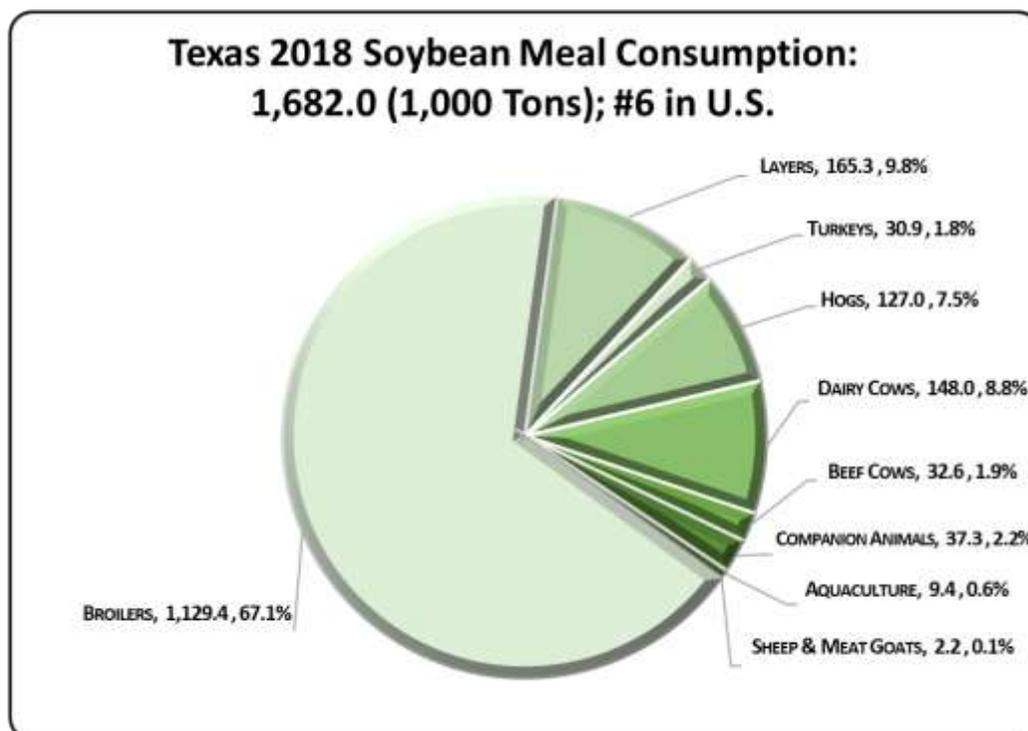
Texas Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Texas's animal agriculture consumed almost 1.7 million tons of soybean meal in 2018, placing the state as #6 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Texas consumed 172.2 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (1.1 million tons)
2. Egg-Laying Hens (165.3 thousand tons)
3. Dairy Cows (148.0 thousand tons)

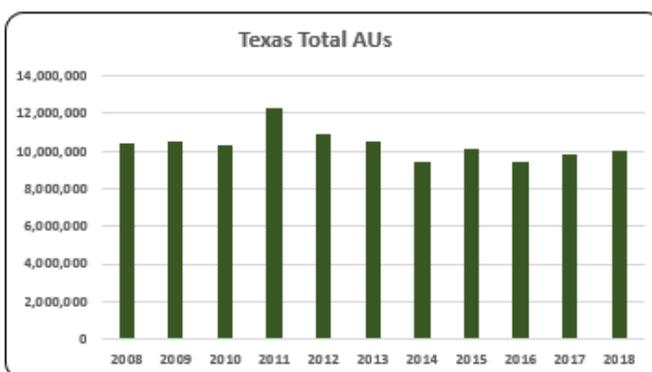
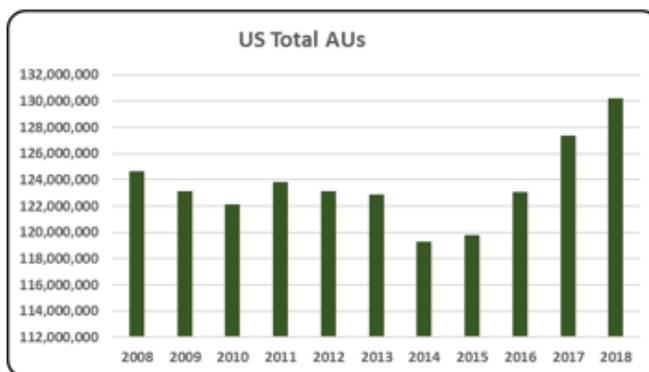


Texas Animal Unit (AU) Trends

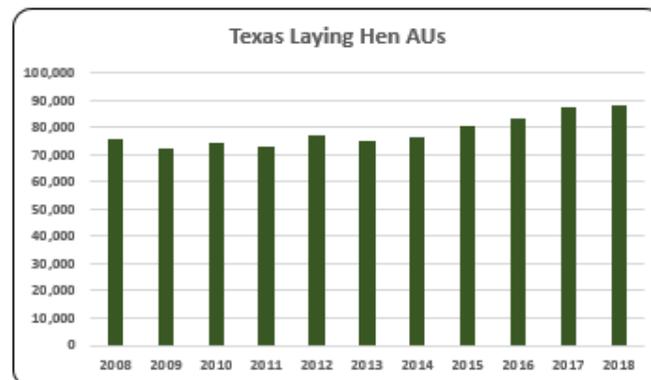
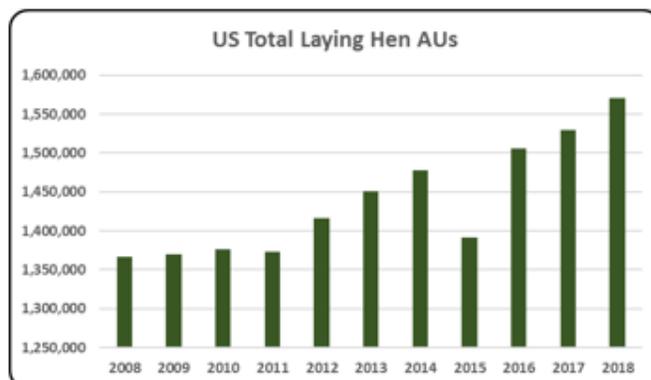
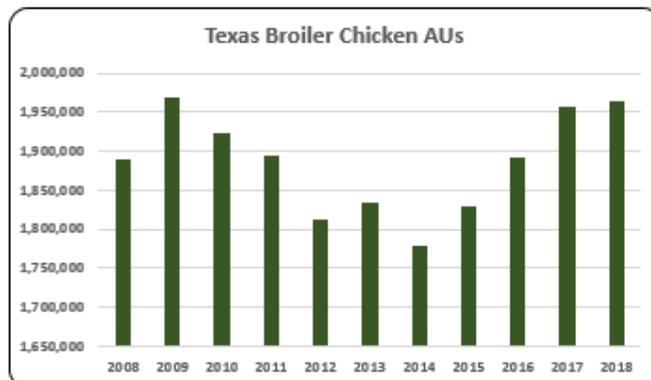
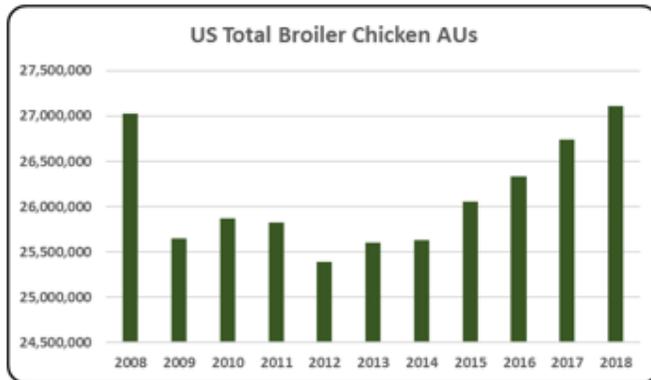
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Texas. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Texas and to give perspective on Texas's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

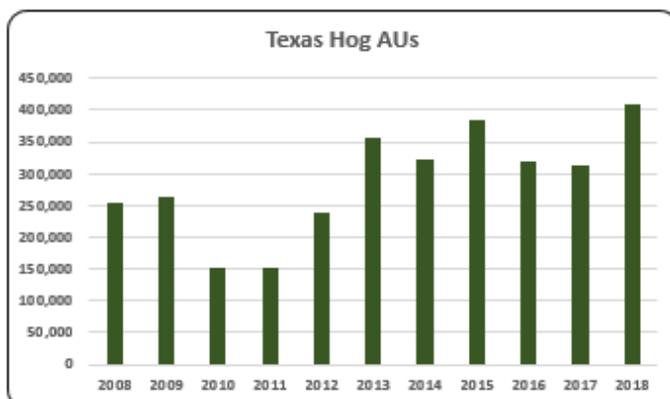
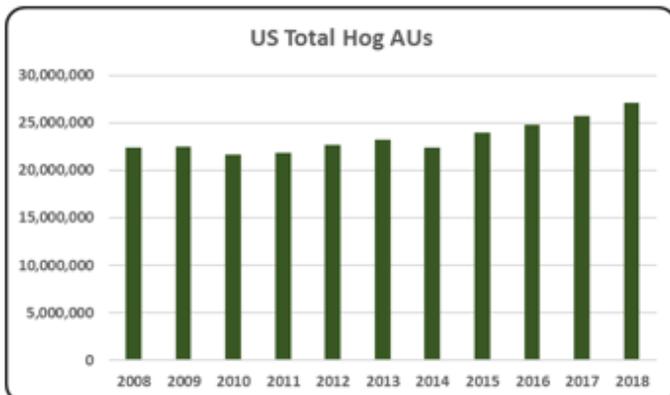
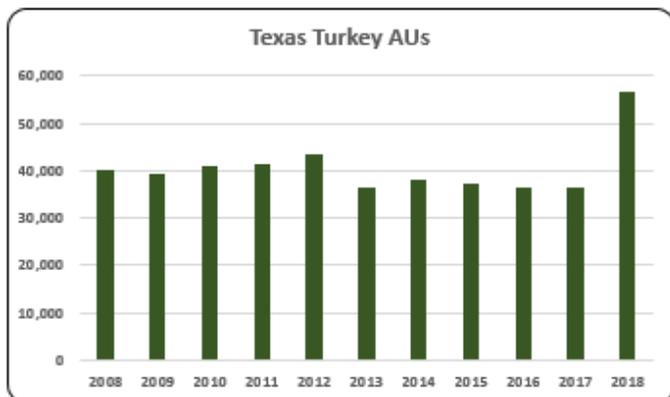
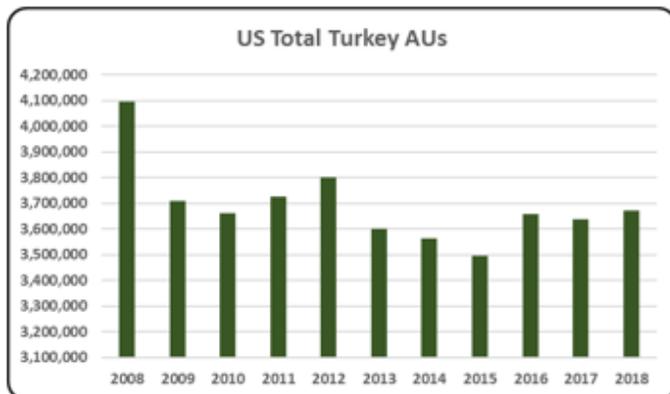
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Texas, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (6.8 million AUs), Broilers (1,963,997 AUs), and Dairy Cows (742,000 AUs). Total animal units in Texas during 2018 were 10.0 million AUs.



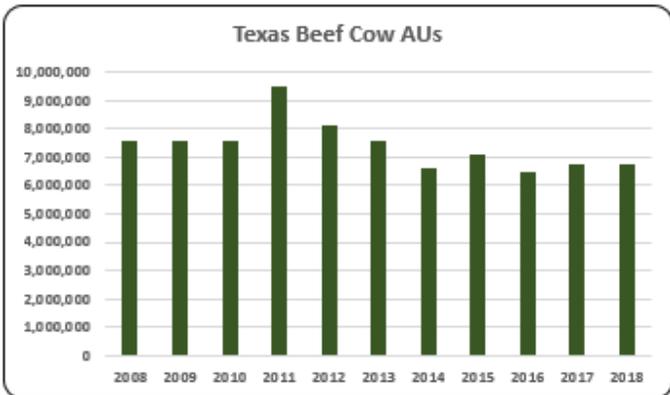
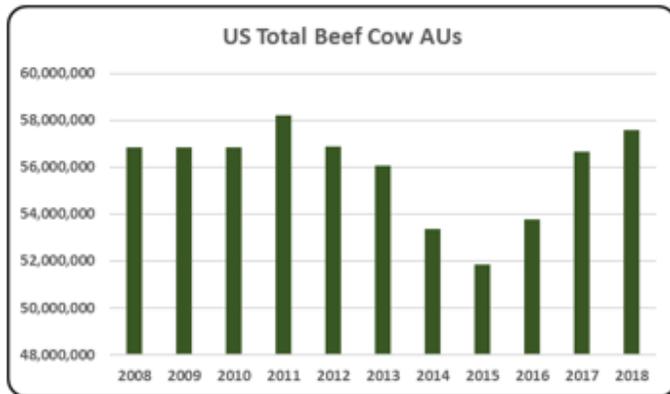
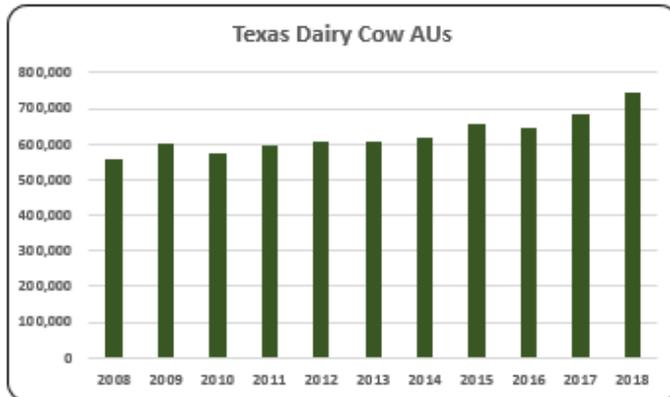
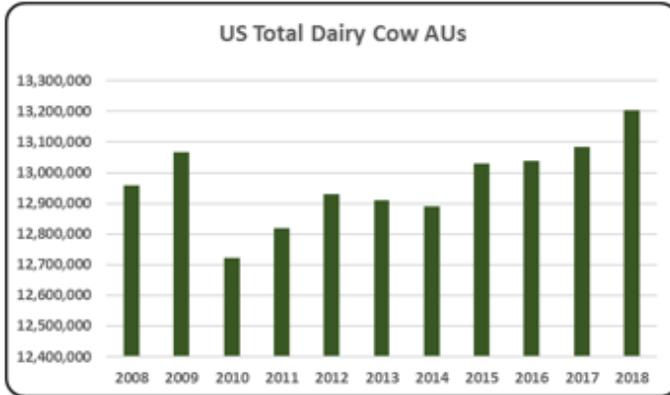
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 10.0 million AUs in Texas in 2018. 7.7% of all AUs in the U.S. were in Texas in 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler AUs in Texas contributed 19.6% (2.0 million AUs) of all animal units in the state in 2018. There was record broiler AUs in 2009 with 2.0 million AUs.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 0.9% (87,891 AUs) of all AUs in 2018 were from laying hens in Texas. 2018 AUs were 15.9% above the level of layer AUs in 2008 (75,835 AUs).



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AU numbers in Texas were the smallest of all animal sectors in terms of animal units in the state, contributing only 0.6% (56,573 AUs) to Texas' animal units in 2018.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- On average, there were 287,905 hog AUs in Texas from 2008 to 2018. Texas hog inventories in 2018 (410,400 AUs) were 60.9% higher than in 2008 (255,150 AUs).



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cow numbers in 2018 (742,000 AUs) made up 7.4% of all AUs in Texas, a 32.5% increase since 2008 has occurred.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- 67.5% (6.8 million AUs) of Texas AUs were from beef cows. Beef cow AUs declined 10.5% since a decade ago in 2008.

Texas Additional Information and Methodology

Animal agriculture is an important part of Texas's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

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Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Texas Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Texas’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Texas, \$1.77 to \$2.63 million in total economic activity, \$0.42 to \$0.59 in household wages and 13 to 17 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.581	\$ 0.543	16.8
	Hogs, Pigs, and Other	\$ 1.771	\$ 0.418	13.1
	Poultry and Eggs	\$ 2.626	\$ 0.586	15.7
	Dairy	\$ 2.356	\$ 0.553	17.1

Appendix

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	7,581,750	7,581,750	7,581,750	9,523,500	8,115,900	7,593,150	6,629,400	7,085,625	6,503,625	6,775,800	6,783,750
	Hog and Pig AUs	255,150	264,300	151,050	151,800	239,850	354,900	321,000	385,500	319,800	313,200	410,400
	Broiler AUs	1,890,047	1,967,590	1,922,536	1,894,354	1,811,287	1,833,746	1,778,675	1,829,495	1,891,972	1,957,169	1,963,997
	Turkey AUs	40,136	39,235	40,878	41,607	43,465	36,430	38,235	37,375	36,475	36,650	56,573
	Egg Layer AUs	75,835	71,992	74,488	72,672	77,079	75,155	76,646	80,354	83,404	87,571	87,891
	Dairy AUs	560,000	602,000	574,000	595,000	609,000	609,000	616,000	658,000	644,000	686,000	742,000
	Total Animal Units	10,402,918	10,526,867	10,344,702	12,278,932	10,896,581	10,502,381	9,459,955	10,076,349	9,479,276	9,856,391	10,044,611
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 6,449,008	\$ 5,481,429	\$ 6,101,526	\$ 8,076,312	\$ 7,423,536	\$ 7,536,504	\$ 9,041,302	\$ 9,236,773	\$ 7,239,829	\$ 7,433,833	\$ 7,584,260
	Hogs and Pigs (\$1,000)	\$ 131,583	\$ 106,533	\$ 75,023	\$ 103,262	\$ 266,045	\$ 197,889	\$ 238,528	\$ 222,851	\$ 191,892	\$ 199,298	\$ 225,405
	Broilers (\$1,000)	\$ 1,592,244	\$ 1,650,227	\$ 1,757,083	\$ 1,678,517	\$ 1,747,550	\$ 2,184,957	\$ 2,261,860	\$ 2,030,358	\$ 1,835,520	\$ 2,231,814	\$ 2,374,520
	Turkeys (\$1,000)	\$ 97,166	\$ 92,087	\$ 80,316	\$ 63,153	\$ 67,904	\$ 49,220	\$ 32,563	\$ 34,649	\$ 39,182	\$ 26,529	\$ 37,765
	Eggs (\$1,000)	\$ 462,283	\$ 347,480	\$ 395,052	\$ 421,982	\$ 445,497	\$ 471,264	\$ 525,954	\$ 728,753	\$ 361,309	\$ 392,538	\$ 546,249
	Milk (\$1,000)	\$ 1,573,792	\$ 1,175,720	\$ 1,509,588	\$ 1,993,056	\$ 1,794,452	\$ 1,960,440	\$ 2,536,260	\$ 1,823,277	\$ 1,852,956	\$ 2,217,936	\$ 2,171,988
	Other	\$ 78,313	\$ 94,022	\$ 105,178	\$ 114,260	\$ 116,905	\$ 111,185	\$ 116,827	\$ 117,514	\$ 119,034	\$ 115,389	\$ 114,600
	Sheep and Lambs (\$1,000)	\$ 22,951	\$ 31,992	\$ 36,480	\$ 38,895	\$ 34,872	\$ 31,704	\$ 39,898	\$ 43,138	\$ 47,210	\$ 46,117	\$ 47,880
	Aquaculture (\$1,000)	\$ 55,362	\$ 62,030	\$ 68,698	\$ 75,365	\$ 82,033	\$ 79,481	\$ 76,929	\$ 74,376	\$ 71,824	\$ 69,272	\$ 66,720
	Total (\$1,000)	\$ 10,384,389	\$ 8,947,498	\$ 10,023,765	\$ 12,450,543	\$ 11,861,889	\$ 12,511,460	\$ 14,753,294	\$ 14,194,175	\$ 11,639,722	\$ 12,617,337	\$ 13,054,787

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	127,974	124,992	127,726	135,749	
	Cattle feedlots (112112)	5,035	2,229	898	282	
	Dairy cattle and milk production (11212)	1,221	1,027	656	429	
	Hog and pig farming (1122)	1,760	1,732	1,184	1,350	
	Poultry and egg production (1123)	3,032	5,829	3,980	3,516	
	Sheep and goat farming (1124)	8,786	13,272	15,603	19,225	
	Animal aquaculture and other animal production (1125,1129)	23,378	28,622	26,587	27,434	
Value of Sales (\$1,000)	Cattle and Calves	8,083,024	10,503,774	13,013,127	12,291,224	
	Hogs and Pigs	128,231	237,504	239,358	163,381	
	Poultry and Eggs	1,260,951	2,113,086	2,624,759	2,991,846	
	Milk*			1,698,264	2,159,171	
	Aquaculture	31,058	46,102	82,033	69,272	
	Other (calculated)	223,026	289,592	201,944	354,840	
	Total	9,726,290	13,190,058	17,859,485	18,029,734	
Input Purchases	Livestock and poultry purchased	(Farms)	65,435	55,194	61,054	74,149
		\$1,000	4,524,369	6,017,794	6,860,573	5,855,780
	Breeding livestock purchased	(Farms)	43,559	36,667	39,929	50,143
		\$1,000	186,906	420,373	418,586	548,951
	Other livestock and poultry purchased	(Farms)	30,388	25,541	29,879	35,229
		\$1,000	4,337,463	5,597,421	6,441,987	5,306,829
Feed purchased	(Farms)	167,033	158,144	185,019	197,956	
	\$1,000	2,700,281	4,226,444	7,272,692	5,206,042	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 19,577,250	\$ 4,115,978	127,620	\$ 831,428
	Hogs, Pigs, and Other	\$ 601,979	\$ 142,088	4,442	\$ 28,702
	Poultry and Eggs	\$ 7,769,701	\$ 1,732,813	46,594	\$ 350,028
	Dairy	\$ 5,117,204	\$ 1,200,892	37,170	\$ 242,580
	Total	\$ 33,066,134	\$ 7,191,771	215,825	\$ 1,452,738
Change from 2008 to 2018	Cattle and Calves	\$ (316,539)	\$ (66,550)	(2,063)	\$ (13,443)
	Hogs, Pigs, and Other	\$ 157,873	\$ 37,264	1,165	\$ 7,527
	Poultry and Eggs	\$ 1,016,740	\$ 226,755	6,097	\$ 45,805
	Dairy	\$ 686,132	\$ 161,020	4,984	\$ 32,526
	Total	\$ 1,544,206	\$ 358,488	10,183	\$ 72,415
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.581	\$ 0.543	16.8	
	Hogs, Pigs, and Other	\$ 1.771	\$ 0.418	13.1	
	Poultry and Eggs	\$ 2.626	\$ 0.586	15.7	
	Dairy	\$ 2.356	\$ 0.553	17.1	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				0.0%
	Total				20.2%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: UTAH

Utah Executive Summary

The use of soybean meal as a key feed ingredient is a modest part of Utah animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Utah. The success of Utah animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Utah during 2018 animal agriculture contributed:

- \$2.6 billion in economic output
- 18,366 jobs
- \$571.2 million in earnings
- \$143.9 million in income taxes paid at local, state, and federal levels
- \$43.8 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Utah has increased economic output by over \$484.4 million, boosted household earnings by \$100.4 million, contributed 3,108 additional jobs and paid \$25.3 million in additional tax revenues.

Utah's animal agriculture consumed almost 170.7 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (57.1 thousand tons)
- Egg-Laying Hens (45.5 thousand tons)
- Dairy Cows (35.0 thousand tons)

This report examines animal agriculture in Utah over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Utah, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Utah and beyond.

Utah Economic Impact of Animal Agriculture

Animal agriculture is an important part of Utah's economy. In 2018, Utah's animal agriculture contributed the following to the economy:

- About \$2.6 billion in economic output
- \$571.2 million in household earnings
- 18,366 jobs
- \$143.9 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Utah's animal agriculture has:

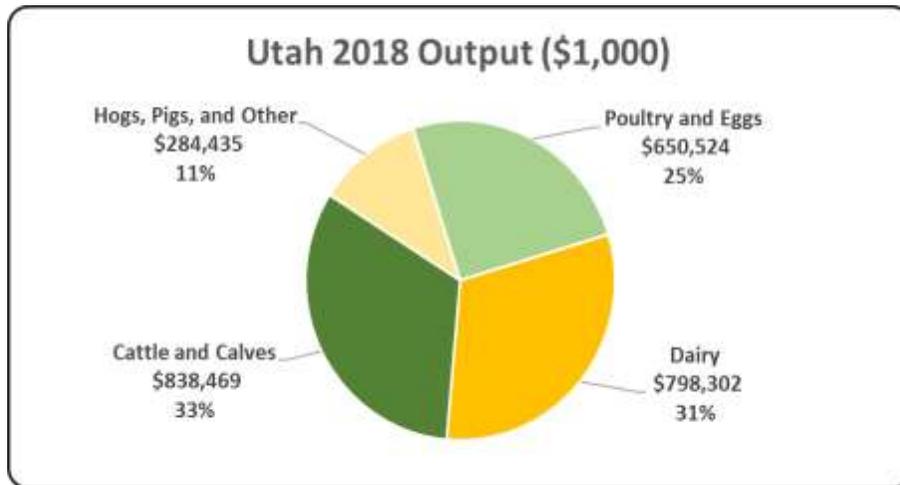
- Increased economic output by \$484.4 million
- Boosted household earnings by \$100.4 million
- Added 3,108 jobs
- Paid an additional \$25.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 2,571,730	\$ 484,387	23.21%
Earnings (\$1,000)	\$ 571,225	\$ 100,358	21.31%
Employment (Jobs)	18,366	3,108	20.37%
Income Taxes Paid (\$1,000)	\$ 143,949	\$ 25,290	21.31%
Property Taxes Paid in 2017 (\$1,000)	\$ 43,836		

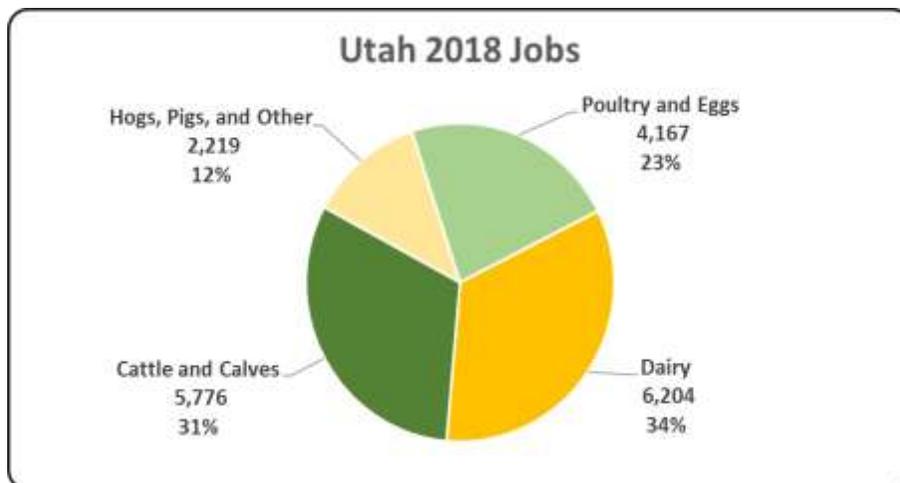
Utah Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Utah economy. Animal agriculture’s impact on Utah total economic output is about \$2.6 billion.



Utah Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Utah in terms of animal agriculture jobs. As shown, animal agriculture contributes 18,366 jobs within and outside of animal agriculture.



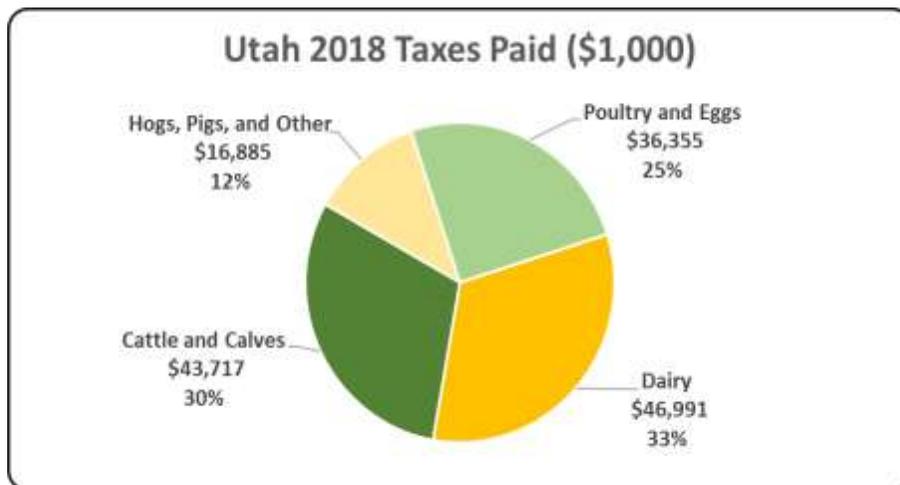
Utah Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Utah economy in terms of earnings. Utah’s animal agriculture contributed about \$571.2 million to household earnings in 2018.



Utah Taxes Paid by Animal Agriculture

Utah’s animal agriculture is also a small source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$143.9 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$43.8 million in property taxes paid by all of Utah agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



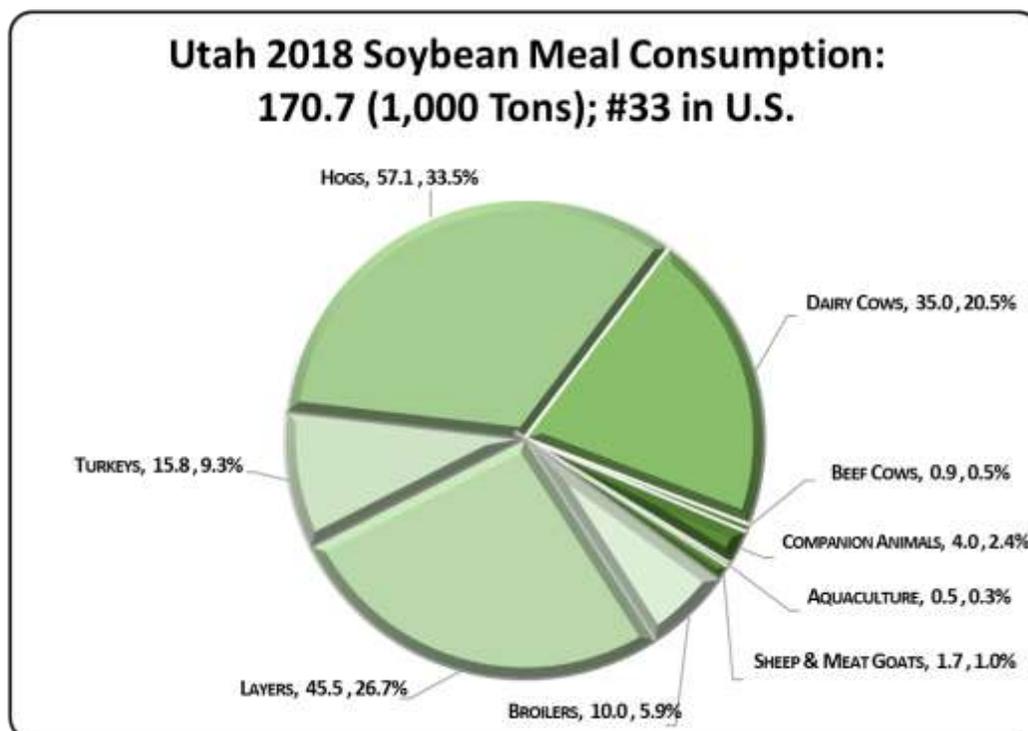
Utah Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Utah's animal agriculture consumed almost 170.7 thousand tons of soybean meal in 2018, placing the state as #33 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Utah consumed 8,600 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (57.1 thousand tons)
2. Egg-Laying Hens (45.5 thousand tons)
3. Dairy Cows (35.0 thousand tons)

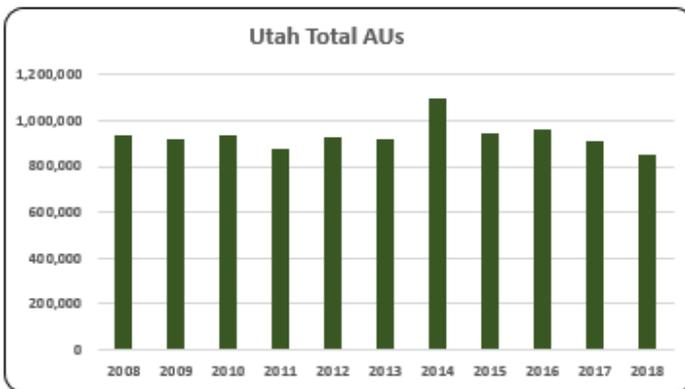
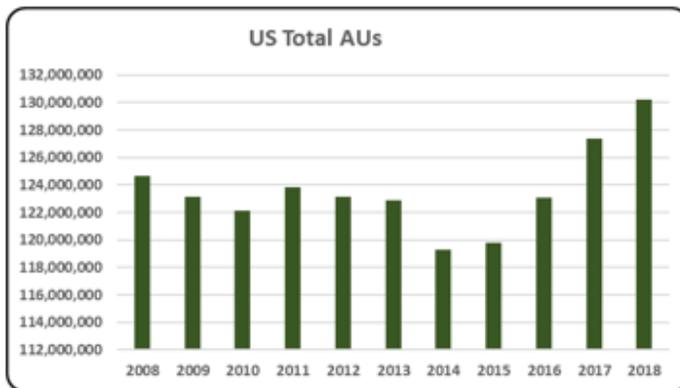


Utah Animal Unit (AU) Trends

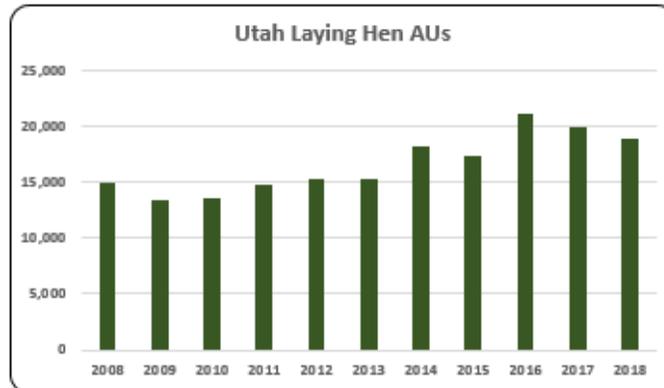
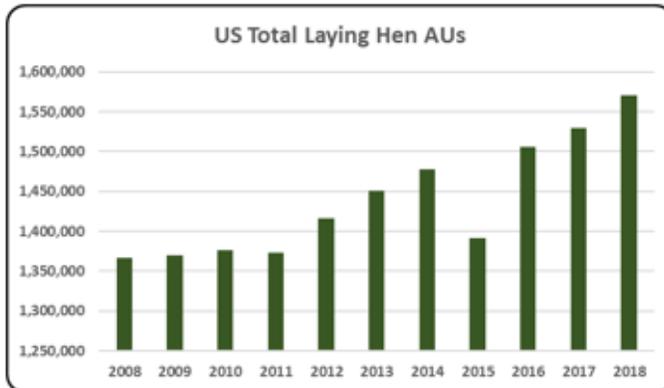
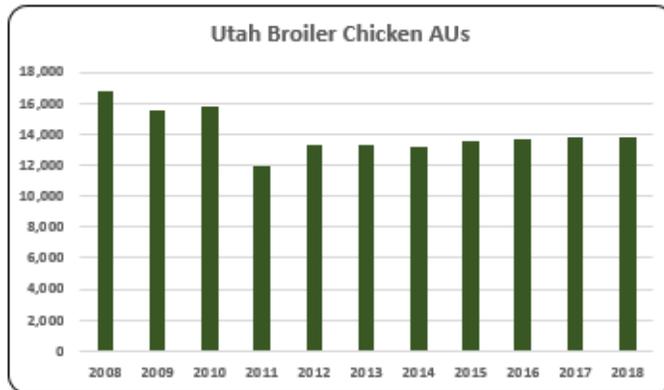
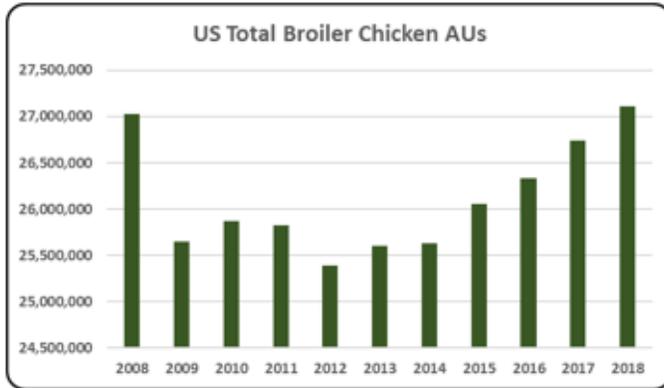
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Utah. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Utah and to give perspective on Utah’s contribution to the nation’s animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

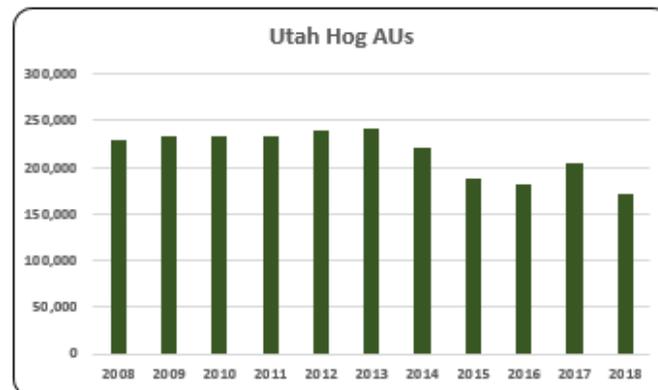
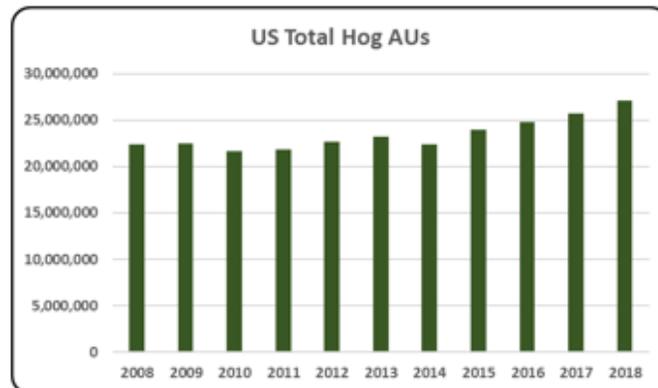
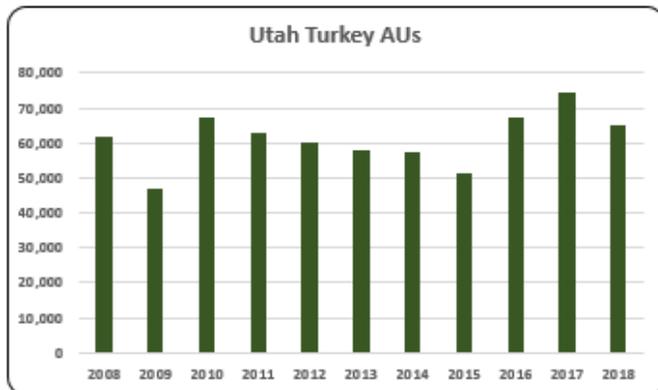
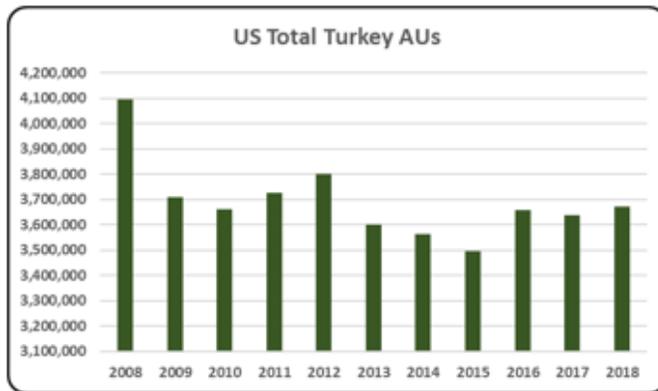
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Utah, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (441,075 AUs), Hogs (172,275 AUs), and Dairy Cows (135,800 AUs). Total animal units in Utah during 2018 were 847,066 AUs.



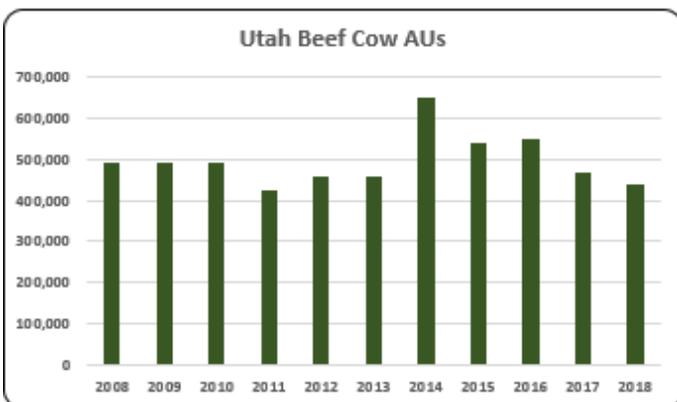
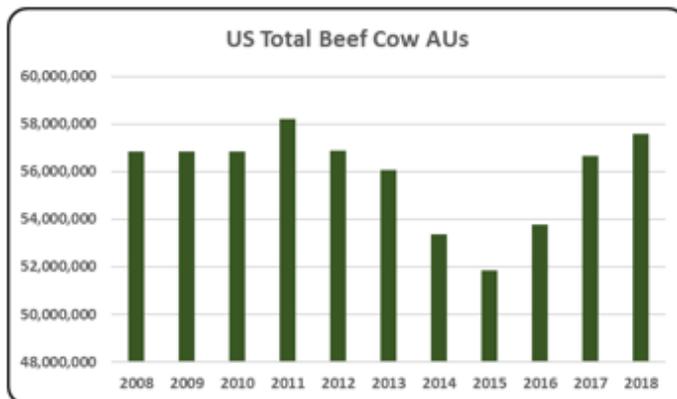
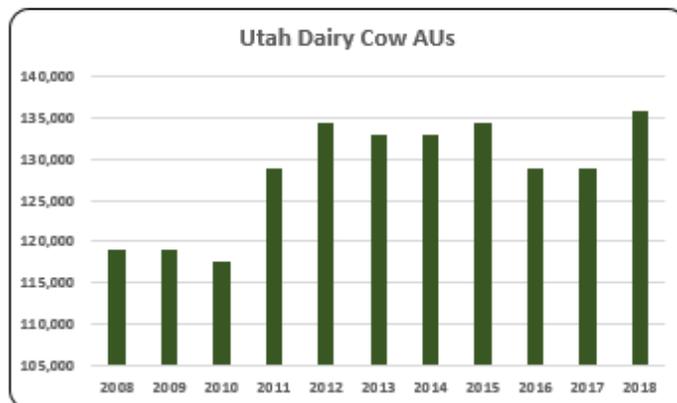
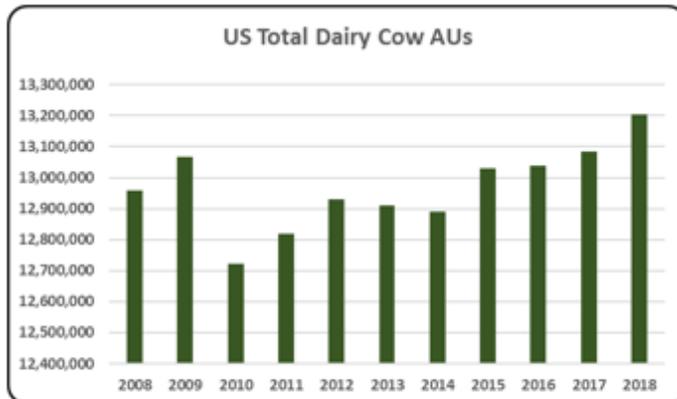
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- 0.7% (847,066 AUs) of animal units in the U.S. were in Utah in 2018. Animal units in Utah in 2018 were down 9.3% from 2008.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- 1.6% (13,841 AUs) of all animal units in Utah in 2018 were contributed by broilers. Broiler AUs in 2008 (16,722 AUs) was 17.2% above 2018 broiler animal unit numbers.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Utah laying hens comprised 2.2% (18,979 AUs) of all animal units in Utah in 2018. Layer AUs in 2018 were 26.7% higher than a decade earlier (14,983 layer AUs).



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs in 2018 (65,095 AUs) were 4.9% higher than in 2008 (62,077 AUs) in Utah.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- There were 172,275 hog AUs in Utah in 2018. Hog AUs decreased 24.8% from 2008, making up 20.3% of Utah’s AUs in 2018.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- There were, on average, 128,418 dairy cow AUs from 2008 to 2018 in Utah. The level of dairy cow AUs in 2018 (135,800 AUs) was 14.1% above the level of dairy cow AUs in 2008 (119,000 AUs).
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- 52.1% of all AUs in Utah in 2018 were from beef cows. Beef cow AUs in 2018 (441,075 AUs) were 10.4% less than in 2007 (492,450 AUs).

Utah Additional Information and Methodology

Animal agriculture is an important part of Utah's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Utah, of interest is the degree to which the industry impacts the Utah economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Utah animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Utah's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Utah which have occurred. As shown in this state report, Utah has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Utah. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

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Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Utah, \$1.74 to \$2.36 million in total economic activity, \$0.41 to \$0.52 in household wages and 14 to 17 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.043	\$ 0.423	14.1
	Hogs, Pigs, and Other	\$ 1.736	\$ 0.409	13.5
	Poultry and Eggs	\$ 2.361	\$ 0.524	15.1
	Dairy	\$ 2.135	\$ 0.499	16.6

Appendix

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Animal Units (AUs)	Beef Cattle AUs	492,450	492,450	492,450	425,700	459,825	456,150	650,250	538,800	552,000	467,175	441,075
	Hog and Pig AUs	229,050	233,100	232,350	233,850	240,450	242,475	220,275	188,325	181,725	205,125	172,275
	Broiler AUs	16,722	15,548	15,757	11,873	13,317	13,270	13,195	13,536	13,637	13,832	13,841
	Turkey AUs	62,077	47,048	67,534	63,035	60,091	58,080	57,329	51,447	67,380	74,409	65,095
	Egg Layer AUs	14,983	13,360	13,584	14,848	15,236	15,372	18,271	17,363	21,146	19,963	18,979
	Dairy AUs	119,000	119,000	117,600	128,800	134,400	133,000	133,000	134,400	128,800	128,800	135,800
	Total Animal Units	934,282	920,505	939,275	878,106	923,319	918,348	1,092,320	943,870	964,688	909,305	847,066
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 194,220	\$ 185,264	\$ 231,323	\$ 272,474	\$ 302,585	\$ 374,285	\$ 482,669	\$ 454,189	\$ 359,301	\$ 415,056	\$ 410,511
	Hogs and Pigs (\$1,000)	\$ 163,240	\$ 153,912	\$ 184,623	\$ 209,304	\$ 192,252	\$ 210,555	\$ 229,904	\$ 154,473	\$ 140,477	\$ 172,717	\$ 128,244
	Broilers (\$1,000)	\$ 13,393	\$ 11,555	\$ 12,076	\$ 10,572	\$ 13,269	\$ 16,168	\$ 16,962	\$ 14,798	\$ 13,157	\$ 15,449	\$ 17,906
	Turkeys (\$1,000)	\$ 58,607	\$ 36,525	\$ 68,017	\$ 68,510	\$ 73,450	\$ 69,534	\$ 71,601	\$ 74,478	\$ 100,264	\$ 85,531	\$ 94,292
	Eggs (\$1,000)	\$ 72,422	\$ 52,470	\$ 64,329	\$ 70,840	\$ 72,537	\$ 81,139	\$ 107,255	\$ 199,491	\$ 73,238	\$ 102,375	\$ 163,332
	Milk (\$1,000)	\$ 322,904	\$ 216,062	\$ 312,174	\$ 403,956	\$ 382,272	\$ 415,545	\$ 517,608	\$ 377,400	\$ 339,390	\$ 392,055	\$ 373,842
	Other	\$ 20,798	\$ 21,468	\$ 26,626	\$ 30,952	\$ 43,992	\$ 32,811	\$ 29,868	\$ 37,779	\$ 36,360	\$ 35,906	\$ 35,620
	Sheep and Lambs (\$1,000)	\$ 17,603	\$ 17,395	\$ 21,674	\$ 25,121	\$ 37,283	\$ 25,681	\$ 22,318	\$ 29,809	\$ 27,970	\$ 27,096	\$ 26,390
	Aquaculture (\$1,000)	\$ 3,195	\$ 4,073	\$ 4,952	\$ 5,830	\$ 6,709	\$ 7,129	\$ 7,549	\$ 7,970	\$ 8,390	\$ 8,810	\$ 9,230
	Total (\$1,000)	\$ 845,584	\$ 677,257	\$ 899,168	\$ 1,066,608	\$ 1,080,357	\$ 1,200,037	\$ 1,455,867	\$ 1,312,607	\$ 1,062,187	\$ 1,219,089	\$ 1,223,746

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	4,202	5,183	5,231	5,938
	Cattle feedlots (112112)	583	415	126	177
	Dairy cattle and milk production (11212)	464	335	248	248
	Hog and pig farming (1122)	179	205	199	183
	Poultry and egg production (1123)	334	359	214	195
	Sheep and goat farming (1124)	582	895	763	1,294
	Animal aquaculture and other animal production (1125,1129)	3,482	2,813	3,760	3,749
Value of Sales (\$1,000)	Cattle and Calves	371,418	347,299	364,214	377,979
	Hogs and Pigs	153,112	196,595	290,632	230,969
	Poultry and Eggs	84,178	140,359	140,131	207,065
	Milk*			326,364	355,846
	Aquaculture	5,746	4,074	6,709	8,810
	Other (calculated)	46,835	62,813	93,368	96,984
	Total	661,289	751,140	1,221,418	1,277,653
Input Purchases	Livestock and poultry purchased	(Farms) 5,172	4,826	6,025	6,237
		\$1,000 158,687	132,323	114,862	142,405
	Breeding livestock purchased	(Farms) 2,702	2,864	3,353	3,530
		\$1,000 18,789	31,074	38,315	41,310
	Other livestock and poultry purchased	(Farms) 3,092	2,836	3,566	3,661
		\$1,000 139,898	101,250	76,547	101,095
	Feed purchased	(Farms) 9,479	9,214	11,921	12,735
	\$1,000 244,175	389,568	611,302	482,845	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 838,469	\$ 173,482	5,776	\$ 43,717
	Hogs, Pigs, and Other	\$ 284,435	\$ 67,004	2,219	\$ 16,885
	Poultry and Eggs	\$ 650,524	\$ 144,267	4,167	\$ 36,355
	Dairy	\$ 798,302	\$ 186,472	6,204	\$ 46,991
	Total	\$ 2,571,730	\$ 571,225	18,366	\$ 143,949
Change from 2008 to 2018	Cattle and Calves	\$ 364,399	\$ 75,395	2,510	\$ 19,000
	Hogs, Pigs, and Other	\$ (97,327)	\$ (22,927)	(759)	\$ (5,778)
	Poultry and Eggs	\$ 243,034	\$ 53,898	1,557	\$ 13,582
	Dairy	\$ (25,720)	\$ (6,008)	(200)	\$ (1,514)
	Total	\$ 484,387	\$ 100,358	3,108	\$ 25,290
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.043	\$ 0.423	14.1	
	Hogs, Pigs, and Other	\$ 1.736	\$ 0.409	13.5	
	Poultry and Eggs	\$ 2.361	\$ 0.524	15.1	
	Dairy	\$ 2.135	\$ 0.499	16.6	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.0%	
	Total			25.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: VERMONT

Vermont Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Vermont animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of Vermont. The success of Vermont animal agriculture in turn has a small impact on the rest of the state and regional economies. For example, in the State of Vermont during 2018 animal agriculture contributed:

- \$1.0 billion in economic output
- 7,923 jobs
- \$228.9 million in earnings
- \$60.5 million in income taxes paid at local, state, and federal levels
- \$34.9 million in the form of property taxes

Vermont's animal agriculture consumed almost 86.2 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (45.2 thousand tons)
- Broilers (27.8 thousand tons)
- Turkeys (6.6 thousand tons)

This report examines animal agriculture in Vermont over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Vermont, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a minor contributor to the economic well-being of the people of Vermont and beyond.

Vermont Economic Impact of Animal Agriculture

Animal agriculture is a moderate but shrinking part of Vermont's economy. In 2018, Vermont's animal agriculture contributed the following to the economy:

- About \$1.0 billion in economic output
- \$228.9 million in household earnings
- 7,923 jobs
- \$60.5 million in income taxes

During the last decade, contractions in Vermont's animal agriculture has:

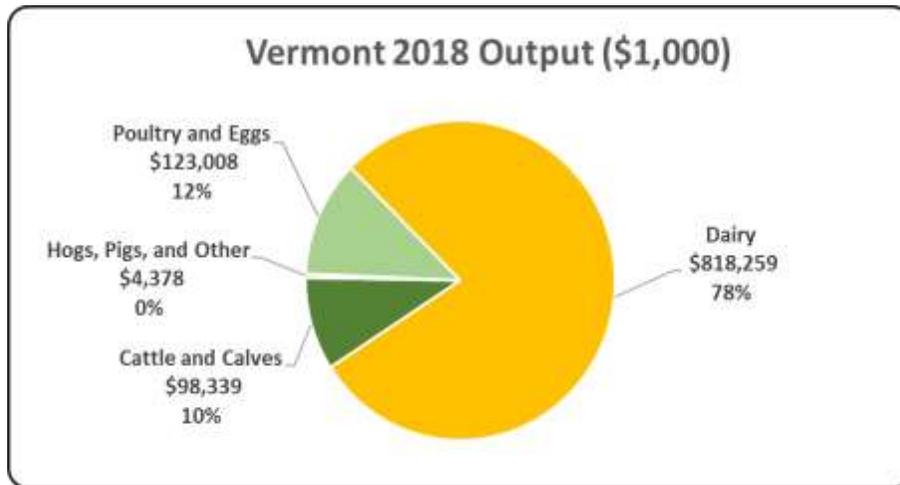
- Decreased economic output by \$234.0 million
- Reduced household earnings by \$52.9 million
- Shrunk by 1,889 jobs
- Paid \$14.0 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 1,043,983	\$ (234,027)	-18.31%
Earnings (\$1,000)	\$ 228,859	\$ (52,862)	-18.76%
Employment (Jobs)	7,923	(1,889)	-19.25%
Income Taxes Paid (\$1,000)	\$ 60,533	\$ (13,982)	-18.76%
Property Taxes Paid in 2017 (\$1,000)	\$ 34,885		

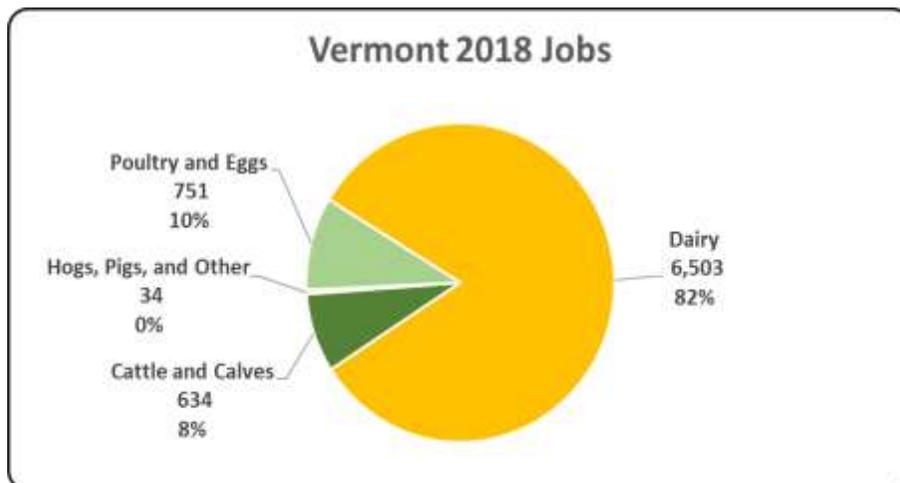
Vermont Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Vermont economy. Animal agriculture’s impact on Vermont total economic output is about \$1.0 billion.



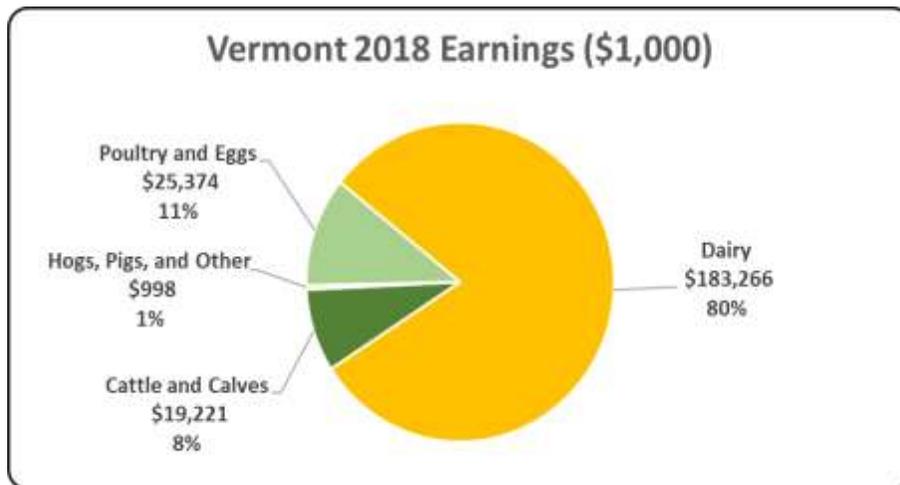
Vermont Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Vermont in terms of animal agriculture jobs. As shown, animal agriculture contributes 7,923 jobs within and outside of animal agriculture.



Vermont Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Vermont economy in terms of earnings. Vermont’s animal agriculture contributed about \$228.9 million to household earnings in 2018.



Vermont Taxes Paid by Animal Agriculture

Vermont’s animal agriculture is not a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$60.5 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$34.9 million in property taxes paid by all of Vermont agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



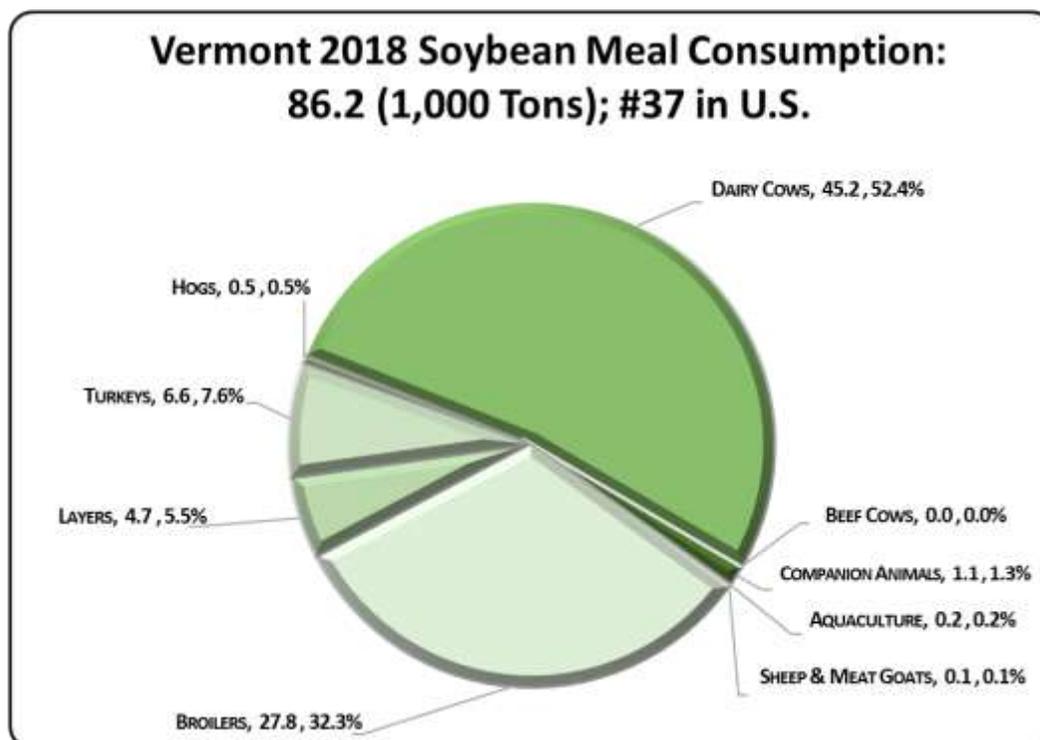
Vermont Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Vermont's animal agriculture consumed almost 86.2 thousand tons of soybean meal in 2018, placing the state as #37 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Vermont consumed 300 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (45.2 thousand tons)
2. Broilers (27.8 thousand tons)
3. Turkeys (6.6 thousand tons)

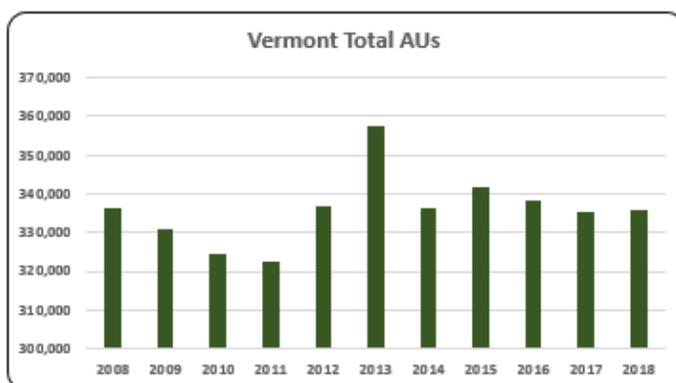
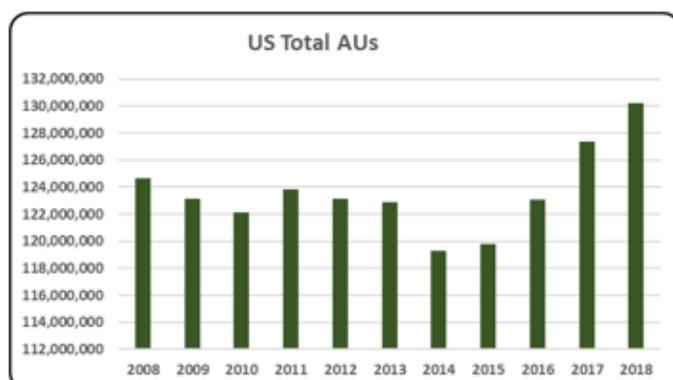


Vermont Animal Unit (AU) Trends

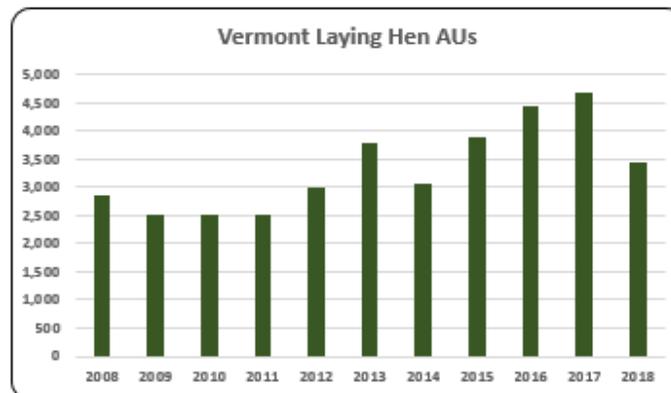
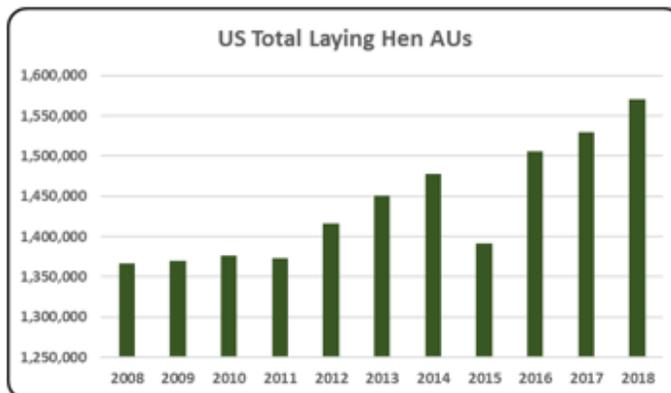
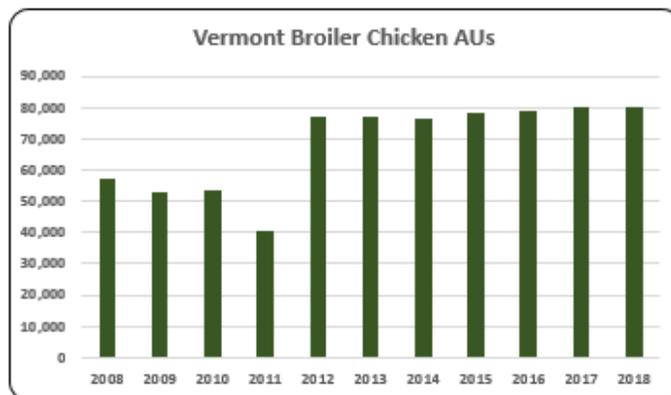
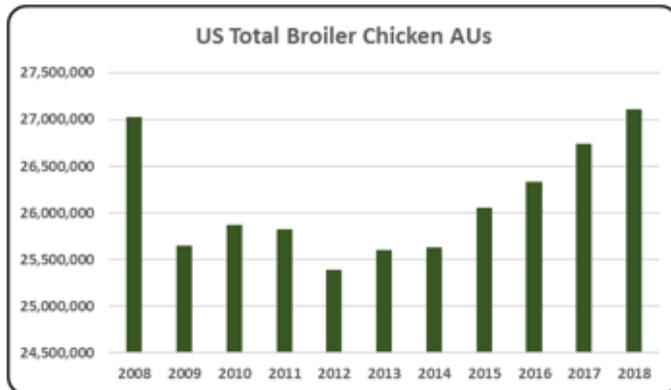
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Vermont. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Vermont and to give perspective on Vermont's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

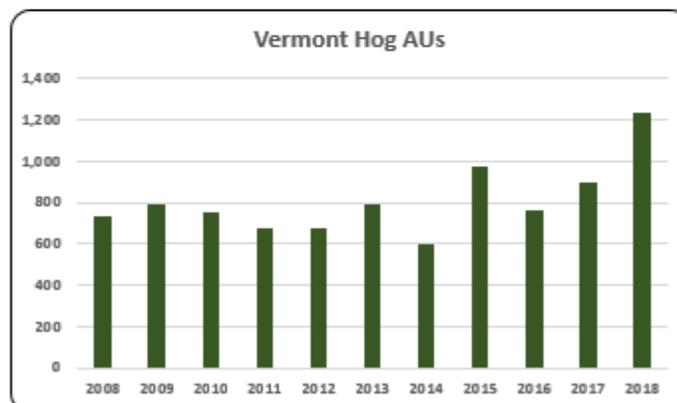
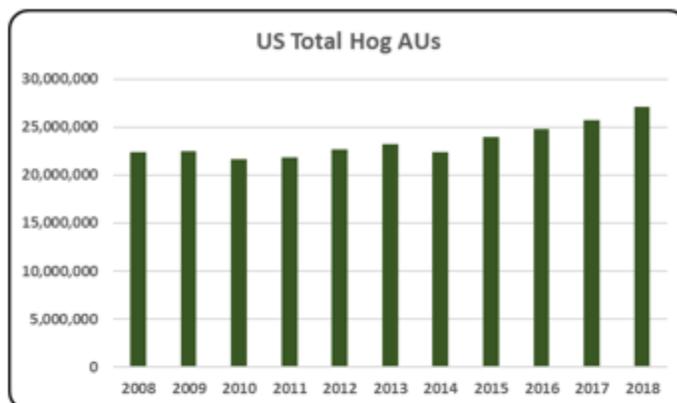
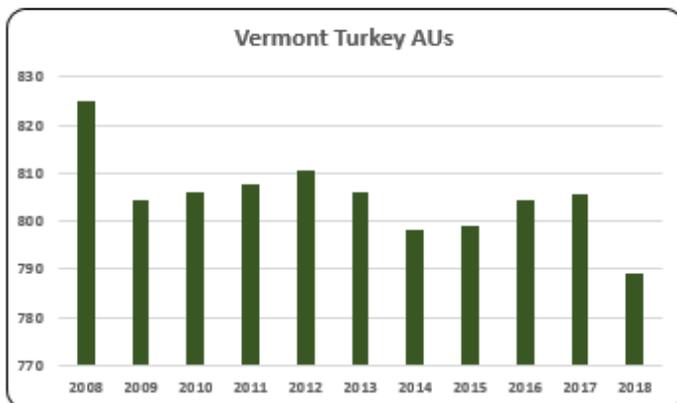
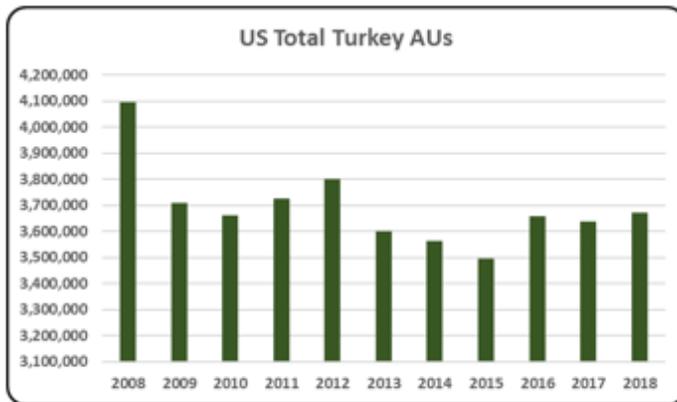
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Vermont, the largest three segments of animal agriculture in terms of AUs during 2018 were: Dairy Cows (179,200 AUs), Broilers (80,204 AUs), and Beef Cows (71,025 AUs). Total animal units in Vermont during 2018 were 335,876 AUs.



- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- In 2018 Vermont had 335,876 AUs, down 0.2% from a decade ago, and 0.3% of total U.S. AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- There were 80,204 broiler AUs in Vermont in 2018. This represented 23.9% of all AUs in the state. Broiler AUs increased from 40.6% from 2008 to 2018 in Vermont.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 3,427 layer AUs in 2018 in Vermont. 2017 was the highest year over the period for laying hens in Vermont with 4,683 layer AUs.

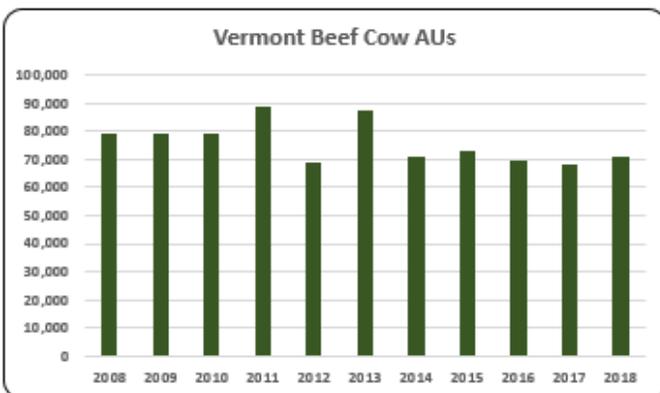
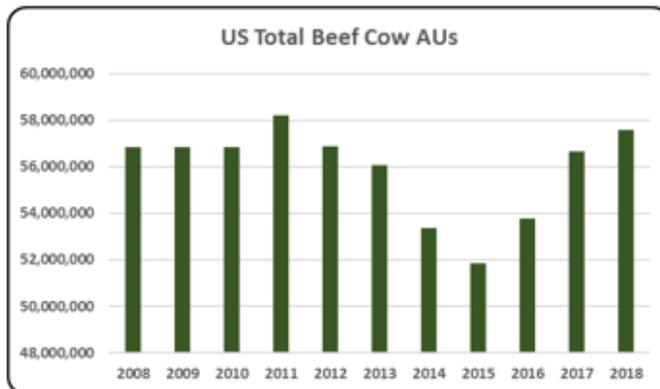
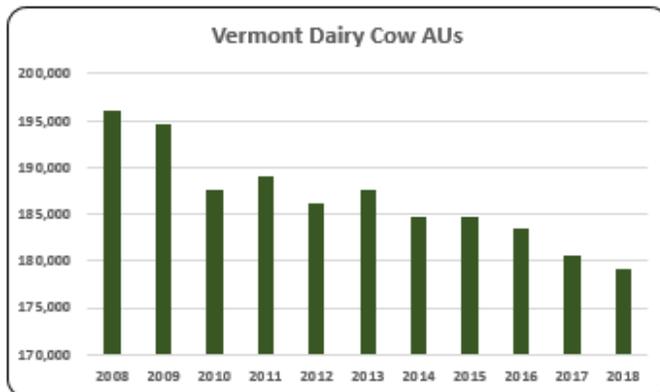
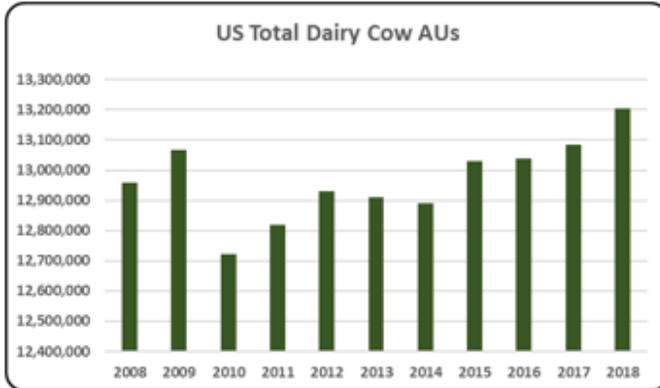


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

- 0.2% (789 AUs) of all AUs in Vermont were from turkey production in 2018.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- Vermont had an average of 809 hog AUs from 2008 to 2018. In 2018 Vermont had 1,230 hog AUs which increased by 67.4% from 2008.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- In 2018, dairy cows comprised 53.4% (179,200 AUs) of all animal units in Vermont. Dairy cow AUs in 2018 were 8.6% less than in 2008.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- 21.2% of AUs in Vermont came from beef cow production in 2018 (71,025 AUs). Beef cow AUs in 2018 were 10.2% less than 2008 (79,050 beef cow AUs).

Vermont Additional Information and Methodology

Animal agriculture is a minor part of Vermont's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Vermont, of interest is the degree to which the industry impacts the Vermont economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Vermont animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Vermont's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Vermont which have occurred. As shown in this state report, Vermont has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Vermont. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Vermont Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Vermont's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Vermont, \$1.47 to \$1.87 million in total economic activity, \$0.32 to \$0.40 in household wages and 11 to 14 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.645	\$ 0.322	10.6
	Hogs, Pigs, and Other	\$ 1.467	\$ 0.334	11.4
	Poultry and Eggs	\$ 1.872	\$ 0.386	11.4
	Dairy	\$ 1.786	\$ 0.400	14.2

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	79,050	79,050	79,050	89,175	69,045	87,525	70,725	72,885	69,660	68,190	71,025
	Hog and Pig AUs	735	795	750	675	675	795	600	975	765	900	1,230
	Broiler AUs	57,026	53,021	53,734	40,489	77,166	76,896	76,460	78,433	79,019	80,152	80,204
	Turkey AUs	825	804	806	808	810	806	798	799	804	806	789
	Egg Layer AUs	2,857	2,527	2,510	2,525	2,984	3,803	3,079	3,886	4,436	4,683	3,427
	Dairy AUs	196,000	194,600	187,600	189,000	186,200	187,600	184,800	184,800	183,400	180,600	179,200
	Total Animal Units	336,493	330,797	324,450	322,672	336,880	357,425	336,462	341,778	338,084	335,330	335,876
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 43,469	\$ 39,438	\$ 40,186	\$ 57,745	\$ 72,300	\$ 68,087	\$ 90,964	\$ 92,141	\$ 61,405	\$ 62,689	\$ 59,784
	Hogs and Pigs (\$1,000)	\$ 390	\$ 501	\$ 581	\$ 814	\$ 871	\$ 883	\$ 989	\$ 1,017	\$ 736	\$ 913	\$ 1,057
	Broilers (\$1,000)	\$ 45,674	\$ 39,407	\$ 41,182	\$ 36,054	\$ 76,889	\$ 93,688	\$ 98,286	\$ 85,745	\$ 76,239	\$ 89,522	\$ 58,023
	Turkeys (\$1,000)	\$ 1,881	\$ 1,796	\$ 1,862	\$ 2,013	\$ 2,084	\$ 2,130	\$ 2,283	\$ 2,331	\$ 2,367	\$ 2,394	\$ 2,479
	Eggs (\$1,000)	\$ 5,252	\$ 3,782	\$ 3,769	\$ 4,384	\$ 4,855	\$ 3,701	\$ 4,274	\$ 5,152	\$ 1,829	\$ 2,628	\$ 5,218
	Milk (\$1,000)	\$ 502,320	\$ 340,722	\$ 446,217	\$ 548,208	\$ 503,524	\$ 555,078	\$ 679,830	\$ 495,876	\$ 471,771	\$ 510,136	\$ 458,280
	Other	\$ 1,101	\$ 1,382	\$ 1,763	\$ 1,973	\$ 2,277	\$ 2,305	\$ 2,235	\$ 2,228	\$ 2,158	\$ 1,994	\$ 1,928
	Sheep and Lambs (\$1,000)	\$ 245	\$ 268	\$ 390	\$ 341	\$ 387	\$ 478	\$ 472	\$ 527	\$ 521	\$ 420	\$ 417
	Aquaculture (\$1,000)	\$ 856	\$ 1,114	\$ 1,373	\$ 1,631	\$ 1,890	\$ 1,827	\$ 1,764	\$ 1,700	\$ 1,637	\$ 1,574	\$ 1,511
	Total (\$1,000)	\$ 600,087	\$ 427,028	\$ 535,559	\$ 651,191	\$ 662,800	\$ 725,872	\$ 878,861	\$ 684,490	\$ 616,505	\$ 670,277	\$ 586,769

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	647	668	862	867	
	Cattle feedlots (112112)	92	61	18	10	
	Dairy cattle and milk production (11212)	1,367	1,141	904	711	
	Hog and pig farming (1122)	45	26	57	71	
	Poultry and egg production (1123)	102	235	203	136	
	Sheep and goat farming (1124)	248	371	390	516	
	Animal aquaculture and other animal production (1125,1129)	763	855	1,035	901	
Value of Sales (\$1,000)	Cattle and Calves	45,106	57,581	61,905	60,755	
	Hogs and Pigs	374	697	1,345	1,857	
	Poultry and Eggs	5,875	10,996	13,136	11,729	
	Milk*			504,884	505,426	
	Aquaculture	1,325	1,989	1,890	1,574	
	Other (calculated)	6,362	172,844	8,688	12,531	
	Total	59,042	244,107	591,848	593,872	
Input Purchases	Livestock and poultry purchased	(Farms)	1,660	1,541	2,205	1,778
		\$1,000	23,993	25,230	21,865	14,892
	Breeding livestock purchased	(Farms)	1,042	789	1,021	803
		\$1,000	14,949	16,178	13,916	9,424
	Other livestock and poultry purchased	(Farms)	803	970	1,536	1,248
		\$1,000	9,045	9,052	7,950	5,468
	Feed purchased	(Farms)	3,978	3,637	4,535	4,045
	\$1,000	108,693	144,129	210,804	173,573	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 98,339	\$ 19,221	634	\$ 5,084
	Hogs, Pigs, and Other	\$ 4,378	\$ 998	34	\$ 264
	Poultry and Eggs	\$ 123,008	\$ 25,374	751	\$ 6,712
	Dairy	\$ 818,259	\$ 183,266	6,503	\$ 48,474
	Total	\$ 1,043,983	\$ 228,859	7,923	\$ 60,533

Change from 2008 to 2018	Cattle and Calves	\$ 12,890	\$ 2,519	83	\$ 666
	Hogs, Pigs, and Other	\$ 1,765	\$ 402	14	\$ 106
	Poultry and Eggs	\$ 4,891	\$ 1,009	30	\$ 267
	Dairy	\$ (253,572)	\$ (56,793)	(2,015)	\$ (15,022)
	Total	\$ (234,027)	\$ (52,862)	(1,889)	\$ (13,982)

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.645	\$ 0.322	10.6
	Hogs, Pigs, and Other	\$ 1.467	\$ 0.334	11.4
	Poultry and Eggs	\$ 1.872	\$ 0.386	11.4
	Dairy	\$ 1.786	\$ 0.400	14.2

Tax Rates	Federal effective income tax rate	14.0%
	Federal Social Security tax rate	6.2%
	State Effective Rate	6.3%
	Total	26.5%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: VIRGINIA

Virginia Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Virginia animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Virginia. The success of Virginia animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Virginia during 2018 animal agriculture contributed:

- \$4.1 billion in economic output
- 19,161 jobs
- \$859.0 million in earnings
- \$206.8 million in income taxes paid at local, state, and federal levels
- \$126.4 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Virginia has increased economic output by over \$76.7 million, boosted household earnings by \$13.0 million, contributed 149 additional jobs and paid \$3.1 million in additional tax revenues.

Virginia's animal agriculture consumed almost 692.8 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (462.4 thousand tons)
- Turkeys (168.5 thousand tons)
- Dairy Cows (22.0 thousand tons)

This report examines animal agriculture in Virginia over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Virginia, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Virginia and beyond.

Virginia Economic Impact of Animal Agriculture

Animal agriculture is an important part of Virginia's economy. In 2018, Virginia's animal agriculture contributed the following to the economy:

- About \$4.1 billion in economic output
- \$859.0 million in household earnings
- 19,161 jobs
- \$206.8 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Virginia's animal agriculture has:

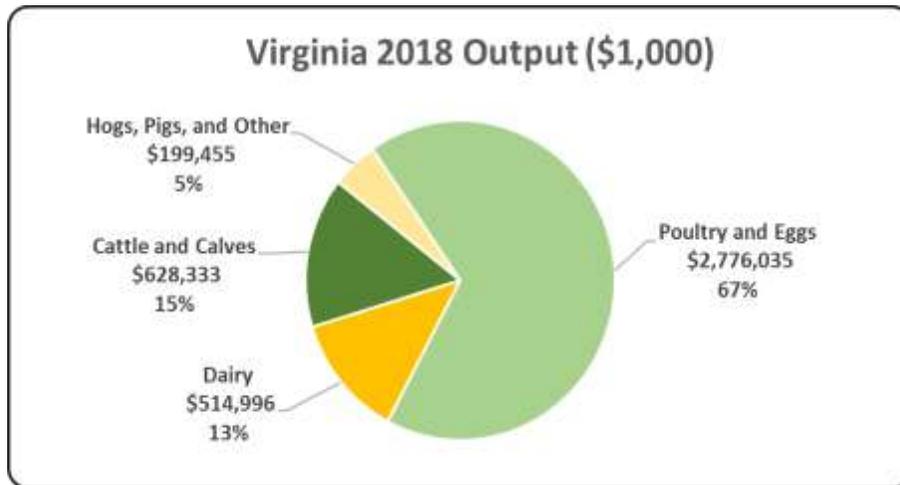
- Increased economic output by \$76.7 million
- Boosted household earnings by \$13.0 million
- Added 149 jobs
- Paid an additional \$3.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 4,118,820	\$ 76,681	1.90%
Earnings (\$1,000)	\$ 858,962	\$ 13,029	1.54%
Employment (Jobs)	19,161	149	0.79%
Income Taxes Paid (\$1,000)	\$ 206,795	\$ 3,137	1.54%
Property Taxes Paid in 2017 (\$1,000)	\$ 126,387		

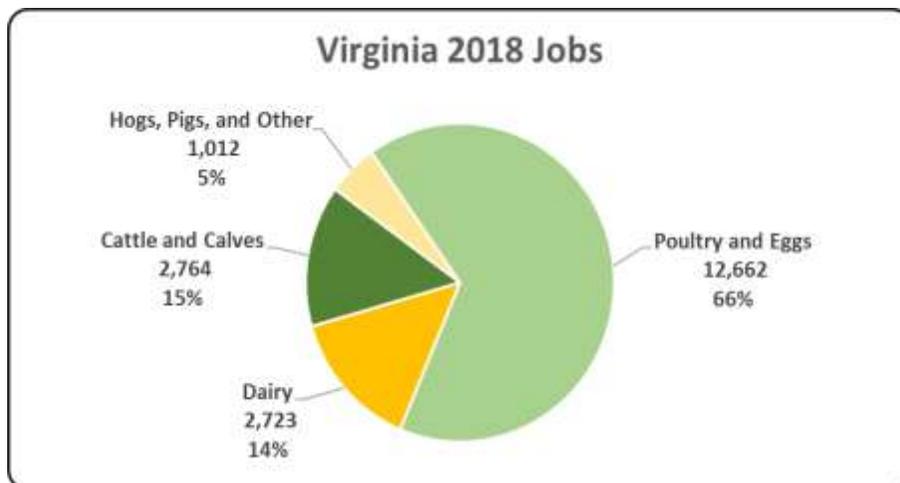
Virginia Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Virginia economy. Animal agriculture’s impact on Virginia total economic output is about \$4.1 billion.



Virginia Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Virginia in terms of animal agriculture jobs. As shown, animal agriculture contributes 19,161 jobs within and outside of animal agriculture.



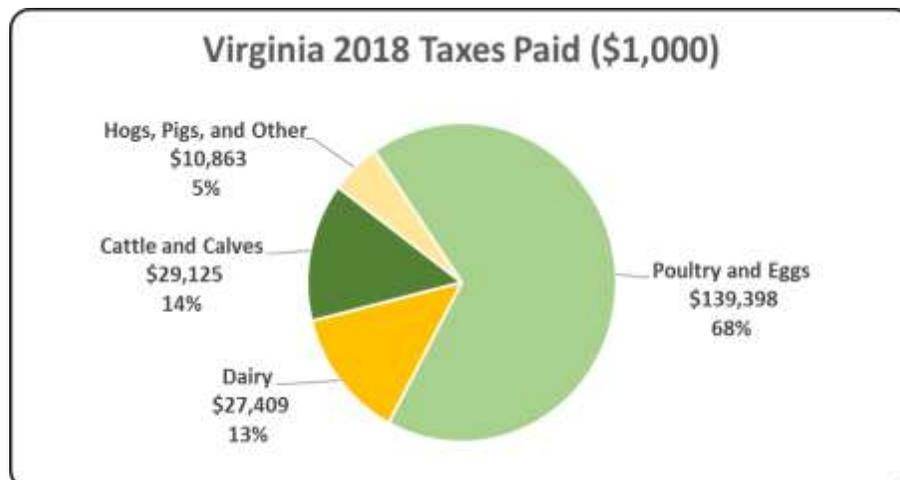
Virginia Earnings

Earnings includes wages and salaries plus proprietors' income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Virginia economy in terms of earnings. Virginia's animal agriculture contributed about \$859.0 million to household earnings in 2018.



Virginia Taxes Paid by Animal Agriculture

Virginia's animal agriculture is also a source of tax revenue. In 2018, the state's animal agriculture industry paid about \$206.8 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$126.4 million in property taxes paid by all of Virginia agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



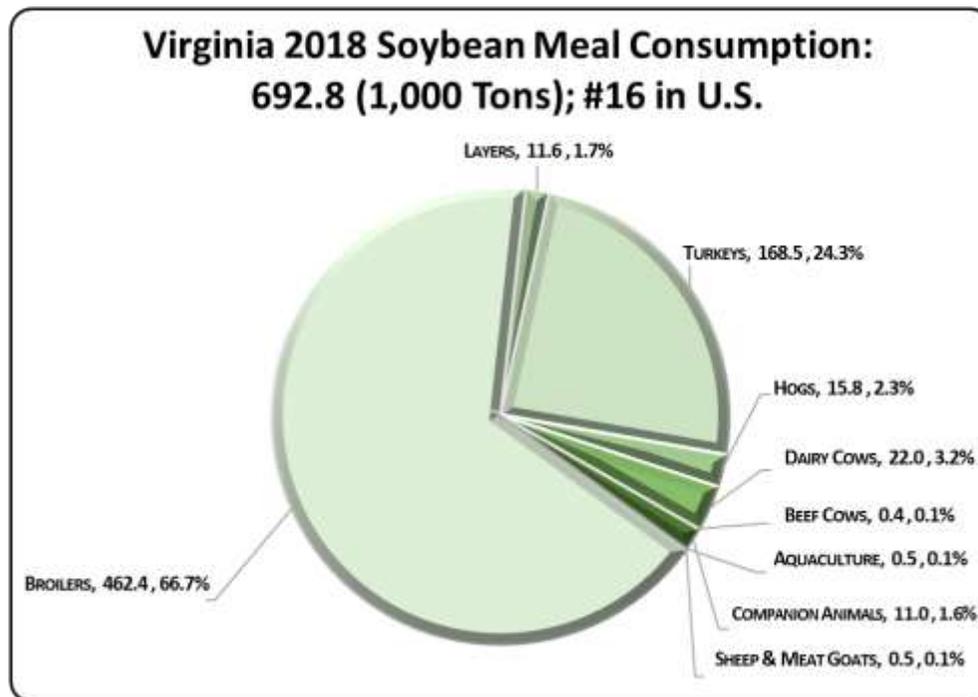
Virginia Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Virginia's animal agriculture consumed almost 692.8 thousand tons of soybean meal in 2018, placing the state as #16 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Virginia consumed 24.4 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (462.4 thousand tons)
2. Turkeys (168.5 thousand tons)
3. Dairy Cows (22.0 thousand tons)

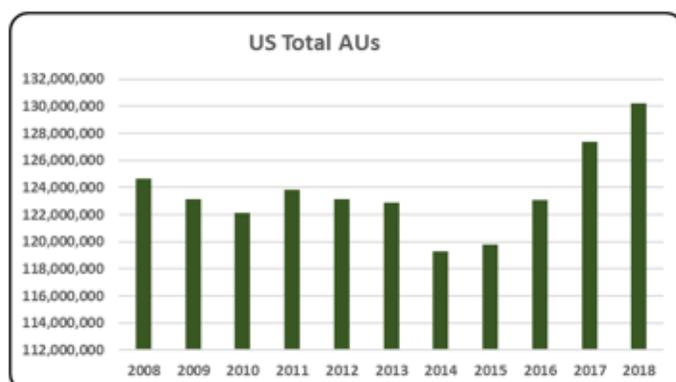


Virginia Animal Unit (AU) Trends

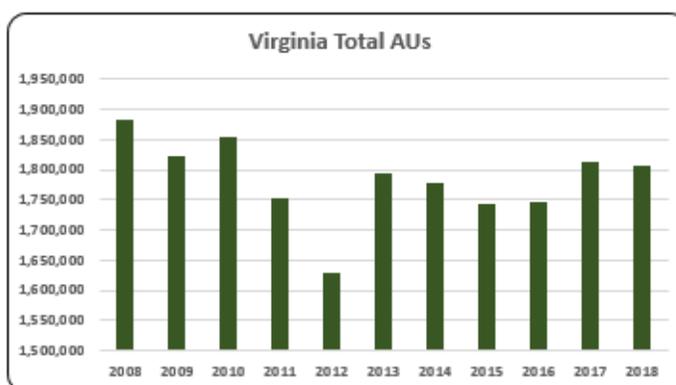
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Virginia. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Virginia and to give perspective on Virginia's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

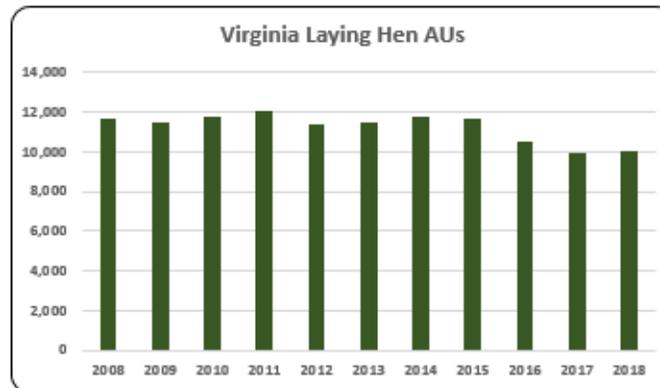
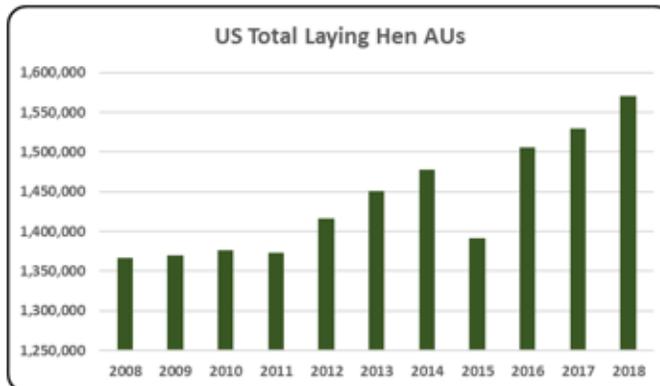
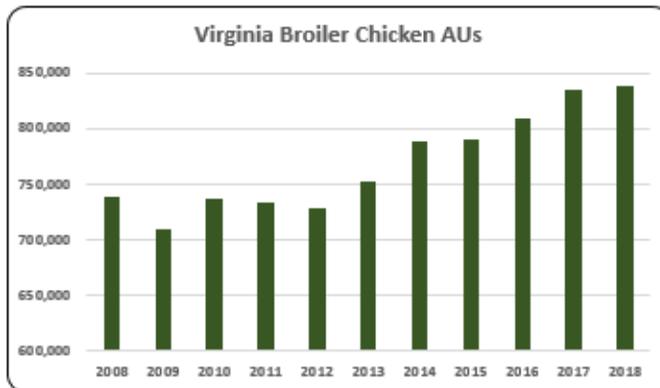
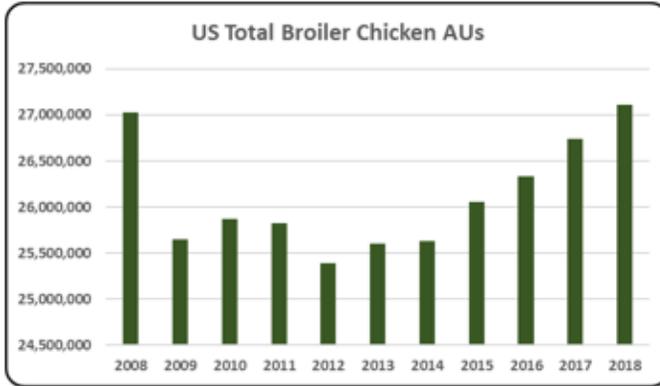
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Virginia, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (838,192 AUs), Beef Cows (552,900 AUs), and Turkeys (234,679 AUs). Total animal units in Virginia during 2018 were 1.8 million AUs.



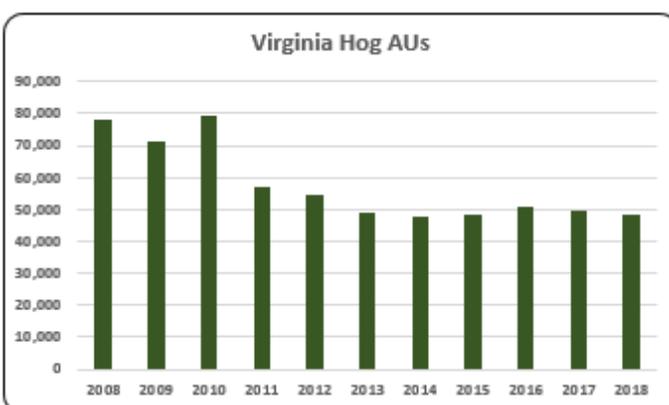
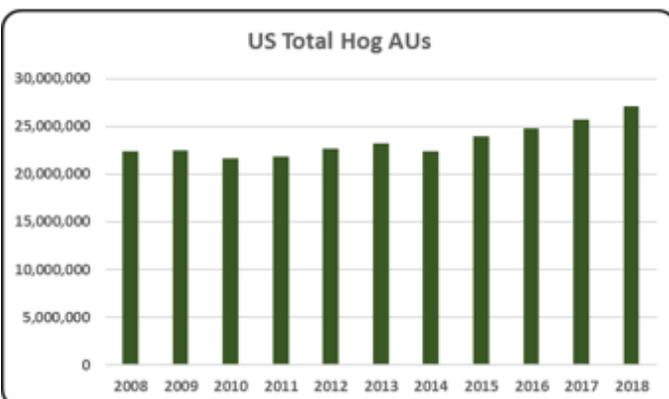
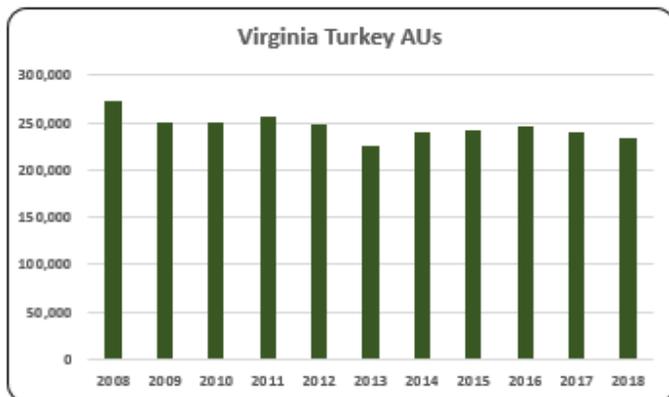
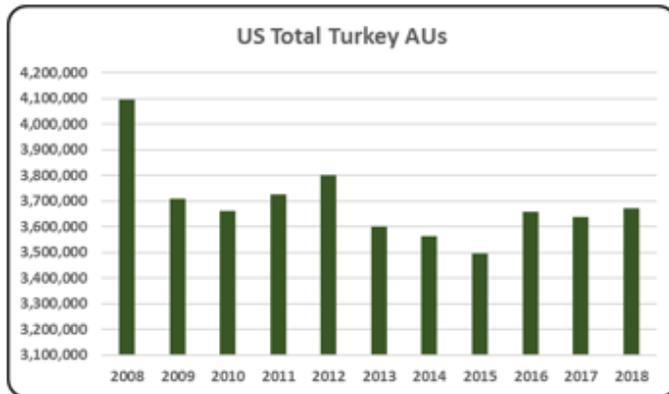
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.



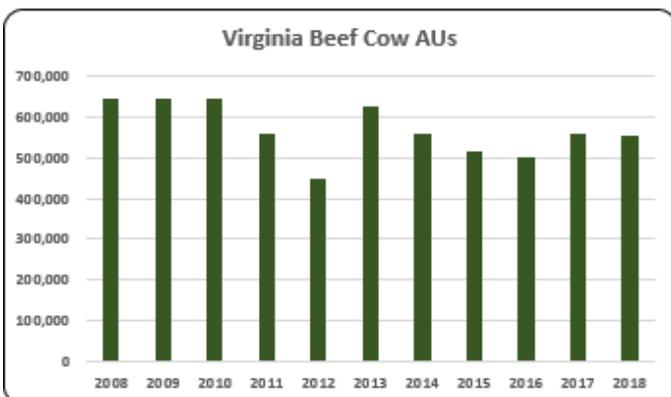
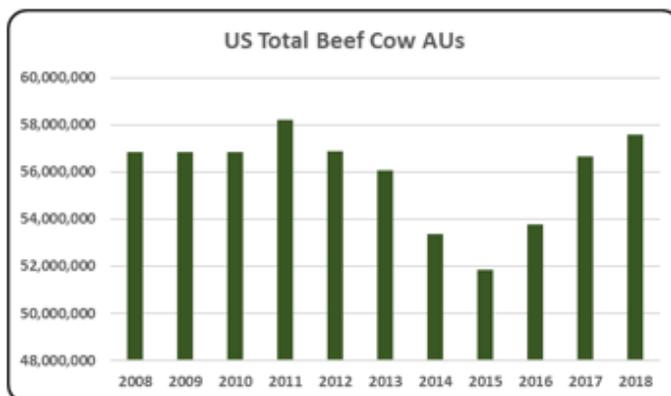
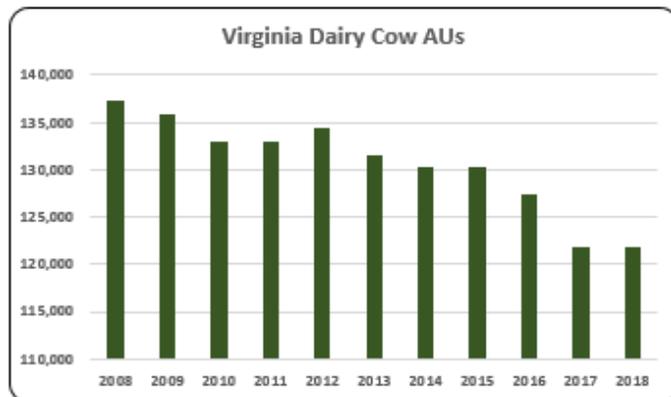
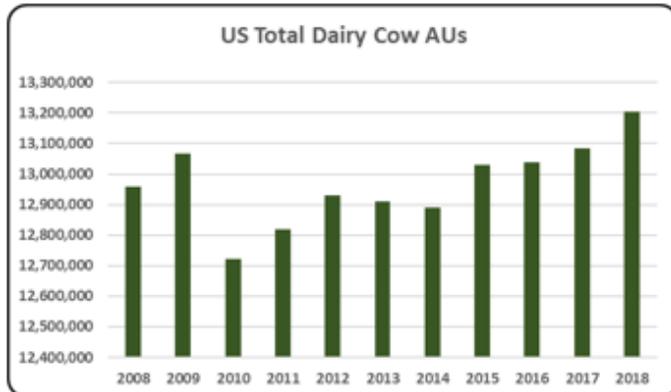
- Virginia animal unit numbers in 2018 were 1.8 million AUs, a 4.0% decrease from a decade earlier in 2008.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broilers were the largest animal sector in Virginia. In 2018, 46.4% (838,192 AUs) of all AUs were from broiler production. Broiler AUs in 2018 were the highest of the last decade, increasing 13.6% since 2008.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 0.6% (9,991 AUs) of all AUs in Virginia were in laying hens in 2018. Laying hen AUs in 2018 dropped 14.6% relative to 2008 (11,702 AUs) in Virginia.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- There were 246,200 turkey AUs, on average, between 2008 and 2018 in Virginia. 2018 turkey AUs (234,679 AUs) decreased 13.9% compared to 2008 (272,535 AUs).
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs decreased 38.1% between 2008 (78,300 AUs) and 2018 (48,480 AUs) in Virginia.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- There were 130,582 dairy cow AUs, on average, from 2008 to 2018. Dairy cow AUs dropped 11.2% during that time period in Virginia.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cow numbers in Virginia fell between 2008 and 2018. In Virginia 30.6% of all AUs were from beef cows in 2018 (552,900 AUs).

Virginia Additional Information and Methodology

Animal agriculture is an important part of Virginia's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Virginia, of interest is the degree to which the industry impacts the Virginia economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Virginia animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Virginia's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Virginia which have occurred. As shown in this state report, Virginia has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Virginia. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Virginia Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Virginia’s economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of “per million dollars” of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Virginia, \$1.49 to \$2.18 million in total economic activity, \$0.31 to \$0.46 in household wages and 7 to 10 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.624	\$ 0.313	7.1
	Hogs, Pigs, and Other	\$ 1.494	\$ 0.338	7.6
	Poultry and Eggs	\$ 2.183	\$ 0.455	10.0
	Dairy	\$ 1.800	\$ 0.398	9.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	644,400	644,400	644,400	561,000	451,200	625,950	559,200	518,475	502,875	558,900	552,900
	Hog and Pig AUs	78,300	71,250	79,500	57,300	54,450	48,900	47,775	48,525	50,775	49,305	48,480
	Broiler AUs	738,032	708,532	736,879	732,504	727,400	751,713	787,450	789,866	808,784	833,720	838,192
	Turkey AUs	272,535	249,942	249,583	256,537	249,158	225,062	240,780	242,945	246,584	240,398	234,679
	Egg Layer AUs	11,702	11,428	11,804	12,088	11,358	11,426	11,799	11,704	10,524	9,895	9,991
	Dairy AUs	137,200	135,800	133,000	133,000	134,400	131,600	130,200	130,200	127,400	121,800	121,800
	Total Animal Units	1,882,169	1,821,352	1,855,166	1,752,429	1,627,966	1,794,650	1,777,204	1,741,714	1,746,942	1,814,018	1,806,043
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 340,907	\$ 343,919	\$ 364,945	\$ 432,521	\$ 515,665	\$ 483,683	\$ 669,635	\$ 668,815	\$ 435,616	\$ 435,286	\$ 386,881
	Hogs and Pigs (\$1,000)	\$ 57,464	\$ 48,814	\$ 60,325	\$ 48,919	\$ 40,495	\$ 44,822	\$ 42,272	\$ 47,778	\$ 44,585	\$ 46,842	\$ 29,561
	Broilers (\$1,000)	\$ 575,690	\$ 550,228	\$ 622,792	\$ 593,074	\$ 653,400	\$ 819,754	\$ 917,917	\$ 791,775	\$ 733,204	\$ 875,242	\$ 935,431
	Turkeys (\$1,000)	\$ 261,043	\$ 192,854	\$ 251,715	\$ 299,305	\$ 306,910	\$ 257,557	\$ 328,063	\$ 375,240	\$ 385,342	\$ 292,396	\$ 235,620
	Eggs (\$1,000)	\$ 77,103	\$ 66,223	\$ 77,640	\$ 88,362	\$ 91,531	\$ 99,390	\$ 114,471	\$ 122,443	\$ 96,909	\$ 89,995	\$ 100,668
	Milk (\$1,000)	\$ 372,816	\$ 265,608	\$ 333,486	\$ 397,089	\$ 359,216	\$ 398,918	\$ 480,330	\$ 343,574	\$ 310,140	\$ 336,784	\$ 286,125
	Other	\$ 51,559	\$ 54,182	\$ 56,770	\$ 59,382	\$ 61,378	\$ 68,458	\$ 75,938	\$ 82,732	\$ 89,978	\$ 97,561	\$ 103,934
	Sheep and Lambs (\$1,000)	\$ 4,737	\$ 5,400	\$ 6,027	\$ 6,678	\$ 6,713	\$ 6,681	\$ 7,048	\$ 6,730	\$ 6,864	\$ 7,335	\$ 6,596
	Aquaculture (\$1,000)	\$ 46,822	\$ 48,782	\$ 50,743	\$ 52,704	\$ 54,665	\$ 61,777	\$ 68,889	\$ 76,002	\$ 83,114	\$ 90,226	\$ 97,338
	Total (\$1,000)	\$ 1,736,582	\$ 1,521,828	\$ 1,767,673	\$ 1,918,652	\$ 2,028,594	\$ 2,172,582	\$ 2,628,625	\$ 2,432,357	\$ 2,095,774	\$ 2,174,106	\$ 2,078,220

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	20,967	20,923	18,149	17,332
	Cattle feedlots (112112)	1,618	778	373	314
	Dairy cattle and milk production (11212)	1,109	934	691	609
	Hog and pig farming (1122)	202	375	323	321
	Poultry and egg production (1123)	1,392	1,798	1,668	1,499
	Sheep and goat farming (1124)	912	1,512	1,564	2,161
	Animal aquaculture and other animal production (1125,1129)	5,391	5,973	6,217	5,796
Value of Sales (\$1,000)	Cattle and Calves	471,703	574,506	707,976	679,486
	Hogs and Pigs	72,213	56,960	67,702	96,223
	Poultry and Eggs	750,035	971,851	1,161,564	1,350,654
	Milk*			347,204	334,521
	Aquaculture	19,945	53,032	54,665	90,226
	Other (calculated)	6,782	61,194	22,023	47,929
	Total	1,320,678	1,717,543	2,361,134	2,599,039
Input Purchases	Livestock and poultry purchased	(Farms) 13,434	11,487	13,722	12,999
		\$1,000 277,272	323,214	424,722	432,549
	Breeding livestock purchased	(Farms) 6,974	6,167	7,395	6,919
		\$1,000 27,806	38,777	57,220	79,022
	Other livestock and poultry purchased	(Farms) 8,182	6,815	8,369	8,016
		\$1,000 249,466	284,437	367,502	353,527
Feed purchased	(Farms) 31,374	29,233	32,768	31,281	
	\$1,000 507,692	727,195	1,067,299	859,311	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 628,333	\$ 120,978	2,764	\$ 29,125
	Hogs, Pigs, and Other	\$ 199,455	\$ 45,121	1,012	\$ 10,863
	Poultry and Eggs	\$ 2,776,035	\$ 579,014	12,662	\$ 139,398
	Dairy	\$ 514,996	\$ 113,849	2,723	\$ 27,409
	Total	\$ 4,118,820	\$ 858,962	19,161	\$ 206,795
Change from 2008 to 2018	Cattle and Calves	\$ (33,326)	\$ (6,417)	(147)	\$ (1,545)
	Hogs, Pigs, and Other	\$ 4,793	\$ 1,084	24	\$ 261
	Poultry and Eggs	\$ 392,134	\$ 81,790	1,789	\$ 19,691
	Dairy	\$ (286,920)	\$ (63,429)	(1,517)	\$ (15,270)
	Total	\$ 76,681	\$ 13,029	149	\$ 3,137
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.624	\$ 0.313	7.1	
	Hogs, Pigs, and Other	\$ 1.494	\$ 0.338	7.6	
	Poultry and Eggs	\$ 2.183	\$ 0.455	10.0	
	Dairy	\$ 1.800	\$ 0.398	9.5	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				3.9%
	Total				24.1%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: WASHINGTON

Washington Executive Summary

The use of soybean meal as a key feed ingredient is a modest part of Washington animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Washington. The success of Washington animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Washington during 2018 animal agriculture contributed:

- \$4.8 billion in economic output
- 24,406 jobs
- \$1.1 billion in earnings
- \$215.9 million in income taxes paid at local, state, and federal levels
- \$217.8 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Washington has increased economic output by over \$119.4 million, boosted household earnings by \$23.5 million, contributed 537 additional jobs and paid \$4.7 million in additional tax revenues.

Washington's animal agriculture consumed almost 241.3 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (97.6 thousand tons)
- Egg-Laying Hens (63.4 thousand tons)
- Broilers (47.9 thousand tons)

This report examines animal agriculture in Washington over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Washington, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Washington and beyond.

Washington Economic Impact of Animal Agriculture

Animal agriculture is an important part of Washington's economy. In 2018, Washington's animal agriculture contributed the following to the economy:

- About \$4.8 billion in economic output
- \$1.1 billion in household earnings
- 24,406 jobs
- \$215.9 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Washington's animal agriculture has:

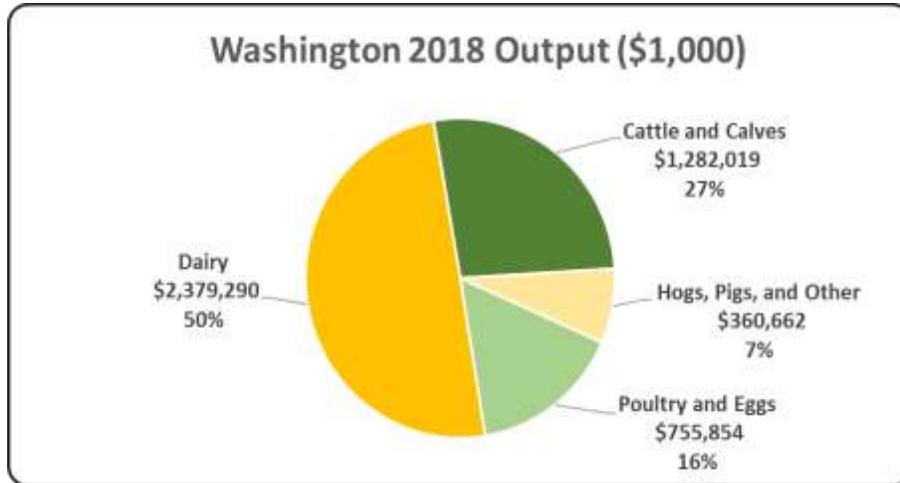
- Increased economic output by \$119.4 million
- Boosted household earnings by \$23.5 million
- Added 537 jobs
- Paid an additional \$4.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 4,777,825	\$ 119,353	2.56%
Earnings (\$1,000)	\$ 1,068,851	\$ 23,453	2.24%
Employment (Jobs)	24,406	537	2.25%
Income Taxes Paid (\$1,000)	\$ 215,908	\$ 4,738	2.24%
Property Taxes Paid in 2017 (\$1,000)	\$ 217,803		

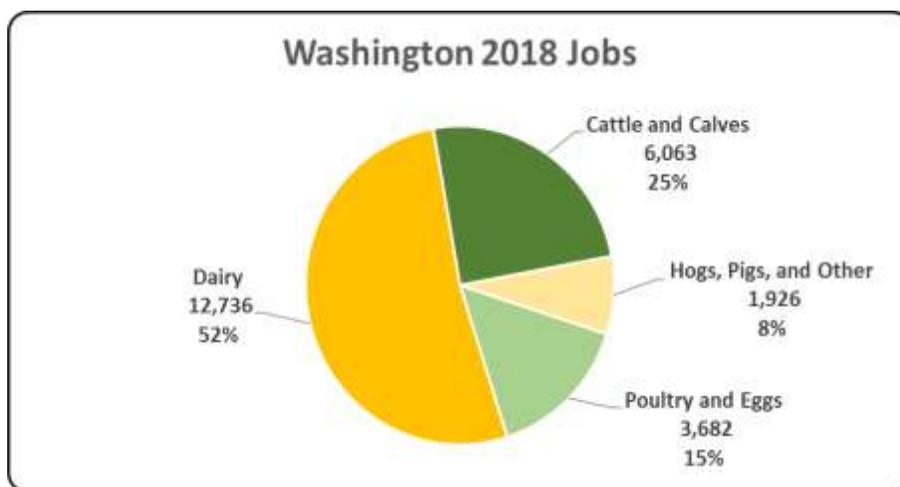
Washington Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Washington economy. Animal agriculture’s impact on Washington total economic output is about \$4.8 billion.



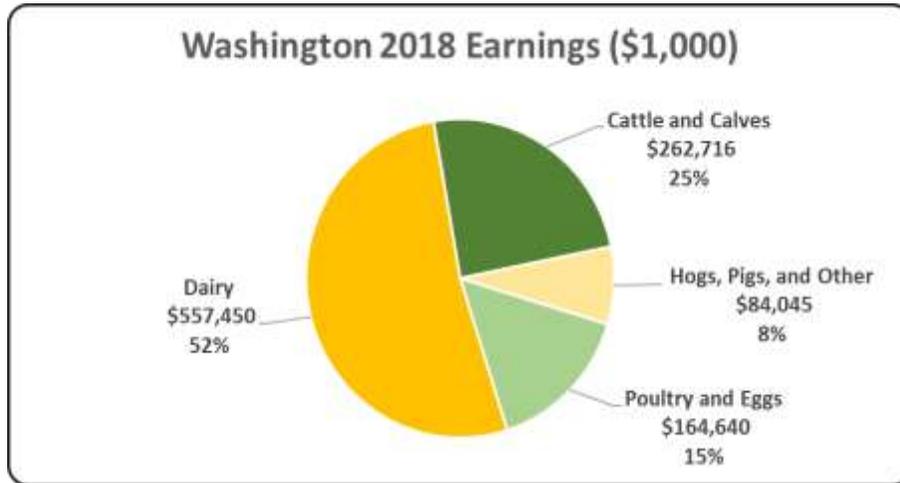
Washington Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Washington in terms of animal agriculture jobs. As shown, animal agriculture contributes 24,406 jobs within and outside of animal agriculture.



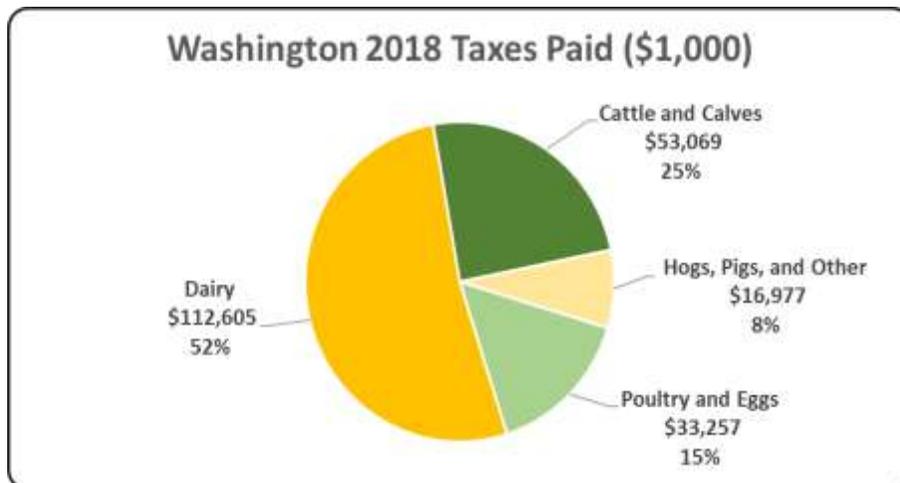
Washington Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Washington economy in terms of earnings. Washington’s animal agriculture contributed about \$1.1 billion to household earnings in 2018.



Washington Taxes Paid by Animal Agriculture

Washington’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$215.9 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$217.8 million in property taxes paid by all of Washington agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



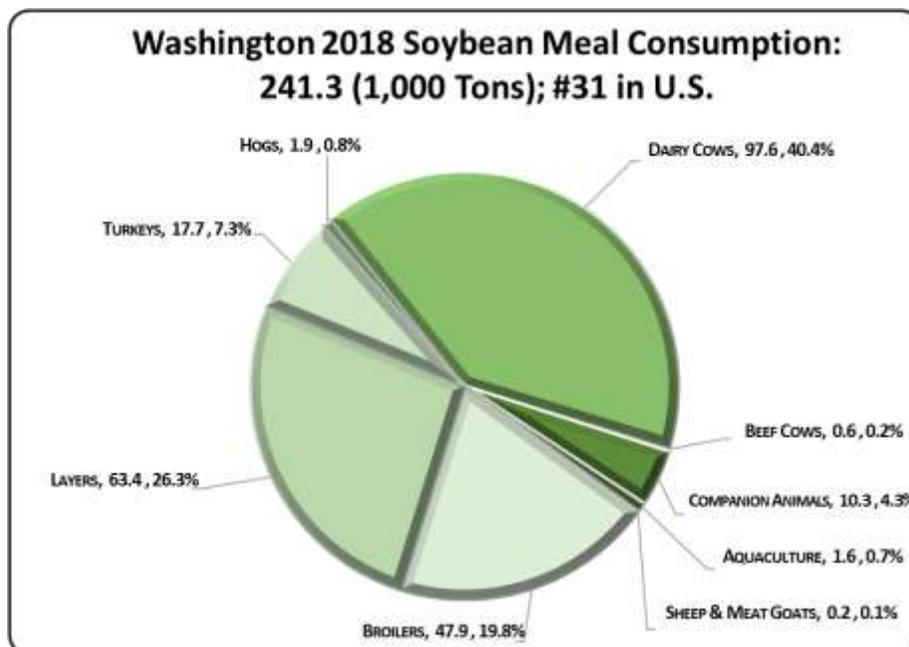
Washington Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Washington's animal agriculture consumed almost 241.3 thousand tons of soybean meal in 2018, placing the state as #31 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Washington consumed 15.4 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (97.6 thousand tons)
2. Egg-Laying Hens (63.4 thousand tons)
3. Broilers (47.9 thousand tons)

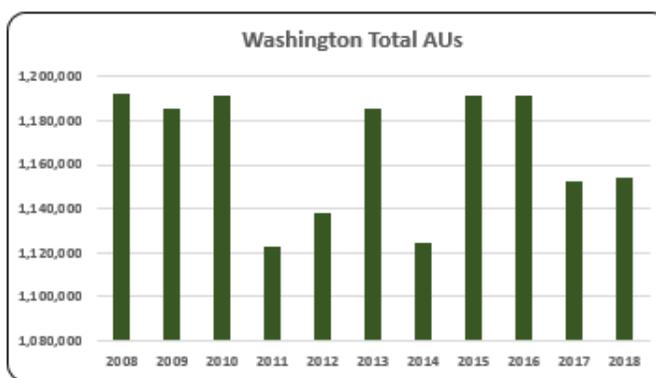
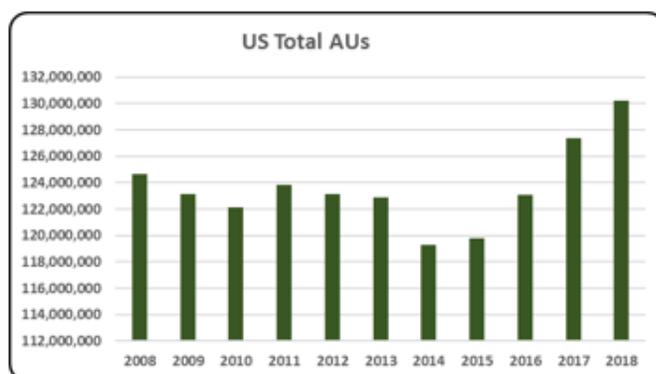


Washington Animal Unit (AU) Trends

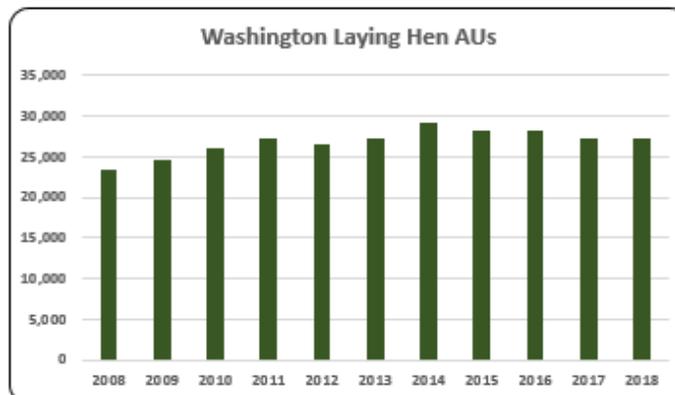
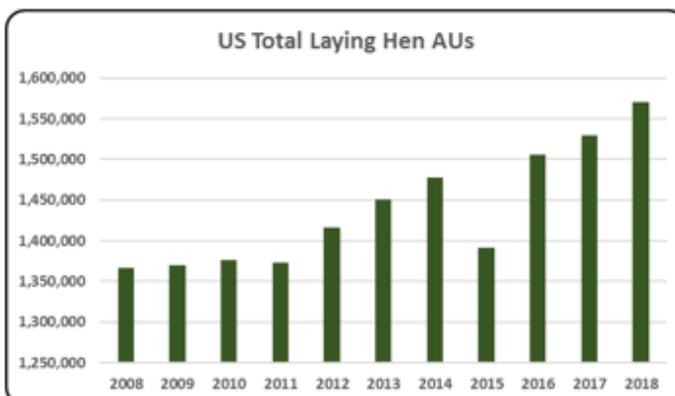
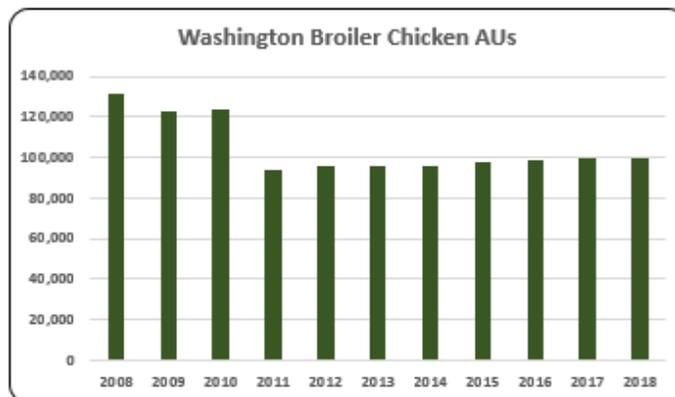
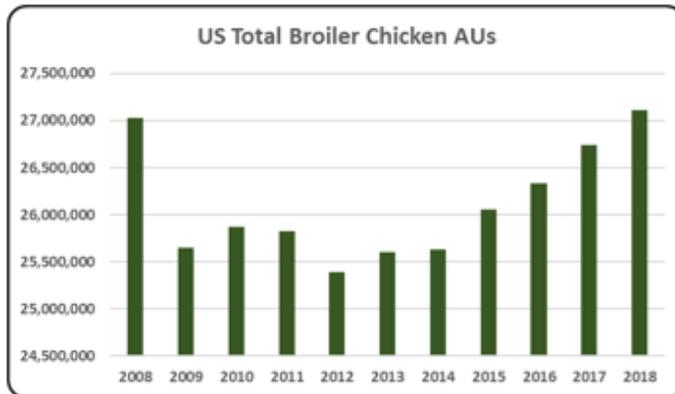
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Washington. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Washington and to give perspective on Washington's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

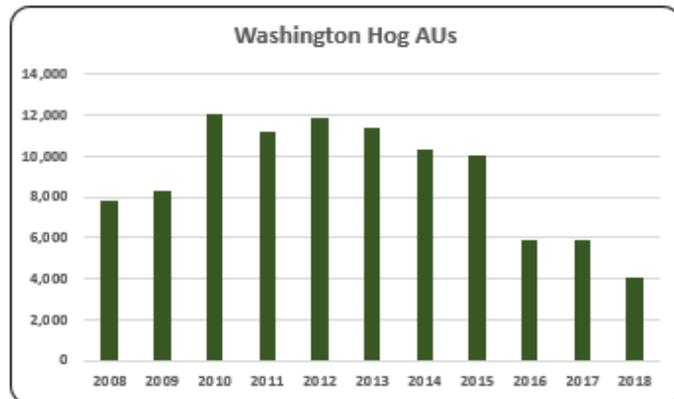
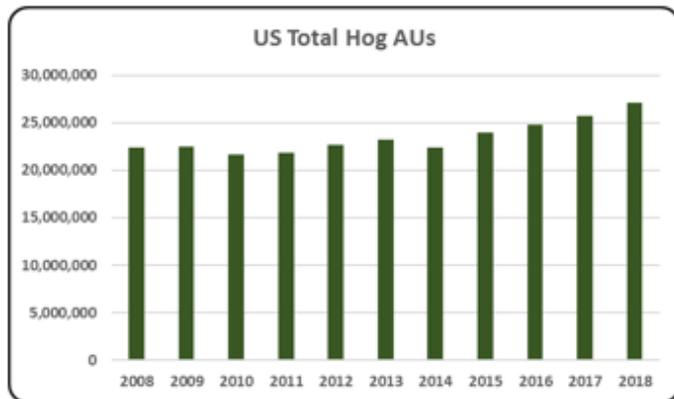
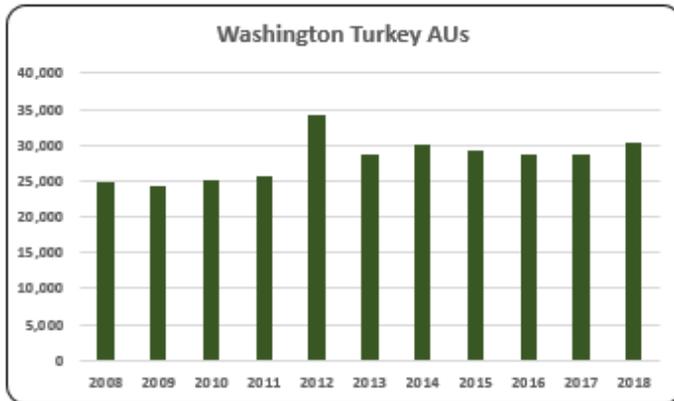
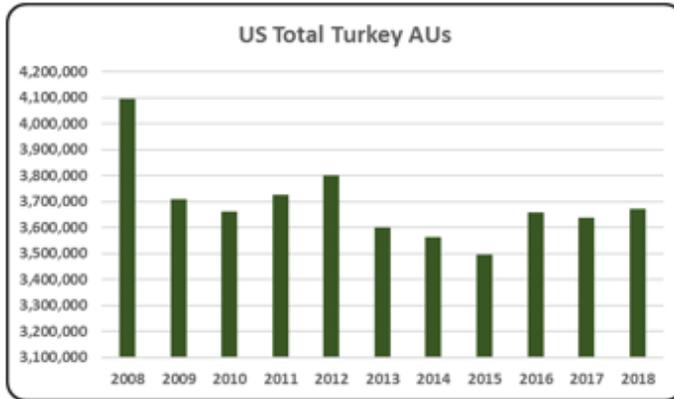
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Washington, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (607,500 AUs), Dairy Cows (385,000 AUs), and Broilers (99,923 AUs). Total animal units in Washington during 2018 were 1.2 billion AUs.



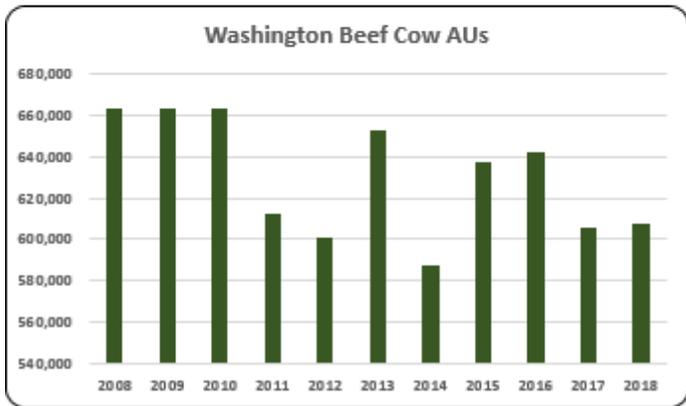
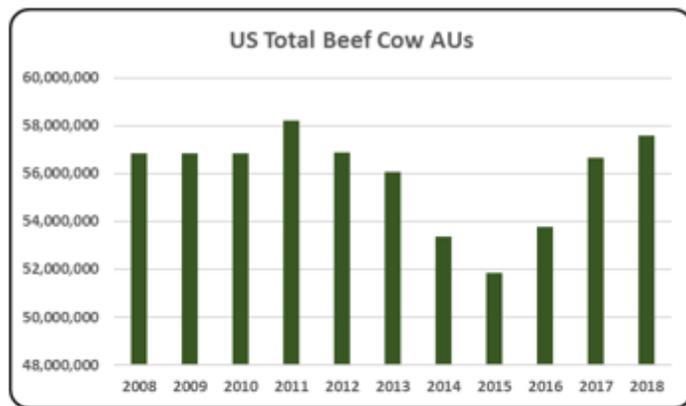
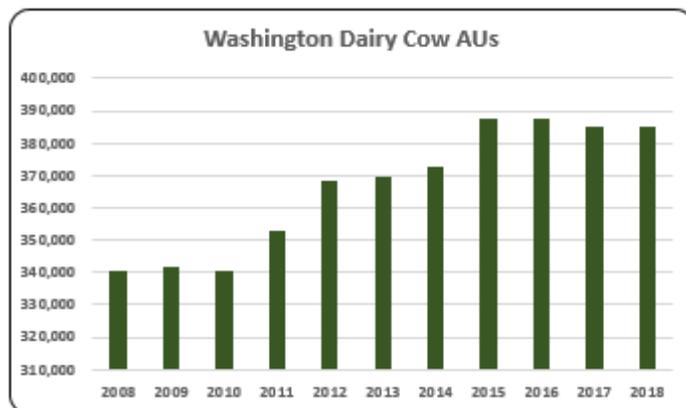
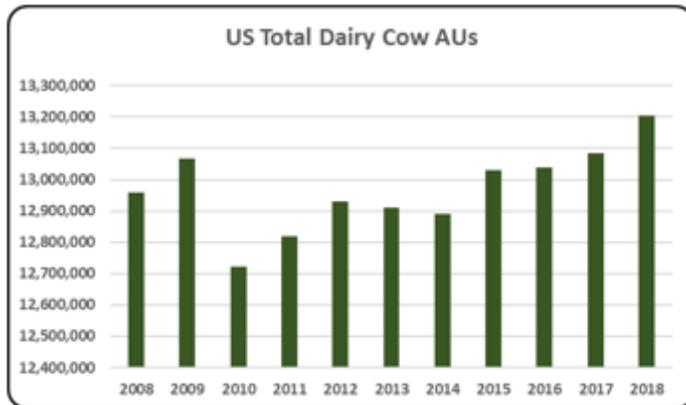
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- The state of Washington held 0.9% (1.2 million AUs) of all AUs in the U.S. This is below the decade average from 2008 to 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- Broiler numbers in 2018 (99,923 AUs) decreased 24.1% from 2008 AU levels (131,632 AUs) in Washington.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Washington’s laying hen numbers in 2018 were 27,280 layer AUs, increasing 16.2% compared to layer AUs in 2008 (23,468 AUs).



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs made up only 2.6% (30,383 AUs) of the Washington total AUs in 2018. There have been, on average, 28,193 AUs during the last decade going back to 2008.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- 0.4% (4,080 AUs) of animal units were from hogs in Washington in 2018. Hog AUs in 2018 were 47.5% lower than in 2008 (7,770 AUs) in Washington.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Dairy cows are the second largest species based on animal units in Washington. There were 385,000 dairy cow AUs in 2018 representing 33.4% of all AUs in Washington.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- In terms of animal units, beef cows are the largest animal sector in the state of Washington. In 2018, 52.6% (607,500 AUs) of all AUs were from beef cows in Washington.

Washington Additional Information and Methodology

Animal agriculture is an important part of Washington's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Washington, of interest is the degree to which the industry impacts the Washington economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Washington animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Washington's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Washington which have occurred. As shown in this state report, Washington has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Washington. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Washington Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Washington's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Washington, \$1.62 to \$2.18 million in total economic activity, \$0.38 to \$0.49 in household wages and 9 to 11 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.966	\$ 0.403	9.3
	Hogs, Pigs, and Other	\$ 1.616	\$ 0.377	8.6
	Poultry and Eggs	\$ 2.183	\$ 0.476	10.6
	Dairy	\$ 2.103	\$ 0.493	11.3

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	663,900	663,900	663,900	612,300	601,200	653,100	586,950	637,950	642,300	605,850	607,500
	Hog and Pig AUs	7,770	8,325	12,021	11,170	11,837	11,374	10,353	10,045	5,869	5,850	4,080
	Broiler AUs	131,632	122,387	124,033	93,460	96,138	95,802	95,258	97,717	98,447	99,858	99,923
	Turkey AUs	24,790	24,234	25,248	25,698	34,176	28,644	30,063	29,387	28,680	28,817	30,383
	Egg Layer AUs	23,468	24,692	25,972	27,312	26,617	27,254	29,129	28,231	28,172	27,259	27,280
	Dairy AUs	340,200	341,600	340,200	352,800	368,200	369,600	372,400	387,800	387,800	385,000	385,000
	Total Animal Units	1,191,759	1,185,137	1,191,374	1,122,740	1,138,168	1,185,774	1,124,154	1,191,130	1,191,268	1,152,635	1,154,166
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 494,443	\$ 467,592	\$ 566,958	\$ 587,179	\$ 658,787	\$ 715,458	\$ 805,951	\$ 848,509	\$ 704,488	\$ 664,438	\$ 652,062
	Hogs and Pigs (\$1,000)	\$ 4,526	\$ 4,377	\$ 10,645	\$ 13,390	\$ 14,777	\$ 13,526	\$ 14,073	\$ 10,586	\$ 5,805	\$ 5,910	\$ 4,270
	Broilers (\$1,000)	\$ 105,428	\$ 90,962	\$ 95,058	\$ 83,223	\$ 95,793	\$ 116,722	\$ 122,450	\$ 106,827	\$ 94,983	\$ 111,533	\$ 85,448
	Turkeys (\$1,000)	\$ 27,622	\$ 26,178	\$ 49,607	\$ 39,006	\$ 41,941	\$ 30,401	\$ 20,112	\$ 27,244	\$ 30,808	\$ 20,859	\$ 20,282
	Eggs (\$1,000)	\$ 136,448	\$ 106,499	\$ 120,732	\$ 140,429	\$ 137,149	\$ 147,396	\$ 177,074	\$ 331,830	\$ 117,086	\$ 141,321	\$ 240,515
	Milk (\$1,000)	\$ 1,002,496	\$ 684,003	\$ 950,222	\$ 1,276,983	\$ 1,159,524	\$ 1,298,880	\$ 1,624,272	\$ 1,136,232	\$ 1,097,250	\$ 1,187,732	\$ 1,131,648
	Other	\$ 137,763	\$ 151,750	\$ 166,644	\$ 180,667	\$ 196,430	\$ 198,491	\$ 203,137	\$ 208,330	\$ 211,855	\$ 215,522	\$ 218,898
	Sheep and Lambs (\$1,000)	\$ 4,266	\$ 4,822	\$ 6,285	\$ 6,876	\$ 9,208	\$ 7,082	\$ 7,540	\$ 8,544	\$ 7,882	\$ 7,361	\$ 6,550
	Aquaculture (\$1,000)	\$ 133,497	\$ 146,928	\$ 160,359	\$ 173,791	\$ 187,222	\$ 191,410	\$ 195,598	\$ 199,785	\$ 203,973	\$ 208,161	\$ 212,349
	Total (\$1,000)	\$ 1,908,726	\$ 1,531,361	\$ 1,959,866	\$ 2,320,877	\$ 2,304,401	\$ 2,520,875	\$ 2,967,070	\$ 2,669,558	\$ 2,262,276	\$ 2,347,314	\$ 2,353,124

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,393	8,200	9,008	9,088	
	Cattle feedlots (112112)	1,004	498	116	127	
	Dairy cattle and milk production (11212)	845	626	471	420	
	Hog and pig farming (1122)	348	567	485	445	
	Poultry and egg production (1123)	455	1,231	1,016	578	
	Sheep and goat farming (1124)	1,060	1,556	1,407	1,930	
	Animal aquaculture and other animal production (1125,1129)	6,421	8,211	5,698	5,607	
Value of Sales (\$1,000)	Cattle and Calves	709,585	716,720	994,835	1,068,925	
	Hogs and Pigs	6,803	5,921	4,542	4,195	
	Poultry and Eggs	143,962	228,825	261,992	251,233	
	Milk*			1,136,856	1,082,594	
	Aquaculture	215,130	162,867	187,222	208,161	
	Other (calculated)	37,534	50,260	25,363	35,970	
	Total	1,113,014	1,164,593	2,610,810	2,651,078	
Input Purchases	Livestock and poultry purchased	(Farms)	7,365	8,589	9,641	8,798
		\$1,000	394,109	326,256	424,941	464,019
	Breeding livestock purchased	(Farms)	3,765	4,247	4,250	3,874
		\$1,000	26,454	37,873	36,085	48,029
	Other livestock and poultry purchased	(Farms)	4,690	5,553	6,686	6,117
		\$1,000	367,655	288,383	388,856	415,990
Feed purchased	(Farms)	18,421	19,927	20,375	20,622	
	\$1,000	471,553	663,387	1,106,416	947,523	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,282,019	\$ 262,716	6,063	\$ 53,069
	Hogs, Pigs, and Other	\$ 360,662	\$ 84,045	1,926	\$ 16,977
	Poultry and Eggs	\$ 755,854	\$ 164,640	3,682	\$ 33,257
	Dairy	\$ 2,379,290	\$ 557,450	12,736	\$ 112,605
	Total	\$ 4,777,825	\$ 1,068,851	24,406	\$ 215,908
Change from 2008 to 2018	Cattle and Calves	\$ 120,282	\$ 24,649	569	\$ 4,979
	Hogs, Pigs, and Other	\$ 85,857	\$ 20,007	458	\$ 4,041
	Poultry and Eggs	\$ 52,789	\$ 11,498	257	\$ 2,323
	Dairy	\$ (139,574)	\$ (32,701)	(747)	\$ (6,606)
	Total	\$ 119,353	\$ 23,453	537	\$ 4,738
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.966	\$ 0.403	9.3	
	Hogs, Pigs, and Other	\$ 1.616	\$ 0.377	8.6	
	Poultry and Eggs	\$ 2.183	\$ 0.476	10.6	
	Dairy	\$ 2.103	\$ 0.493	11.3	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			0.0%	
	Total			20.2%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: WEST VIRGINIA

West Virginia Executive Summary

The use of soybean meal as a key feed ingredient is a modest part of West Virginia animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a factor of animal agriculture's success in the State of West Virginia. The success of West Virginia animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of West Virginia during 2018 animal agriculture contributed:

- \$771.0 million in economic output
- 3,374 jobs
- \$151.9 million in earnings
- \$37.9 million in income taxes paid at local, state, and federal levels
- \$30.9 million in the form of property taxes

West Virginia's animal agriculture consumed almost 207.1 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Broilers (150.4 thousand tons)
- Turkeys (34.2 thousand tons)
- Egg-Laying Hens (15.7 thousand tons)

This report examines animal agriculture in West Virginia over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in West Virginia, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of West Virginia and beyond.

West Virginia Economic Impact of Animal Agriculture

Animal agriculture is a moderate but shrinking part of West Virginia's economy. In 2018, West Virginia's animal agriculture contributed the following to the economy:

- About \$771.0 million in economic output
- \$151.9 million in household earnings
- 3,374 jobs
- \$37.9 million in income taxes

During the last decade West Virginia's animal agriculture has:

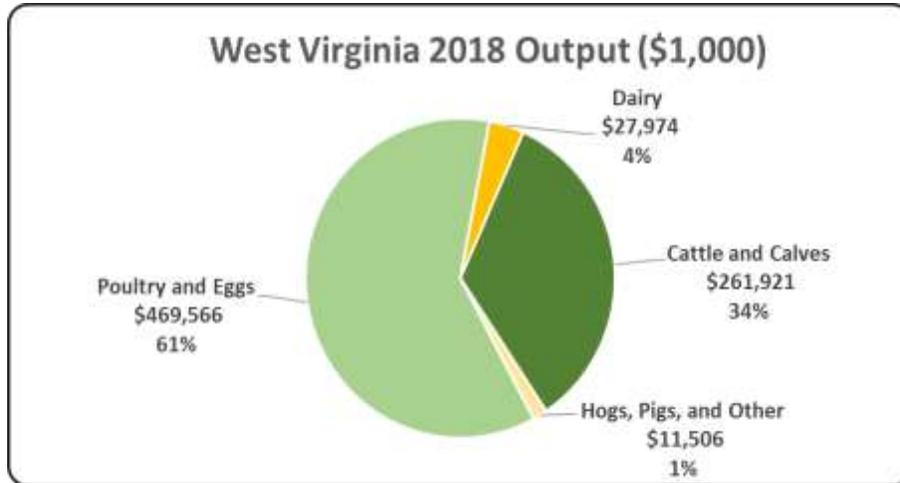
- Decreased economic output by almost \$900,000
- Reduced household earnings by \$1.2 million
- Shrunk by 34 jobs
- Paid about \$305,000 less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 770,968	\$ 891	0.12%
Earnings (\$1,000)	\$ 151,912	\$ (1,223)	-0.80%
Employment (Jobs)	3,374	(34)	-1.01%
Income Taxes Paid (\$1,000)	\$ 37,902	\$ (305)	-0.80%
Property Taxes Paid in 2017 (\$1,000)	\$ 30,943		

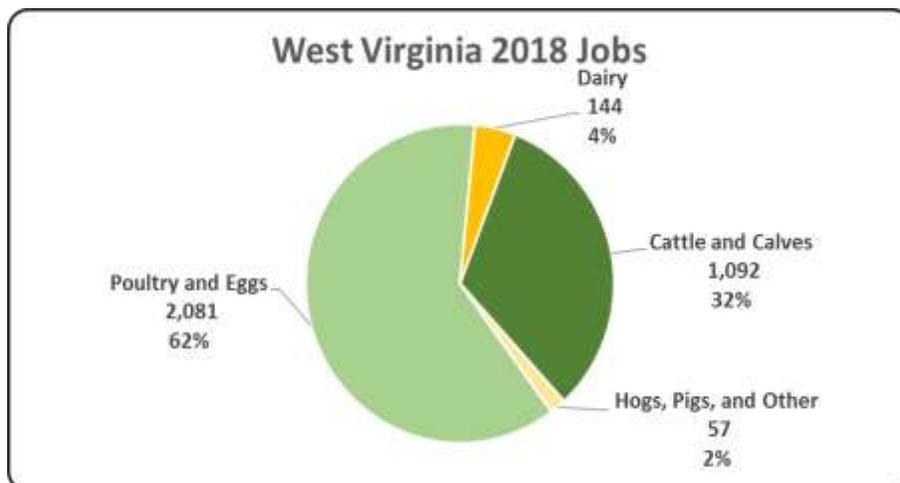
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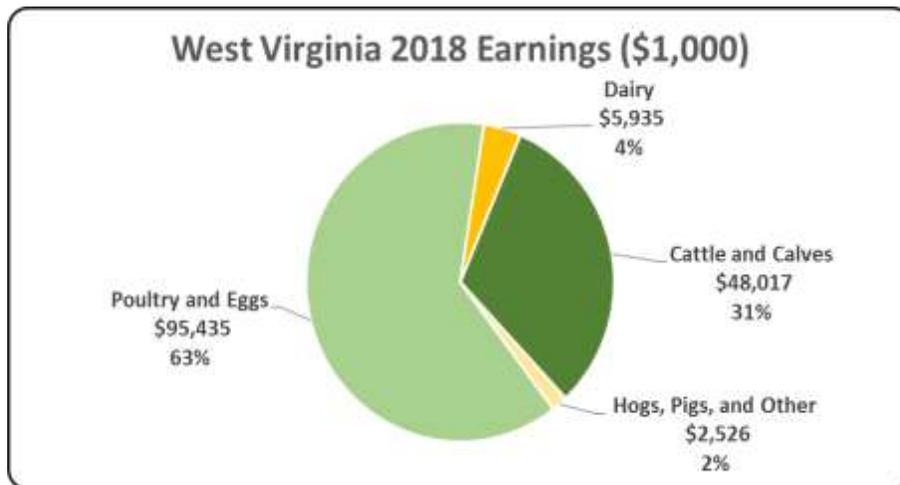
West Virginia Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to West Virginia in terms of animal agriculture jobs. As shown, animal agriculture contributes 3,374 jobs within and outside of animal agriculture.



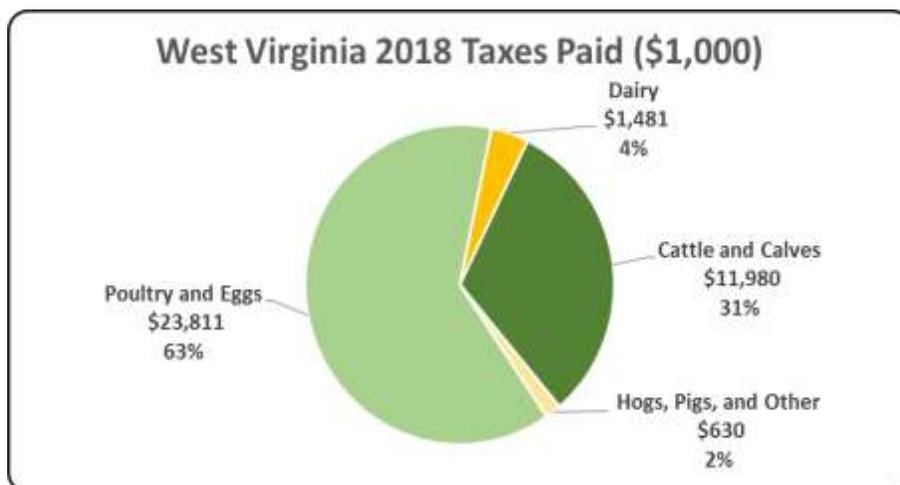
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West Virginia Taxes Paid by Animal Agriculture

West Virginia’s animal agriculture is also a small source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$37.9 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$30.9 million in property taxes paid by all of West Virginia agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



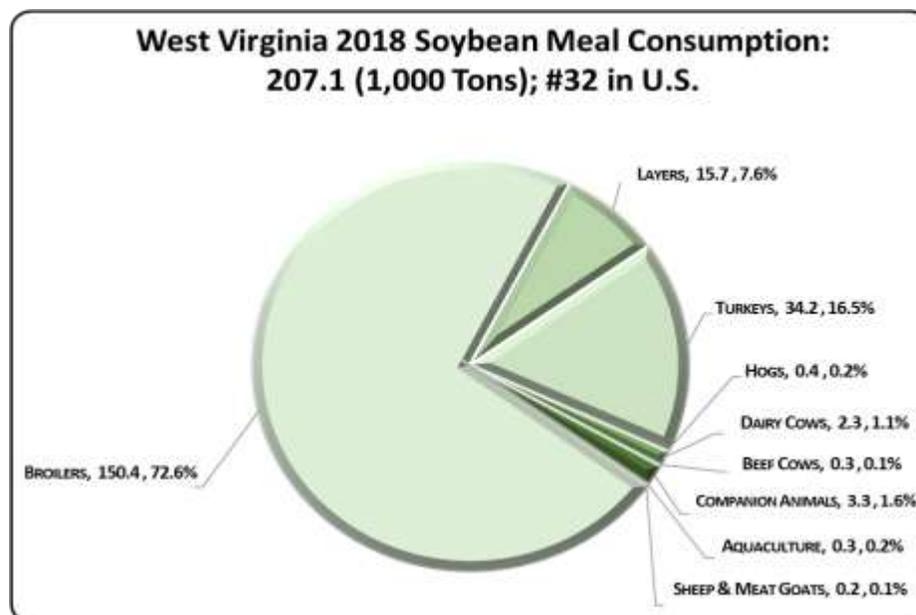
West Virginia Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

West Virginia's animal agriculture consumed almost 207.1 thousand tons of soybean meal in 2018, placing the state as #32 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in West Virginia consumed 3,600 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Broilers (150.4 thousand tons)
2. Turkeys (34.2 thousand tons)
3. Egg-Laying Hens (15.7 thousand tons)

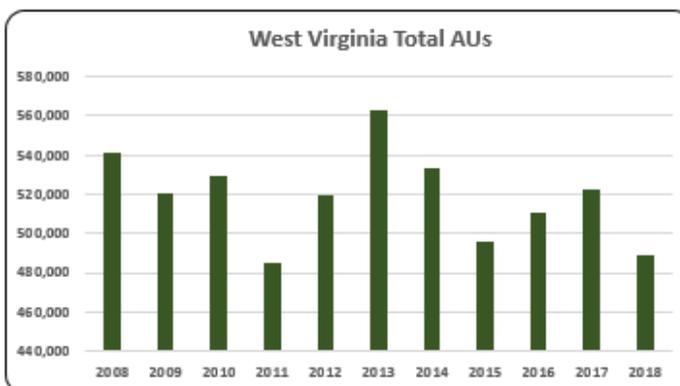
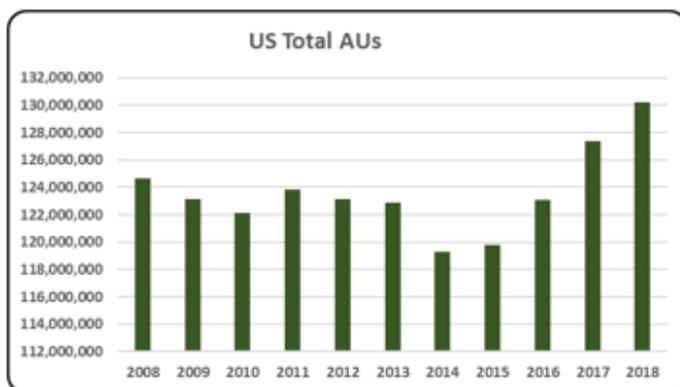


West Virginia Animal Unit (AU) Trends

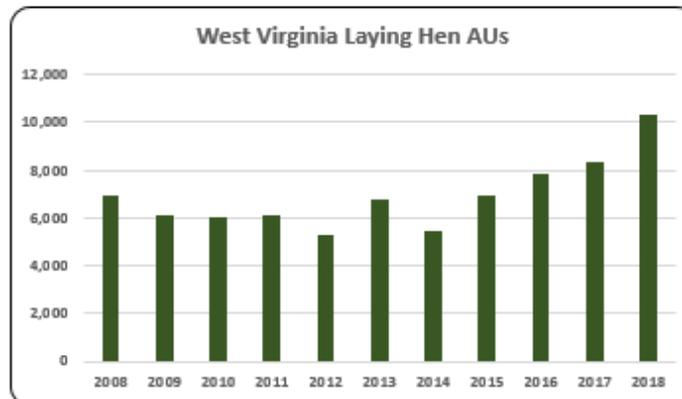
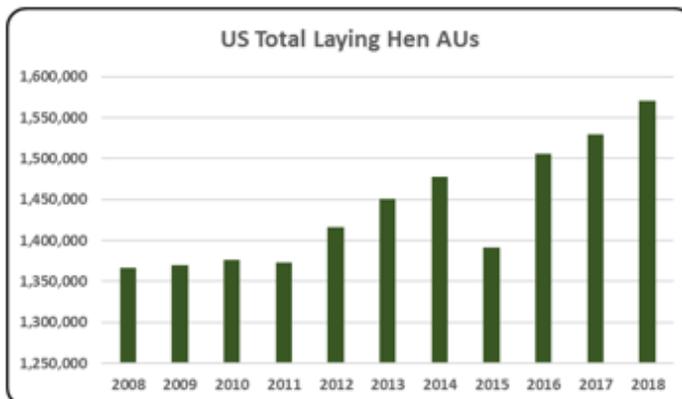
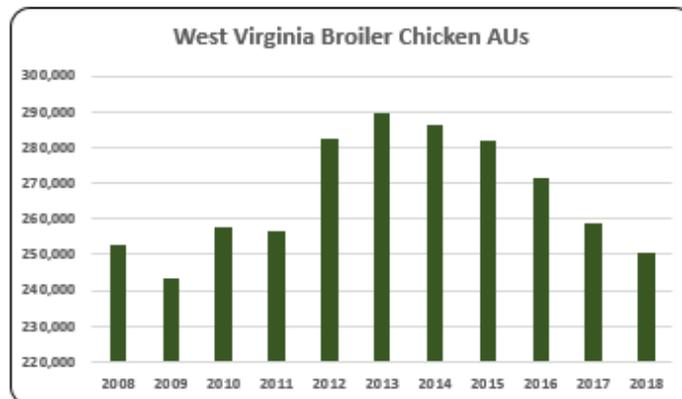
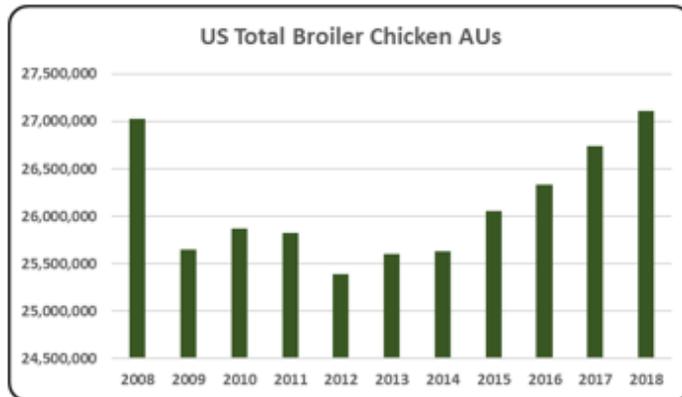
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of West Virginia. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to West Virginia and to give perspective on West Virginia's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

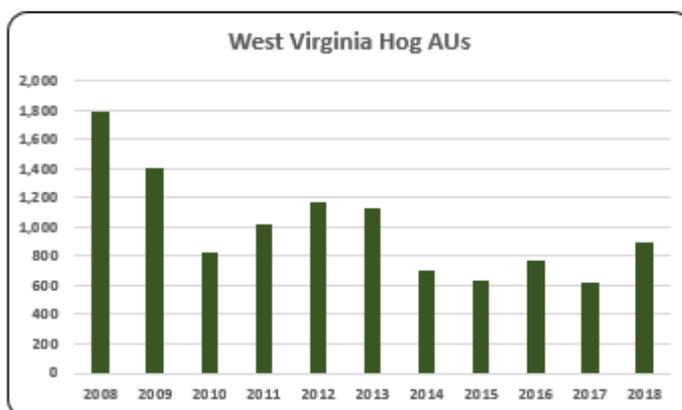
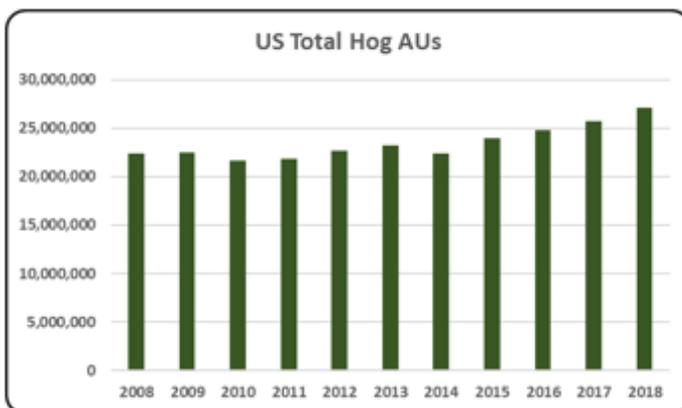
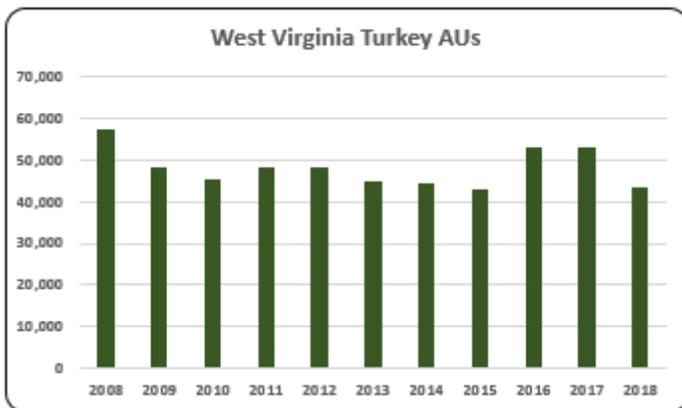
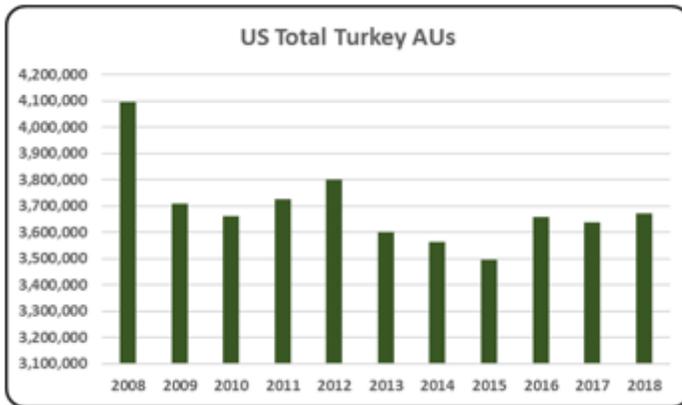
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In West Virginia, the largest three segments of animal agriculture in terms of AUs during 2018 were: Broilers (250,346 AUs), Beef Cows (174,675 AUs), and Turkeys (43,304 AUs). Total animal units in West Virginia during 2018 were 489,320 AUs.



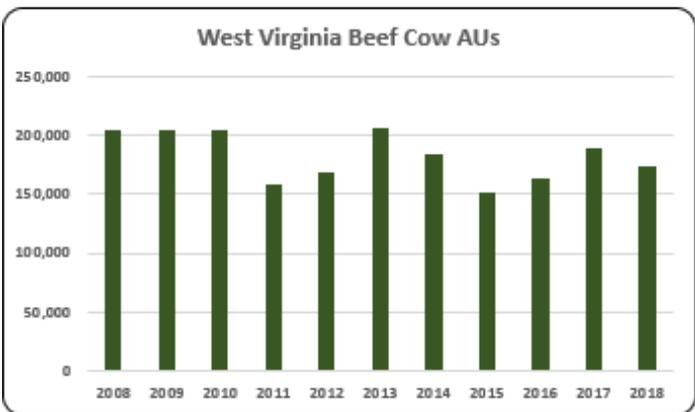
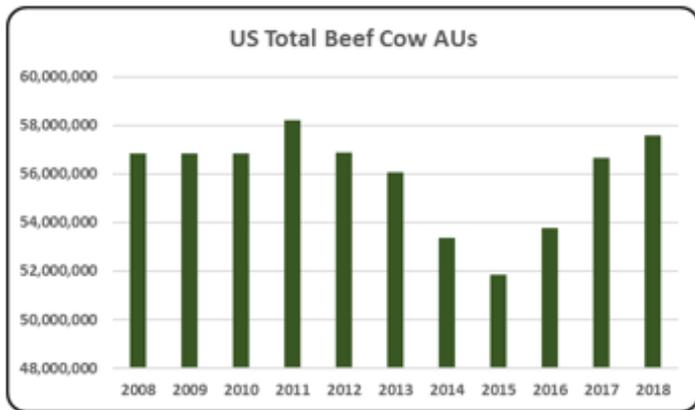
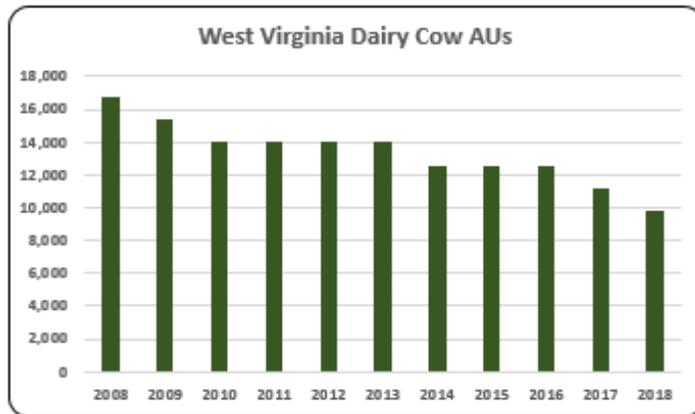
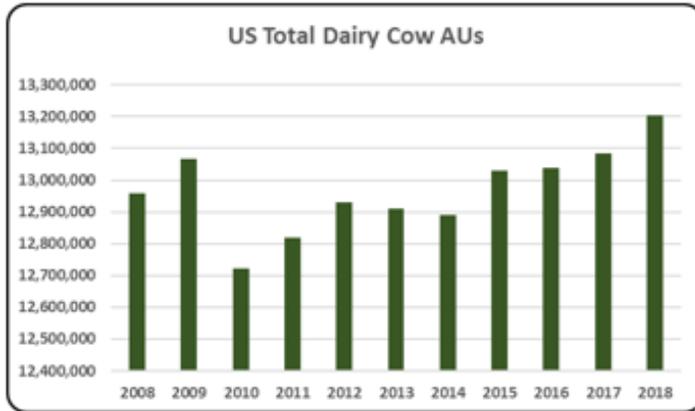
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 489,320 AUs in West Virginia in 2018 representing only 0.4% of the U.S. total, and below the decade average of 518,988 AUs from 2008 to 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- On average, there were 266,451 broiler AUs from 2008 to 2018 in West Virginia. Broiler production fell 0.9% in 2018 compared to 2008.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hen animal units increased 49.2% from 6,902 laying hen AUs in 2008 to 10,296 laying hen AUs in 2018 in West Virginia.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- Turkey AUs in West Virginia decreased by 24.7% over the last decade to 43,304 in 2018. Turkeys make up 8.9% of all AUs in the state.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs decreased by 49.6% from the high level at the beginning of the time period in 2008 (1,785 AUs) to a much lower total in 2018 (900 AUs).



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- There were 9,800 dairy cow AUs in West Virginia in 2018. Dairy cow AUs in 2018 were 41.7% less than in 2008 (16,800 AUs).
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- 35.7% (174,675 AUs) of all 2018 AUs in West Virginia were made up of beef cows. Beef cow AUs decreased 14.9% from 2008 to 2018 in West Virginia.

West Virginia Additional Information and Methodology

Animal agriculture is a moderate part of West Virginia's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in West Virginia, of interest is the degree to which the industry impacts the West Virginia economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for West Virginia animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted West Virginia's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in West Virginia which have occurred. As shown in this state report, West Virginia has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in West Virginia. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

West Virginia Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on West Virginia's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in West Virginia, \$1.34 to \$1.67 million in total economic activity, \$0.29 to \$0.34 in household wages and 7 to 8 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 1.664	\$ 0.305	6.9
	Hogs, Pigs, and Other	\$ 1.342	\$ 0.295	6.6
	Poultry and Eggs	\$ 1.672	\$ 0.340	7.4
	Dairy	\$ 1.537	\$ 0.326	7.9

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	205,350	205,350	205,350	158,850	168,330	206,385	183,750	151,125	164,475	190,275	174,675
	Hog and Pig AUs	1,785	1,410	825	1,020	1,170	1,125	705	630	765	615	900
	Broiler AUs	252,694	243,337	257,790	256,587	282,544	289,444	286,427	281,623	271,398	258,772	250,346
	Turkey AUs	57,535	48,518	45,512	48,376	48,366	45,012	44,430	42,873	53,044	52,945	43,304
	Egg Layer AUs	6,902	6,104	6,063	6,099	5,306	6,762	5,475	6,911	7,887	8,327	10,296
	Dairy AUs	16,800	15,400	14,000	14,000	14,000	14,000	12,600	12,600	12,600	11,200	9,800
	Total Animal Units	541,066	520,119	529,540	484,931	519,716	562,728	533,387	495,761	510,170	522,134	489,320
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 103,023	\$ 100,171	\$ 106,340	\$ 141,611	\$ 170,343	\$ 170,384	\$ 217,215	\$ 220,334	\$ 172,920	\$ 175,922	\$ 157,433
	Hogs and Pigs (\$1,000)	\$ 1,193	\$ 1,117	\$ 699	\$ 1,298	\$ 1,497	\$ 1,184	\$ 939	\$ 756	\$ 812	\$ 651	\$ 750
	Broilers (\$1,000)	\$ 161,644	\$ 151,176	\$ 166,772	\$ 156,794	\$ 188,000	\$ 233,816	\$ 236,773	\$ 191,582	\$ 168,352	\$ 182,675	\$ 176,924
	Turkeys (\$1,000)	\$ 55,109	\$ 41,548	\$ 47,617	\$ 60,089	\$ 61,868	\$ 51,511	\$ 60,535	\$ 73,794	\$ 91,426	\$ 70,766	\$ 49,169
	Eggs (\$1,000)	\$ 30,275	\$ 28,183	\$ 38,911	\$ 39,398	\$ 40,760	\$ 46,209	\$ 55,887	\$ 54,603	\$ 55,890	\$ 50,120	\$ 54,681
	Milk (\$1,000)	\$ 34,028	\$ 20,898	\$ 26,533	\$ 32,656	\$ 29,260	\$ 30,856	\$ 34,160	\$ 24,675	\$ 21,574	\$ 22,860	\$ 18,204
	Other	\$ 4,448	\$ 4,676	\$ 5,911	\$ 6,414	\$ 7,688	\$ 6,994	\$ 7,181	\$ 7,821	\$ 7,958	\$ 7,836	\$ 7,826
	Sheep and Lambs (\$1,000)	\$ 2,044	\$ 1,852	\$ 2,667	\$ 2,750	\$ 3,605	\$ 2,866	\$ 3,008	\$ 3,604	\$ 3,696	\$ 3,530	\$ 3,475
	Aquaculture (\$1,000)	\$ 2,404	\$ 2,824	\$ 3,244	\$ 3,664	\$ 4,083	\$ 4,128	\$ 4,172	\$ 4,217	\$ 4,261	\$ 4,306	\$ 4,351
	Total (\$1,000)	\$ 389,720	\$ 347,770	\$ 392,783	\$ 438,259	\$ 499,416	\$ 540,955	\$ 612,690	\$ 573,565	\$ 518,932	\$ 510,829	\$ 464,987

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	9,878	10,481	9,430	9,421
	Cattle feedlots (112112)	379	297	153	95
	Dairy cattle and milk production (11212)	278	165	155	149
	Hog and pig farming (1122)	217	335	170	227
	Poultry and egg production (1123)	520	1,113	680	651
	Sheep and goat farming (1124)	631	968	693	931
	Animal aquaculture and other animal production (1125,1129)	2,328	2,635	1,848	2,370
Value of Sales (\$1,000)	Cattle and Calves	117,967	164,962	217,411	171,784
	Hogs and Pigs	1,992	2,089	withheld	1,316
	Poultry and Eggs	250,922	301,708	401,439	387,884
	Milk*			32,654	22,819
	Aquaculture	2,712	3,478	withheld	4,306
	Other (calculated)	7,326	9,734	6,410	13,053
	Total	380,919	481,971	657,914	601,162
Input Purchases	Livestock and poultry purchased	(Farms) 5,911	5,845	6,198	6,957
		\$1,000 63,817	96,910	128,271	130,916
	Breeding livestock purchased	(Farms) 3,255	2,800	3,343	3,703
		\$1,000 8,075	8,821	22,374	37,643
	Other livestock and poultry purchased	(Farms) 3,393	3,814	3,820	4,392
		\$1,000 55,742	88,089	105,897	93,273
Feed purchased	(Farms) 14,291	14,027	15,066	16,225	
	\$1,000 130,696	177,847	327,286	195,412	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 261,921	\$ 48,017	1,092	\$ 11,980
	Hogs, Pigs, and Other	\$ 11,506	\$ 2,526	57	\$ 630
	Poultry and Eggs	\$ 469,566	\$ 95,435	2,081	\$ 23,811
	Dairy	\$ 27,974	\$ 5,935	144	\$ 1,481
	Total	\$ 770,968	\$ 151,912	3,374	\$ 37,902
Change from 2008 to 2018	Cattle and Calves	\$ 57,090	\$ 10,466	238	\$ 2,611
	Hogs, Pigs, and Other	\$ 2,461	\$ 540	12	\$ 135
	Poultry and Eggs	\$ (24,144)	\$ (4,907)	(107)	\$ (1,224)
	Dairy	\$ (34,516)	\$ (7,322)	(178)	\$ (1,827)
	Total	\$ 891	\$ (1,223)	(34)	\$ (305)
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 1.664	\$ 0.305	6.9	
	Hogs, Pigs, and Other	\$ 1.342	\$ 0.295	6.6	
	Poultry and Eggs	\$ 1.672	\$ 0.340	7.4	
	Dairy	\$ 1.537	\$ 0.326	7.9	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.8%	
	Total			25.0%	
Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.					

2008-2018 Animal Agriculture: WISCONSIN

Wisconsin Executive Summary

The use of soybean meal as a key feed ingredient is an important part of Wisconsin animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a key driver of animal agriculture success in the State of Wisconsin. The success of Wisconsin animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Wisconsin during 2018:

- \$16.6 billion in economic output
- 99,917 jobs
- \$3.7 billion in earnings
- \$974.6 million in income taxes paid at local, state, and federal levels
- \$329.3 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Wisconsin has increased economic output by over \$525.6 million, boosted household earnings by \$81.1 million, contributed 1,858 additional jobs and paid \$21.1 million in additional tax revenues.

Wisconsin's animal agriculture consumed almost 589.5 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Dairy Cows (328.4 thousand tons)
- Broilers (120.0 thousand tons)
- Egg-Laying Hens (57.9 thousand tons)

This report examines animal agriculture in Wisconsin over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Wisconsin, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a major contributor to the economic well-being of the people of Wisconsin and beyond.

Wisconsin Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Wisconsin's economy. In 2018, Wisconsin's animal agriculture contributed the following to the economy:

- About \$16.6 billion in economic output
- \$3.7 billion in household earnings
- 99,917 jobs
- \$974.6 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Wisconsin's animal agriculture has:

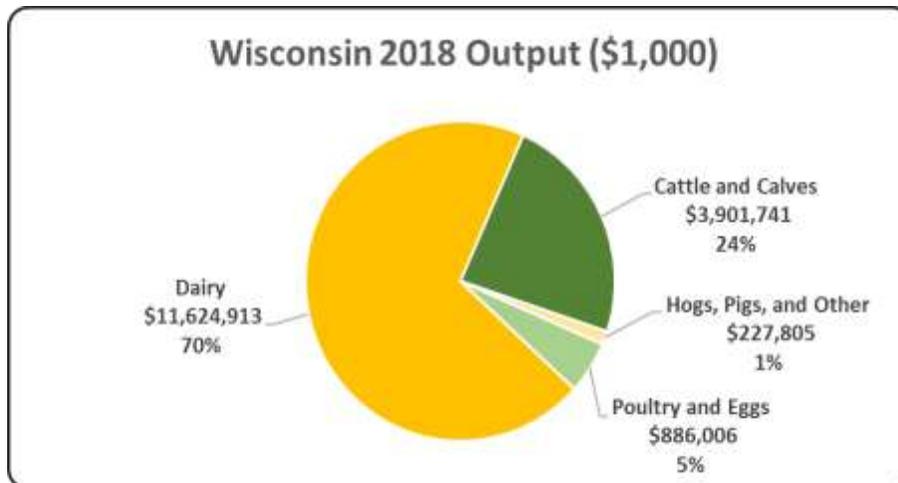
- Increased economic output by \$525.6 million
- Boosted household earnings by \$81.1 million
- Added 1,858 jobs
- Paid an additional \$21.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 16,640,465	\$ 525,557	3.26%
Earnings (\$1,000)	\$ 3,744,753	\$ 81,096	2.21%
Employment (Jobs)	99,917	1,858	1.89%
Income Taxes Paid (\$1,000)	\$ 974,572	\$ 21,105	2.21%
Property Taxes Paid in 2017 (\$1,000)	\$ 329,321		

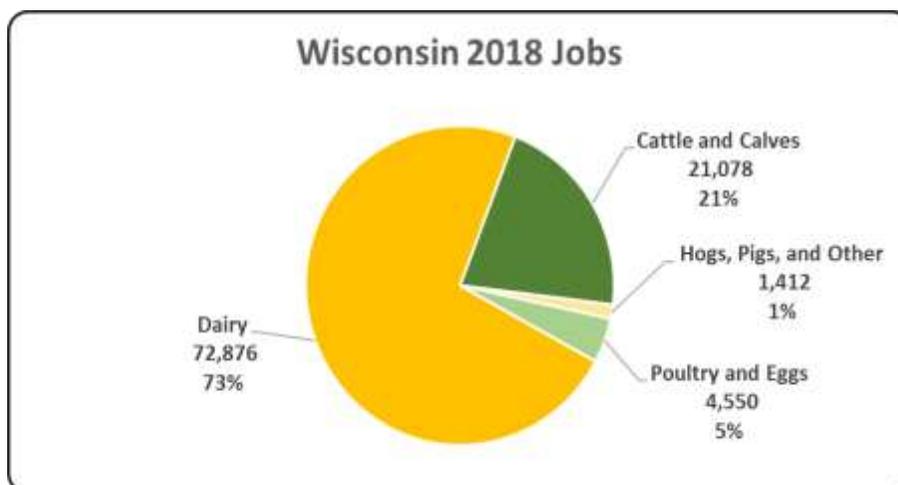
Wisconsin Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Wisconsin economy. Animal agriculture’s impact on Wisconsin total economic output is about \$16.6 billion.



Wisconsin Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Wisconsin in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Wisconsin total jobs, contributing 99,917 jobs within and outside of animal agriculture.



Wisconsin Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Wisconsin economy in terms of earnings. Wisconsin’s animal agriculture contributed about \$3.7 billion to household earnings in 2018.



Wisconsin Taxes Paid by Animal Agriculture

Wisconsin’s animal agriculture is also a significant source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$974.6 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$329.3 million in property taxes paid by all of Wisconsin agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



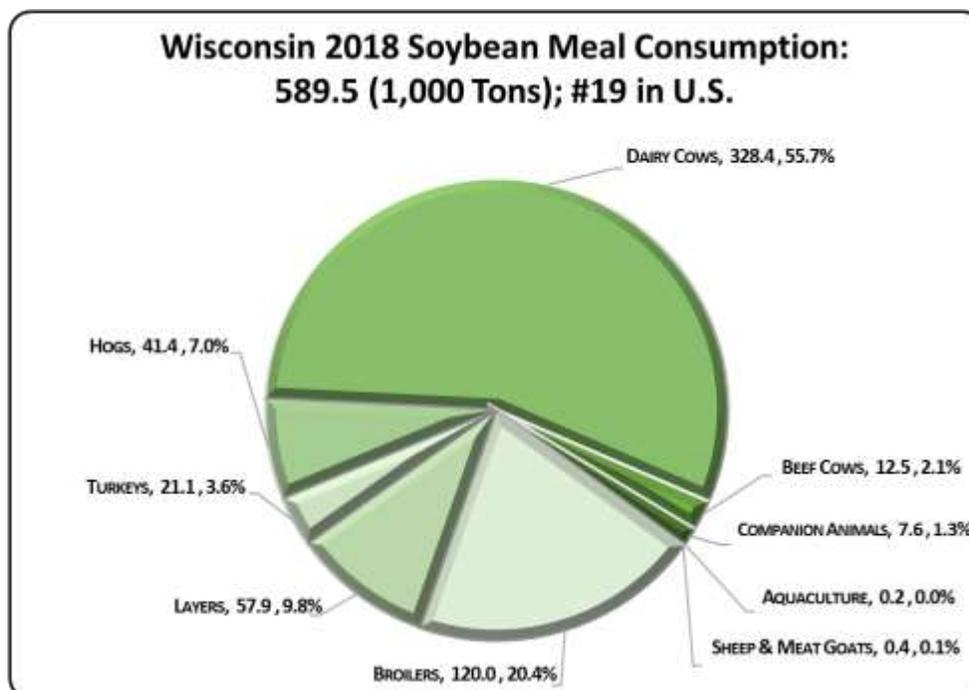
Wisconsin Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Wisconsin's animal agriculture consumed almost 589.5 thousand tons of soybean meal in 2018, placing the state as #19 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Wisconsin consumed 381.6 thousand tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Dairy Cows (328.4 thousand tons)
2. Broilers (120.0 thousand tons)
3. Egg-Laying Hens (57.9 thousand tons)

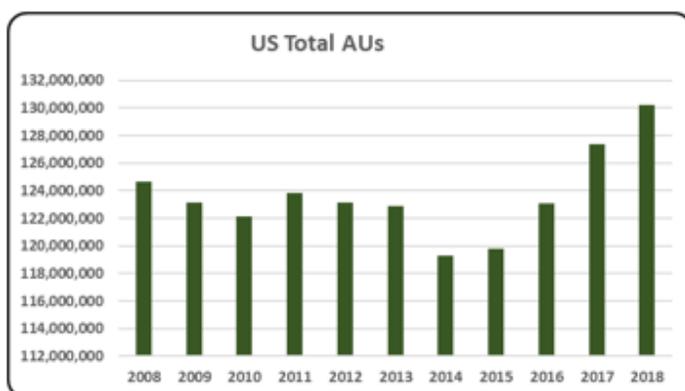


Wisconsin Animal Unit (AU) Trends

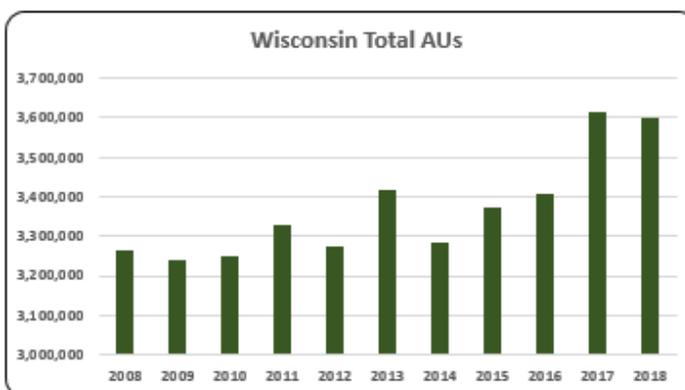
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Wisconsin. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Wisconsin and to give perspective on Wisconsin's contribution to the nation's animal agriculture industry and beyond.

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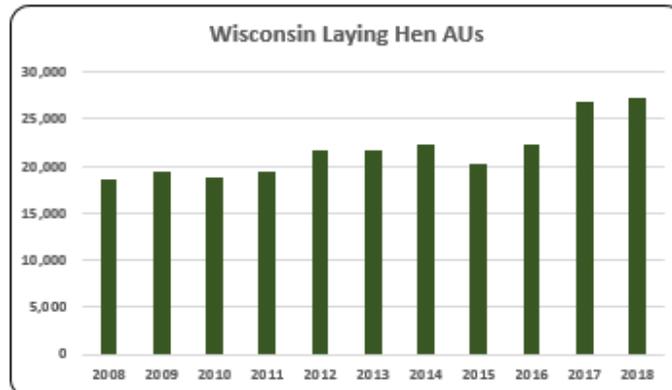
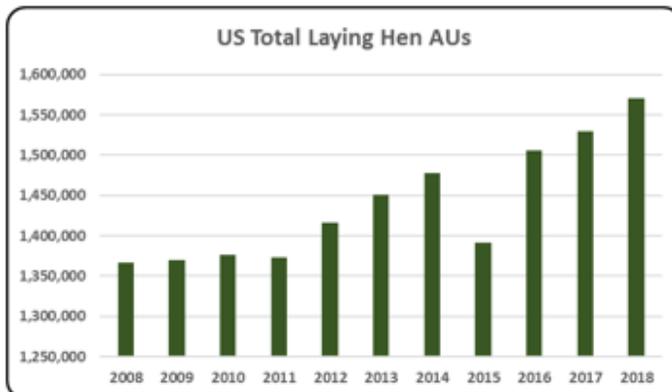
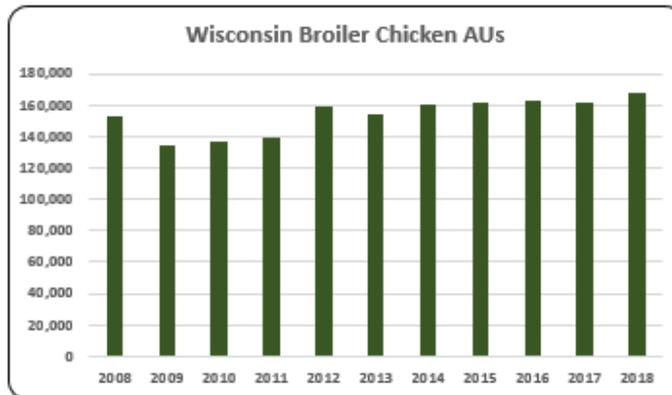
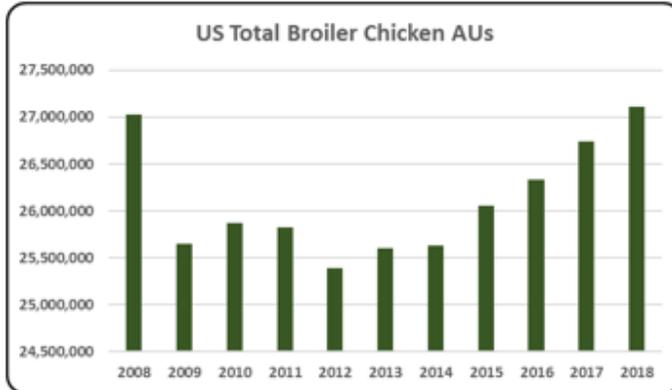
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Wisconsin, the largest three segments of animal agriculture in terms of AUs during 2018 were: Dairy Cows (1.8 million AUs), Beef Cows (1,441,485 AUs), and Broilers (167,699 AUs). Total animal units in Wisconsin during 2018 were 3.6 million AUs.



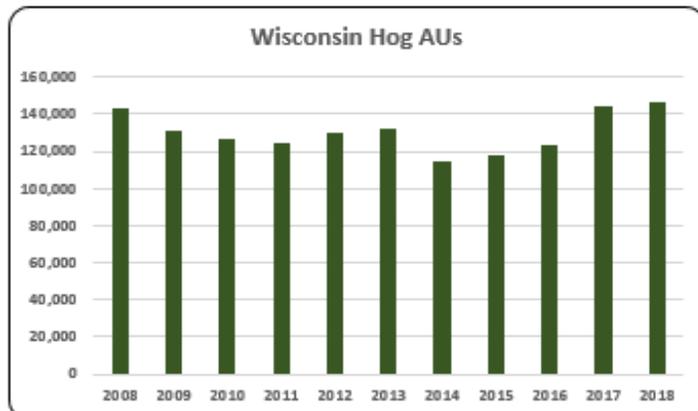
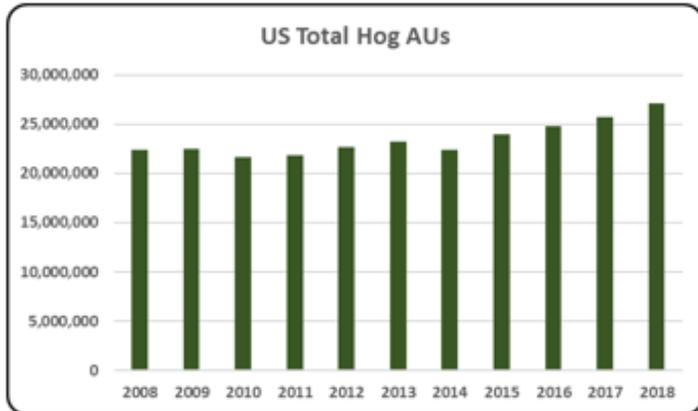
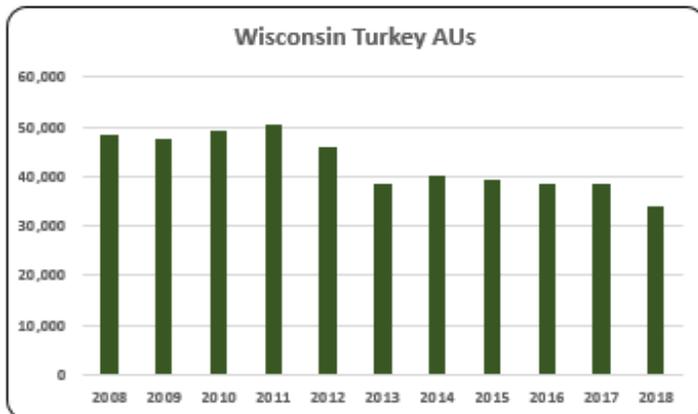
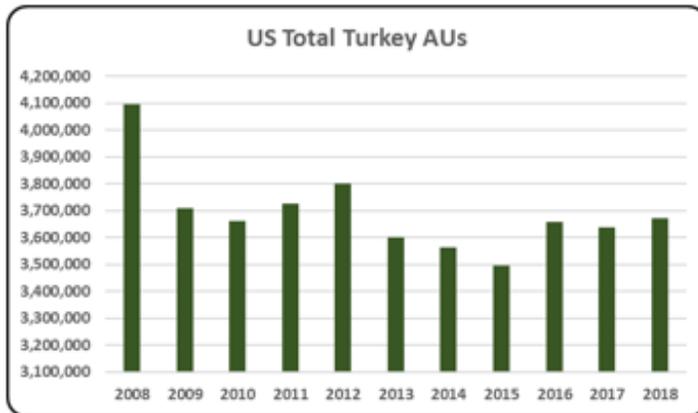
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.



- There were 3.6 million AUs in Wisconsin in 2018 representing about 2.8% of all AUs in the U.S. AUs increased 10.3% in 2018 relative to 2008's 3.3 million AUs in Wisconsin.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- On average, there were 153,767 broiler AUs in Wisconsin from 2008 to 2018. Broiler AUs in 2018 (167,699 AUs) increased by 10.0% compared to 2008 (152,442 AUs).
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens were the smallest animal sector in terms of animal units in Wisconsin with only 0.8% (27,181 AUs) of the total animal units in 2018.

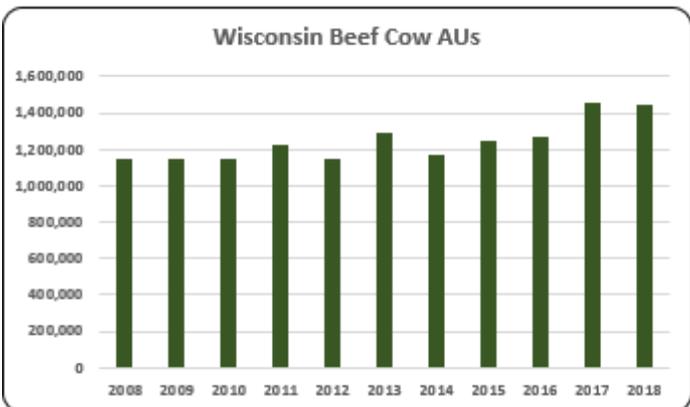
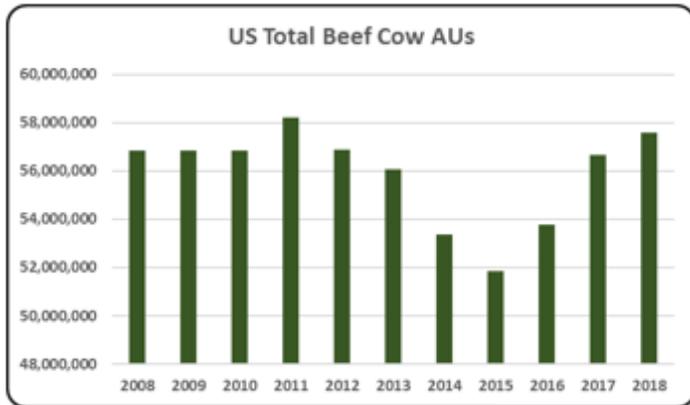
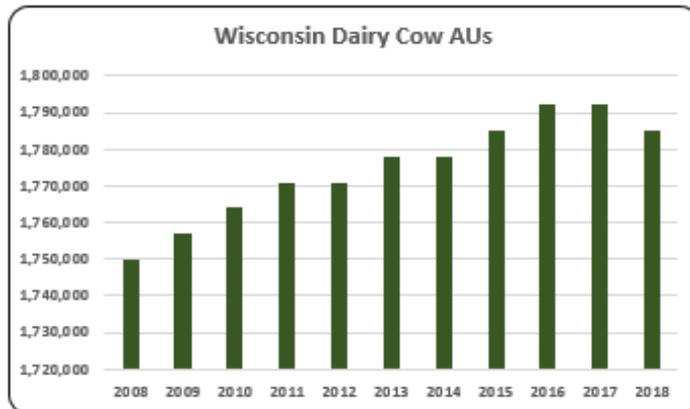
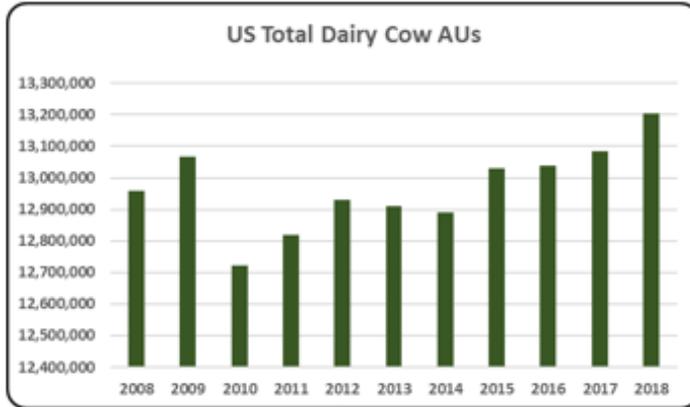


- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.

- There were 42,820 turkey AUs on average from 2008 to 2018 in Wisconsin. 2018 turkey AUs (34,018 AUs) declined 29.9% from 2008 turkey AUs in Wisconsin.

- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.

- In 2018, Wisconsin had 146,775 hog AUs. The average number of hog AUs throughout the decade was 130,369 from 2008 to 2018.



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- With the second largest dairy cow numbers in the country, Wisconsin had 13.5% (1.8 million AUs) of all dairy cows in the U.S. in 2018. This is 49.6% of the state’s AUs.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cow AUs made up 40.0% (1.4 million AUs) of all AUs in Wisconsin in 2018. Beef cow AUs, in 2018, rose 25.1% compared to 2008.

Wisconsin Additional Information and Methodology

Animal agriculture is an important part of Wisconsin's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Wisconsin, of interest is the degree to which the industry impacts the Wisconsin economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Wisconsin animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Wisconsin's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Wisconsin which have occurred. As shown in this state report, Wisconsin has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Wisconsin. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Wisconsin Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Wisconsin's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Wisconsin, \$1.72 to \$2.71 million in total economic activity, \$0.40 to \$0.59 in household wages and 11 to 14 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.409	\$ 0.499	13.0
	Hogs, Pigs, and Other	\$ 1.716	\$ 0.401	10.6
	Poultry and Eggs	\$ 2.712	\$ 0.594	13.9
	Dairy	\$ 2.304	\$ 0.533	14.4

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	1,152,000	1,152,000	1,152,000	1,225,185	1,144,635	1,292,595	1,169,790	1,248,540	1,267,215	1,451,835	1,441,485
	Hog and Pig AUs	143,700	130,845	126,165	124,050	130,350	132,150	114,300	118,050	123,600	144,075	146,775
	Broiler AUs	152,442	134,762	136,841	139,710	159,006	154,190	160,495	162,001	162,598	161,695	167,699
	Turkey AUs	48,530	47,441	49,428	50,309	45,874	38,449	40,354	39,446	38,496	38,681	34,018
	Egg Layer AUs	18,523	19,444	18,880	19,512	21,651	21,650	22,289	20,259	22,307	26,852	27,181
	Dairy AUs	1,750,000	1,757,000	1,764,000	1,771,000	1,771,000	1,778,000	1,778,000	1,785,000	1,792,000	1,792,000	1,785,000
	Total Animal Units	3,265,195	3,241,493	3,247,313	3,329,766	3,272,516	3,417,033	3,285,228	3,373,295	3,406,216	3,615,138	3,602,158
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 778,254	\$ 708,203	\$ 860,662	\$ 1,164,319	\$ 1,292,043	\$ 1,443,995	\$ 1,910,703	\$ 2,084,559	\$ 1,608,713	\$ 1,687,348	\$ 1,619,719
	Hogs and Pigs (\$1,000)	\$ 107,923	\$ 90,766	\$ 110,277	\$ 135,219	\$ 122,921	\$ 128,999	\$ 122,464	\$ 106,577	\$ 98,594	\$ 123,294	\$ 112,135
	Broilers (\$1,000)	\$ 99,866	\$ 87,927	\$ 95,243	\$ 89,643	\$ 111,100	\$ 130,809	\$ 142,879	\$ 121,803	\$ 108,602	\$ 122,944	\$ 127,899
	Turkeys (\$1,000)	\$ 70,916	\$ 67,209	\$ 97,114	\$ 76,362	\$ 82,106	\$ 59,515	\$ 39,373	\$ 36,569	\$ 41,353	\$ 27,999	\$ 22,709
	Eggs (\$1,000)	\$ 102,910	\$ 78,301	\$ 78,316	\$ 85,397	\$ 101,214	\$ 115,879	\$ 129,992	\$ 187,719	\$ 79,083	\$ 103,278	\$ 176,103
	Milk (\$1,000)	\$ 4,625,208	\$ 3,306,309	\$ 4,191,635	\$ 5,289,774	\$ 5,281,456	\$ 5,597,116	\$ 6,809,775	\$ 5,167,340	\$ 5,058,480	\$ 5,487,920	\$ 5,045,535
	Other	\$ 15,204	\$ 16,771	\$ 20,078	\$ 20,641	\$ 21,645	\$ 19,848	\$ 20,639	\$ 21,740	\$ 20,737	\$ 20,816	\$ 20,626
	Sheep and Lambs (\$1,000)	\$ 5,255	\$ 5,848	\$ 8,180	\$ 7,769	\$ 7,798	\$ 5,982	\$ 6,754	\$ 7,836	\$ 6,814	\$ 6,874	\$ 6,665
	Aquaculture (\$1,000)	\$ 9,949	\$ 10,923	\$ 11,898	\$ 12,872	\$ 13,847	\$ 13,866	\$ 13,885	\$ 13,904	\$ 13,923	\$ 13,942	\$ 13,961
	Total (\$1,000)	\$ 5,800,280	\$ 4,355,486	\$ 5,453,325	\$ 6,861,355	\$ 7,012,485	\$ 7,496,161	\$ 9,175,825	\$ 7,726,307	\$ 7,015,563	\$ 7,573,599	\$ 7,124,726

Ag Census Data Category	Animal Type	2002	2007	2012	2017
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	9,852	11,593	10,241	10,464
	Cattle feedlots (112112)	3,749	2,485	892	1,017
	Dairy cattle and milk production (11212)	16,096	13,081	10,401	8,099
	Hog and pig farming (1122)	759	989	475	518
	Poultry and egg production (1123)	910	2,297	1,591	935
	Sheep and goat farming (1124)	1,117	1,501	1,555	1,913
	Animal aquaculture and other animal production (1125,1129)	6,347	5,816	4,814	5,191
Value of Sales (\$1,000)	Cattle and Calves	834,895	1,014,553	1,416,881	1,496,148
	Hogs and Pigs	79,836	100,309	90,589	92,260
	Poultry and Eggs	224,968	375,284	465,717	487,405
	Milk*			4,952,039	5,150,658
	Aquaculture	14,262	14,182	13,847	13,942
	Other (calculated)	128,225	220,410	192,404	119,574
	Total	1,282,186	1,724,738	7,131,477	7,359,987
Input Purchases	Livestock and poultry purchased	(Farms) 21,117	19,948	19,759	17,702
		\$1,000 294,121	356,954	454,402	475,309
	Breeding livestock purchased	(Farms) 12,329	10,799	10,907	9,291
		\$1,000 108,518	139,475	186,105	181,947
	Other livestock and poultry purchased	(Farms) 11,343	11,816	11,748	11,064
		\$1,000 185,603	217,479	268,297	293,362
Feed purchased	(Farms) 43,074	38,826	39,784	36,683	
	\$1,000 785,165	1,091,862	2,066,721	2,024,483	

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 3,901,741	\$ 807,754	21,078	\$ 210,218
	Hogs, Pigs, and Other	\$ 227,805	\$ 53,224	1,412	\$ 13,852
	Poultry and Eggs	\$ 886,006	\$ 194,001	4,550	\$ 50,489
	Dairy	\$ 11,624,913	\$ 2,689,775	72,876	\$ 700,014
	Total	\$ 16,640,465	\$ 3,744,753	99,917	\$ 974,572
Change from 2008 to 2018	Cattle and Calves	\$ 1,661,338	\$ 343,937	8,975	\$ 89,510
	Hogs, Pigs, and Other	\$ (24,677)	\$ (5,766)	(153)	\$ (1,500)
	Poultry and Eggs	\$ (989)	\$ (216)	(5)	\$ (56)
	Dairy	\$ (1,110,114)	\$ (256,858)	(6,959)	\$ (66,847)
	Total	\$ 525,557	\$ 81,096	1,858	\$ 21,105
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	Cattle and Calves	\$ 2.409	\$ 0.499	13.0	
	Hogs, Pigs, and Other	\$ 1.716	\$ 0.401	10.6	
	Poultry and Eggs	\$ 2.712	\$ 0.594	13.9	
	Dairy	\$ 2.304	\$ 0.533	14.4	
Tax Rates	Federal effective income tax rate			14.0%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.8%	
	Total			26.0%	

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2008-2018 Animal Agriculture: WYOMING

Wyoming Executive Summary

The use of soybean meal as a key feed ingredient is a modest part of Wyoming animal agriculture. While the degree to which animal agriculture utilizes this versatile feed ingredient has fluctuated with time, it remains a driver of animal agriculture's success in the State of Wyoming. The success of Wyoming animal agriculture in turn has an impact on the rest of the state and regional economies. For example, in the State of Wyoming during 2018 animal agriculture contributed:

- \$1.6 billion in economic output
- 10,313 jobs
- \$315.2 million in earnings
- \$63.7 million in income taxes paid at local, state, and federal levels
- \$55.2 million in the form of property taxes

Plus, from 2008-2018 animal agriculture in Wyoming has increased economic output by over \$240.7 million, boosted household earnings by \$45.4 million, contributed 1,512 additional jobs and paid \$9.2 million in additional tax revenues.

Wyoming's animal agriculture consumed almost 38.6 thousand tons of soybean meal in 2018. This soybean meal was fed primarily to:

- Hogs (14.0 thousand tons)
- Broilers (8.7 thousand tons)
- Egg-Laying Hens (5.3 thousand tons)

This report examines animal agriculture in Wyoming over the last decade. While this analysis is certainly instructive and allows improved understanding of animal agriculture's impact during that time, as the next decade unfolds in Wyoming, many opportunities and challenges will arise. And, if past is prologue, animal agriculture will continue to be a contributor to the economic well-being of the people of Wyoming and beyond.

Wyoming Economic Impact of Animal Agriculture

Animal agriculture is an important part of Wyoming's economy. In 2018, Wyoming's animal agriculture contributed the following to the economy:

- About \$1.6 billion in economic output
- \$315.2 million in household earnings
- 10,313 jobs
- \$63.7 million in income taxes

And the animal agriculture sector has shown growth during challenging economic times. During the last decade Wyoming's animal agriculture has:

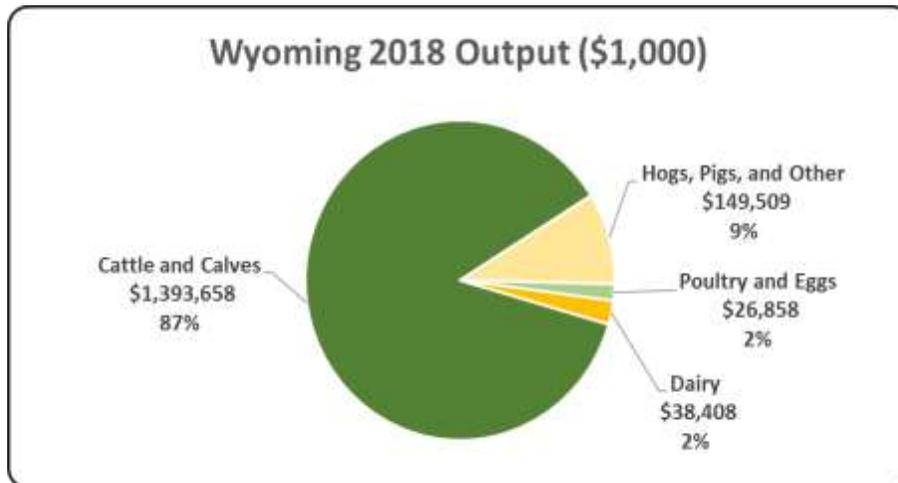
- Increased economic output by \$240.7 million
- Boosted household earnings by \$45.4 million
- Added 1,512 jobs
- Paid an additional \$9.2 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2018	Change 2008-2018	% Change 2008-2018
Output (\$1,000)	\$ 1,608,433	\$ 240,702	17.60%
Earnings (\$1,000)	\$ 315,166	\$ 45,412	16.83%
Employment (Jobs)	10,313	1,512	17.18%
Income Taxes Paid (\$1,000)	\$ 63,664	\$ 9,173	16.83%
Property Taxes Paid in 2017 (\$1,000)	\$ 55,168		

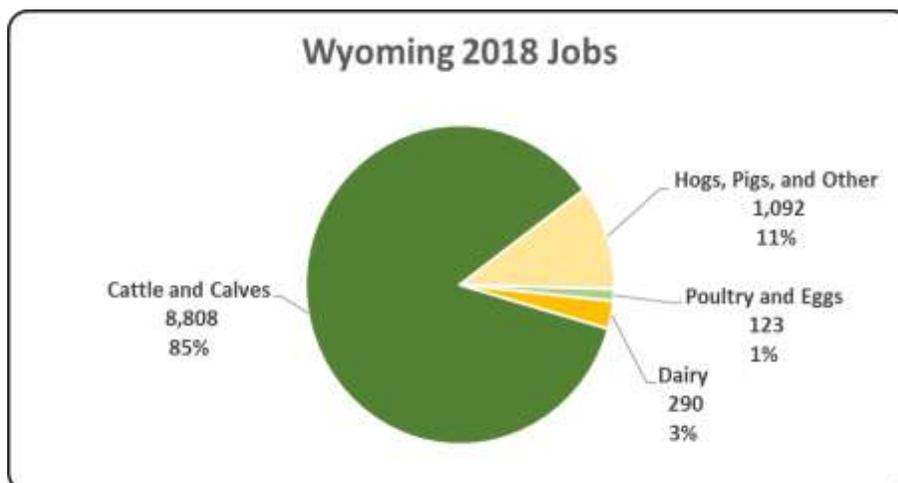
Wyoming Output

“Output” refers to the total value of all the output (production or sales) of a study area and/or industry within a study area and was calculated using RIMS II multipliers. This is a gross number that does not make any deductions for the cost or origination of inputs that were used in the production process. The table illustrates the impact of animal agriculture to the Wyoming economy. Animal agriculture’s impact on Wyoming total economic output is about \$1.6 billion.



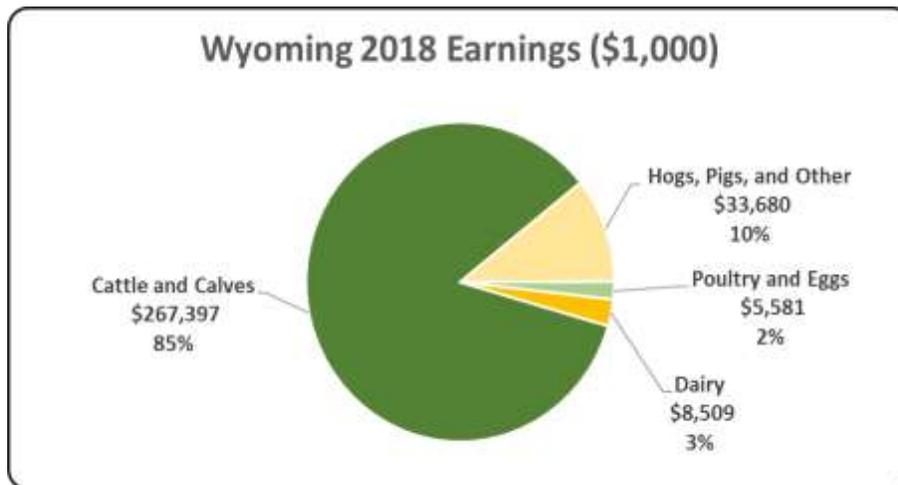
Wyoming Jobs

“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Wyoming in terms of animal agriculture jobs. As shown, animal agriculture contributes 10,313 jobs within and outside of animal agriculture.



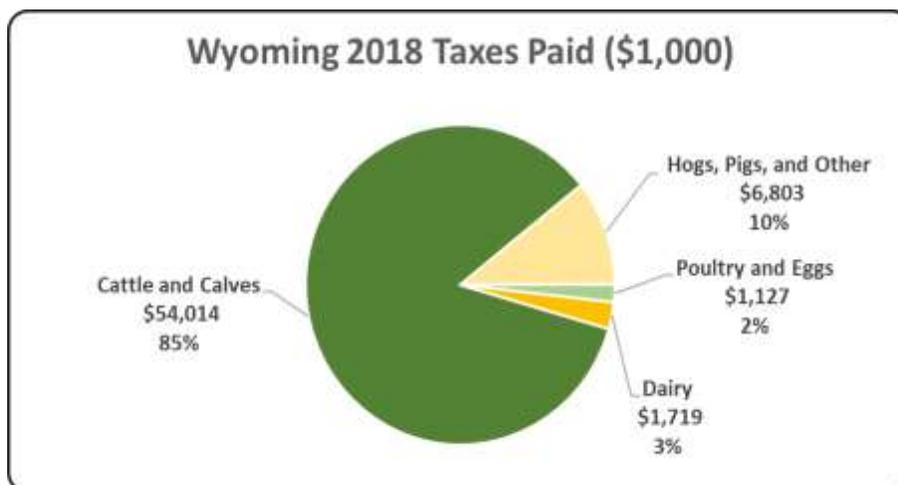
Wyoming Earnings

Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Wyoming economy in terms of earnings. Wyoming’s animal agriculture contributed about \$315.2 million to household earnings in 2018.



Wyoming Taxes Paid by Animal Agriculture

Wyoming’s animal agriculture is also a source of tax revenue. In 2018, the state’s animal agriculture industry paid about \$63.7 million in income taxes at local, state, and federal levels. Plus the 2017 Census of Agriculture estimated \$55.2 million in property taxes paid by all of Wyoming agriculture during 2017. Estimates of income taxes paid by animal agriculture are shown in the following chart.



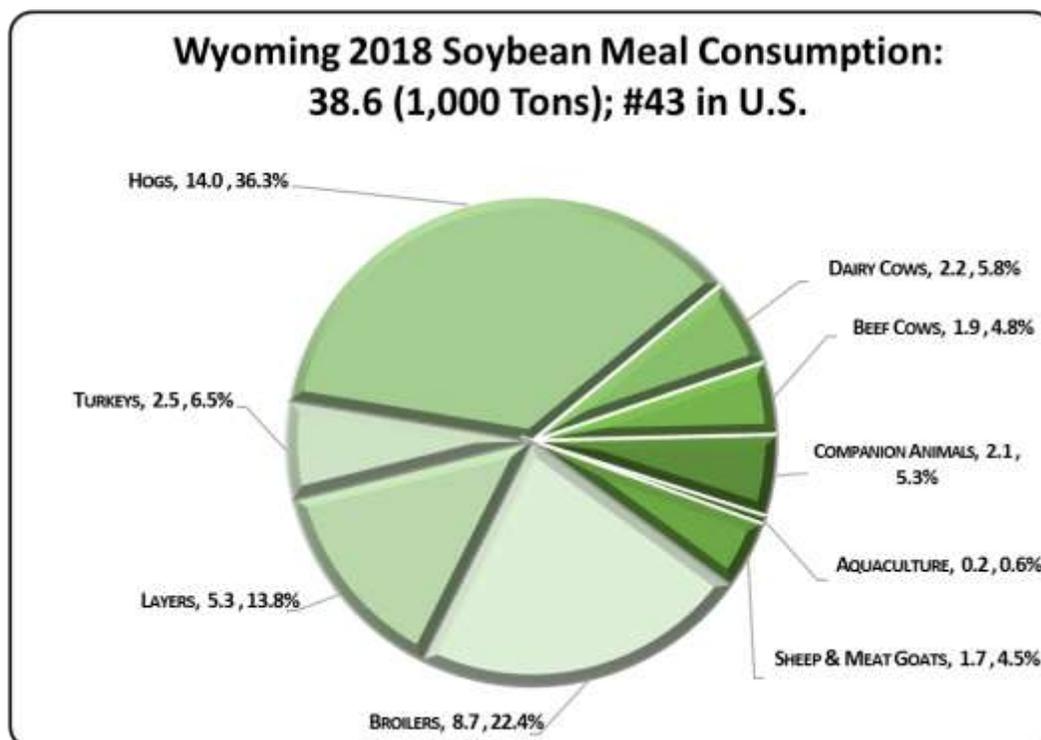
Wyoming Animal Agriculture Soybean Meal Consumption

The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), and consumer preferences which have influence on production practices.

Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year by up to sixteen specific animal species has been estimated.

Wyoming's animal agriculture consumed almost 38,600 tons of soybean meal in 2018, placing the state as #43 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Wyoming consumed 9,800 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

1. Hogs (14,000 tons)
2. Broilers (8,700 tons)
3. Egg-Laying Hens (5,300 tons)

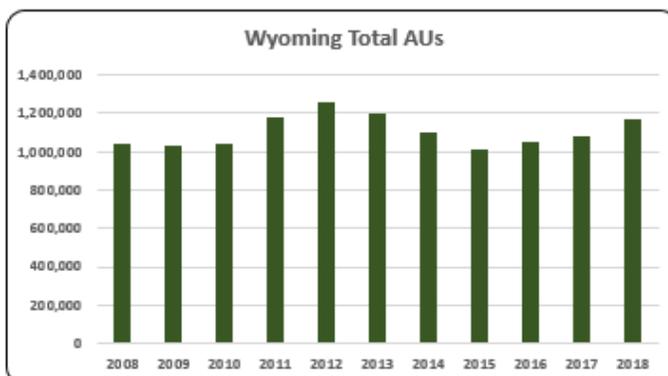
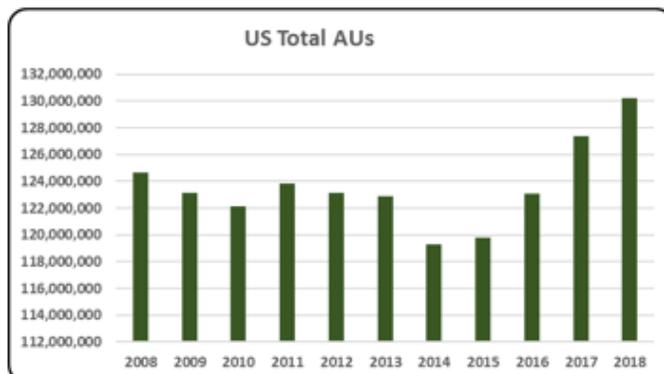


Wyoming Animal Unit (AU) Trends

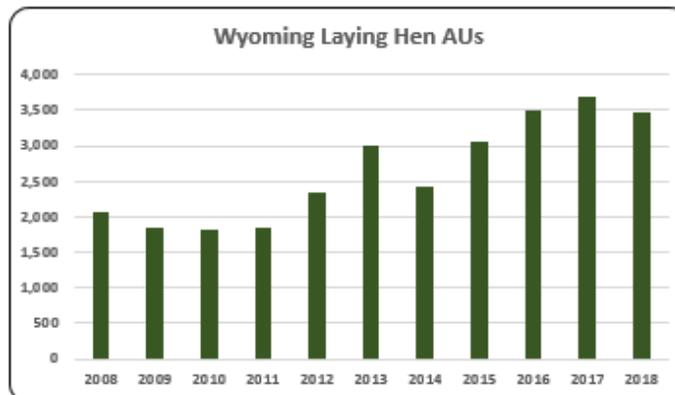
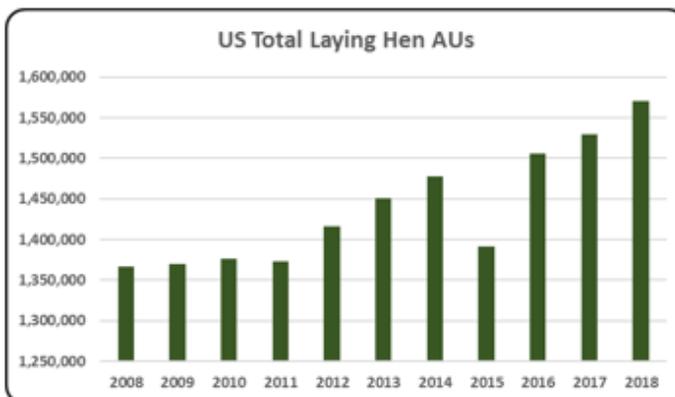
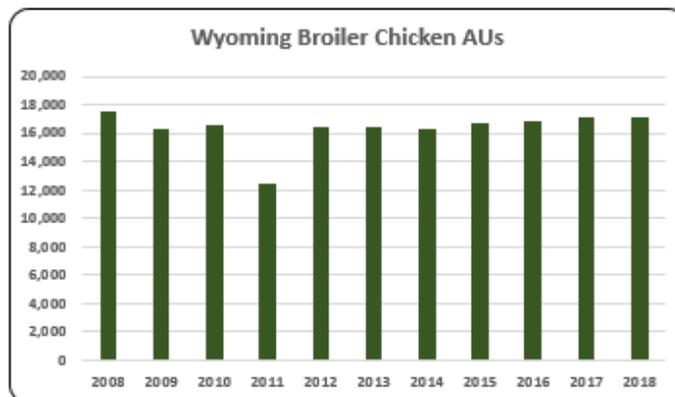
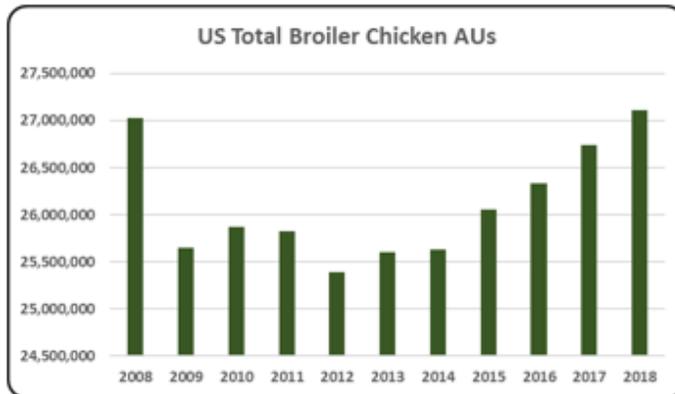
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Wyoming. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. The use of animal units allows for a more accurate comparison of differing sizes of livestock and poultry. This section is included to bring context to the question of what animal agriculture means to Wyoming and to give perspective on Wyoming's contribution to the nation's animal agriculture industry and beyond.

Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying potential, etc.

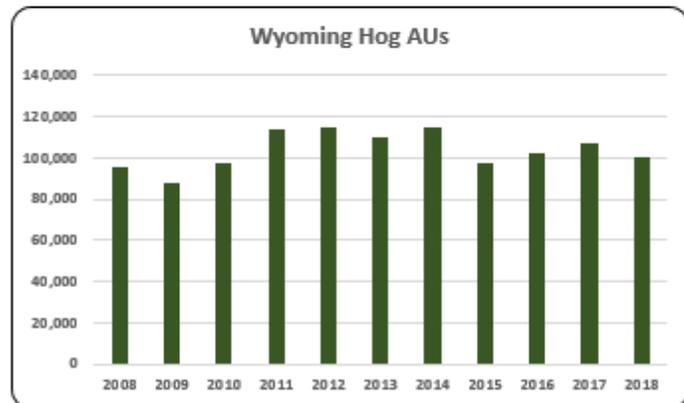
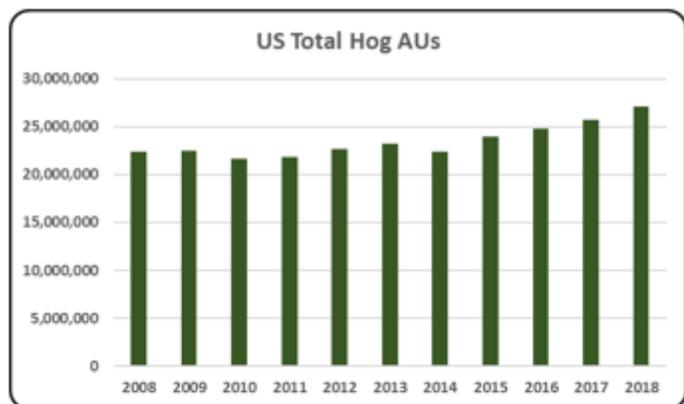
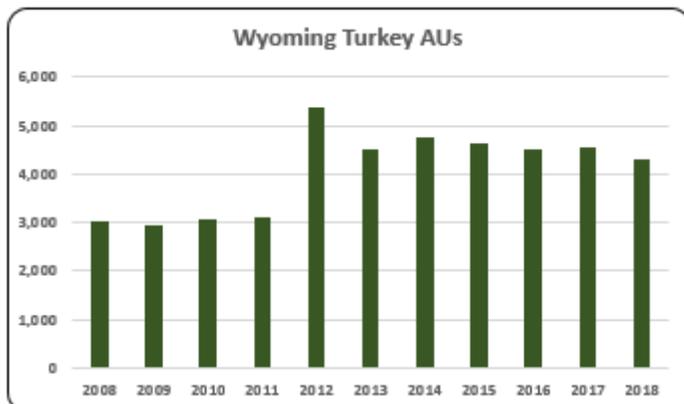
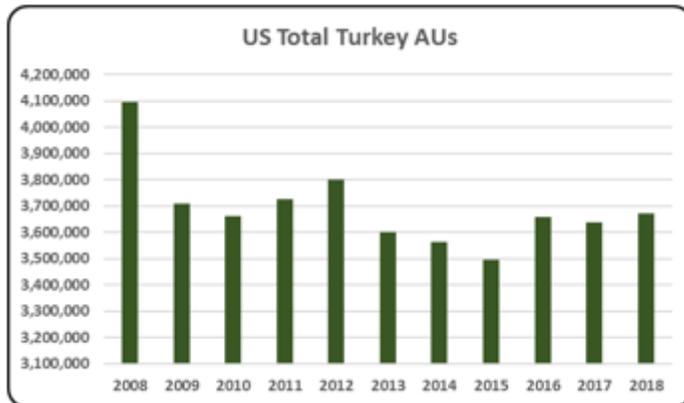
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Wyoming, the largest three segments of animal agriculture in terms of AUs during 2018 were: Beef Cows (1.0 million AUs), Hogs (99,900 AUs), and Broilers (17,065 AUs). Total animal units in Wyoming during 2018 were 1.2 million AUs.



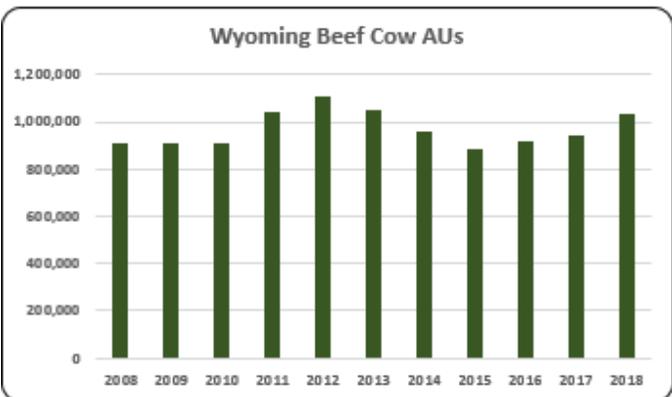
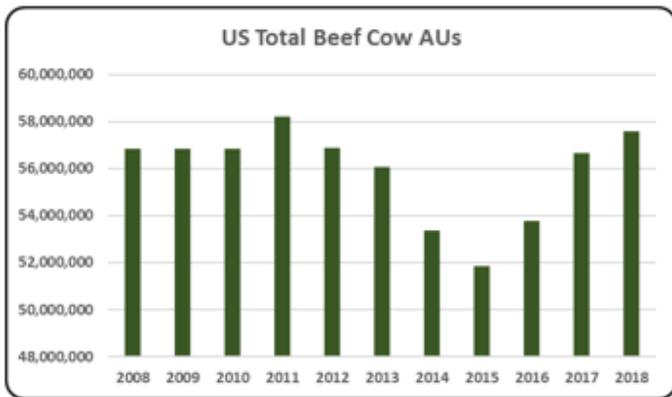
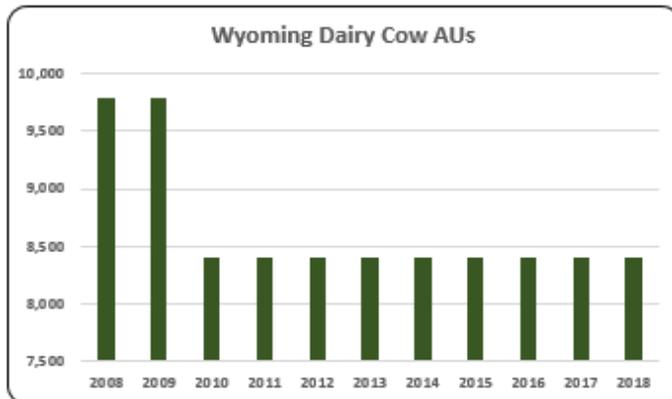
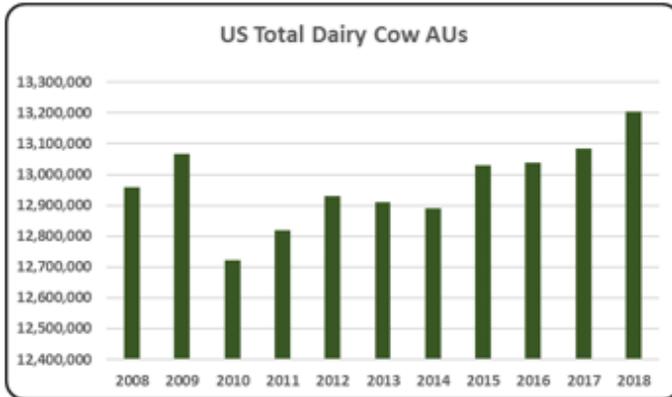
- In 2018 U.S. total AUs hit a decade high at 130 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Hogs, beef cows and laying hens were the most significant contributors to the growth between 2016 and 2018.
- There were 1.2 million AUs in Wyoming in 2018 representing 0.9% of all AUs in the U.S. Animal units in Wyoming increased 12.3% from 2008 to 2018.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2008 to 2018, broiler chicken AUs were 26.1 million across the U.S. Between 2017 and 2018 there was a 1.4% increase in broiler chicken AUs (372,300).
- The average number of broiler AUs in Wyoming was 16,331 during last decade from 2008 to 2018. Broiler AUs fell 2.9% in 2018 (17,054 AUs) from 2007 (17,580 AUs) in Wyoming.
- On average, the layer AUs during 2008-2018 were 1.4 million. In 2018, layer AUs were 1.6 million, a 2.7% increase from the year before (41,104 AUs). Growth continued to slow in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens represented 0.3% (3,467 AUs) of all animal units in the Wyoming in 2018.



- In 2018, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2018 with 16% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak that decreased laying hens in 2015.
- There were 4,287 turkey AUs in 2018 in Wyoming. Turkey AUs increased 42.1% in Wyoming since 2008.
- From 2008 to 2018, hog AUs increased 21.1% (4.7 million AUs). Hogs make up 20.8% of all animal units within the United States. Slow growth has continued for every year since 2014.
- Hog AUs averaged 103,538 from 2008 to 2018 in Wyoming. 2018 hog numbers (99,900 AUs) were 50% above 2008 (95,220 AUs).



- From 2008 to 2018, dairy cow AUs averaged 13.0 million. In 2018, dairy cow AUs increased 120,540 AUs (0.9%) from 2017.
- Wyoming 2018 dairy cow AUs were the same as 2017 at 8,400. Dairy cow animal units in Wyoming decreased by 14.3% from 2008 to 2018.
- From 2008 to 2018, beef cow AUs averaged 55.9 million. 2018 beef cow AUs increased by 1.6% (0.9 million AUs). Growth has continued going back to 2016 from when the U.S. saw widespread drought affecting much of agriculture.
- Beef cows accounted for 88.6% (1.0 million AUs) of all AUs in Wyoming in 2018, beef cow AUs in 2018 were up 13.4% relative to 2008.

Wyoming Additional Information and Methodology

Animal agriculture is an important part of Wyoming's current and future economic health. To quantify the connection between animal agriculture and local economies, the United Soybean Board commissioned [Decision Innovation Solutions](#), an economic research firm in Urbandale, Iowa, to conduct an in-depth analysis of several aspects of animal agriculture. This analysis includes the following components:

1. Economic impact of animal agriculture to local (state) economies during the 2008-2018 time period
2. Soybean meal usage by animal species during the 2017/18 soybean marketing year
3. Animal Unit (AU) trends from 2008-2018

Given the long-term presence of animal agriculture in Wyoming, of interest is the degree to which the industry impacts the Wyoming economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Wyoming animal agriculture are presented in this report. Methodology for this section of the report closely mirrors that followed in years' past. Also presented are estimates of the change in how animal agriculture has impacted Wyoming's economy over the last decade. Differences, to the extent they are present, are noted within the larger national report which accompanies this state report.

As with any industry across the economic spectrum, there are ebbs and flows in activity that have implications for other parts of the economy. Again using the same 2008-2018 time period as with the economic impact section of this state report, the "Animal Unit Trends" seeks to quantify production changes in animal agriculture in Wyoming which have occurred. As shown in this state report, Wyoming has seen changes within its animal agriculture industry. Expectations are that animal agriculture will continue to evolve over the next decade.

Animal agriculture is the single largest user of soybean meal in Wyoming. Through in-depth conversations with many of the nation's top nutritionists and researchers, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2017-18 soybean marketing year for up to sixteen specific animal species has been estimated.

Should readers have comments or questions regarding methodology, results and interpretation, please contact the authors at info@decision-innovation.com or 515.639.2900.

Wyoming Multipliers

Economic multipliers give a sense for how economic activity in a given industry is related to other industries in the same study area. To estimate the impact of animal agriculture on Wyoming's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis for cattle ranching and farming, dairy cattle and milk production, poultry and egg production, and other animal production (primarily hogs and pigs), where applicable.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. Referring to the multipliers below, for every million dollars in output generated by the various segments of animal agriculture in Wyoming, \$1.43 to \$2.03 million in total economic activity, \$0.31 to \$0.39 in household wages and 7 to 13 additional jobs are generated in the economy at large.

	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
RIMS II Multipliers	Cattle and Calves	\$ 2.034	\$ 0.390	12.9
	Hogs, Pigs, and Other	\$ 1.433	\$ 0.323	10.5
	Poultry and Eggs	\$ 1.492	\$ 0.310	6.8
	Dairy	\$ 1.657	\$ 0.367	12.5

Appendix

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Animal Units (AUs)	Beef Cattle AUs	912,600	912,600	912,600	1,045,200	1,110,600	1,053,225	956,325	882,225	920,175	945,375	1,034,850
	Hog and Pig AUs	95,220	87,450	97,500	113,550	114,750	109,800	114,900	97,650	101,700	106,500	99,900
	Broiler AUs	17,580	16,345	16,565	12,482	16,418	16,361	16,268	16,688	16,813	17,054	17,065
	Turkey AUs	3,017	2,949	3,073	3,127	5,390	4,518	4,742	4,635	4,523	4,545	4,287
	Egg Layer AUs	2,076	1,836	1,824	1,834	2,349	2,993	2,423	3,059	3,491	3,686	3,467
	Dairy AUs	9,800	9,800	8,400	8,400	8,400	8,400	8,400	8,400	8,400	8,400	8,400
	Total Animal Units	1,040,292	1,030,980	1,039,961	1,184,593	1,257,907	1,195,297	1,103,058	1,012,657	1,055,102	1,085,560	1,167,968
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 462,933	\$ 404,132	\$ 495,666	\$ 603,619	\$ 618,850	\$ 698,529	\$ 928,182	\$ 860,466	\$ 690,498	\$ 689,140	\$ 685,282
	Hogs and Pigs (\$1,000)	\$ 60,704	\$ 50,231	\$ 71,259	\$ 118,416	\$ 103,837	\$ 76,255	\$ 86,817	\$ 57,648	\$ 62,127	\$ 68,905	\$ 57,287
	Broilers (\$1,000)	\$ 14,080	\$ 12,148	\$ 12,695	\$ 11,114	\$ 16,359	\$ 19,934	\$ 20,912	\$ 18,244	\$ 16,221	\$ 19,047	\$ 14,959
	Turkeys (\$1,000)	\$ 4,897	\$ 4,641	\$ 6,037	\$ 4,747	\$ 5,104	\$ 3,700	\$ 2,448	\$ 4,297	\$ 4,859	\$ 3,290	\$ 2,862
	Eggs (\$1,000)	\$ 193	\$ 134	\$ 167	\$ 175	\$ 190	\$ 176	\$ 176	\$ 176	\$ 176	\$ 176	\$ 176
	Milk (\$1,000)	\$ 23,612	\$ 14,449	\$ 19,866	\$ 24,128	\$ 23,417	\$ 25,768	\$ 30,303	\$ 24,778	\$ 23,347	\$ 24,738	\$ 23,179
	Other	\$ 33,683	\$ 35,213	\$ 38,031	\$ 42,487	\$ 57,637	\$ 45,689	\$ 42,838	\$ 47,865	\$ 48,339	\$ 49,408	\$ 47,017
	Sheep and Lambs (\$1,000)	\$ 31,170	\$ 31,931	\$ 33,981	\$ 37,669	\$ 52,051	\$ 40,539	\$ 38,124	\$ 43,587	\$ 44,497	\$ 46,002	\$ 44,047
	Aquaculture (\$1,000)	\$ 2,513	\$ 3,282	\$ 4,050	\$ 4,818	\$ 5,586	\$ 5,150	\$ 4,714	\$ 4,278	\$ 3,842	\$ 3,406	\$ 2,970
	Total (\$1,000)	\$ 600,103	\$ 520,948	\$ 643,721	\$ 804,686	\$ 825,395	\$ 870,050	\$ 1,111,676	\$ 1,013,474	\$ 845,567	\$ 854,704	\$ 830,761

Ag Census Data Category	Animal Type	2002	2007	2012	2017	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	4,290	3,910	4,365	4,942	
	Cattle feedlots (112112)	269	108	69	100	
	Dairy cattle and milk production (11212)	51	26	36	28	
	Hog and pig farming (1122)	61	133	96	80	
	Poultry and egg production (1123)	41	83	112	87	
	Sheep and goat farming (1124)	387	382	293	564	
	Animal aquaculture and other animal production (1125,1129)	1,891	3,264	3,140	2,773	
Value of Sales (\$1,000)	Cattle and Calves	643,123	801,833	1,101,195	956,561	
	Hogs and Pigs	23,057	41,923	35,101	79,650	
	Poultry and Eggs	663	997	602	withheld	
	Milk*			22,904	20,882	
	Aquaculture	3,213	7,157	5,586	withheld	
	Other (calculated)	48,582	69,487	67,202	96,820	
	Total	718,638	921,397	1,232,590	1,153,913	
Input Purchases	Livestock and poultry purchased	(Farms)	3,673	3,493	4,349	4,226
		\$1,000	199,326	215,888	316,034	225,734
	Breeding livestock purchased	(Farms)	2,565	2,354	2,837	2,939
		\$1,000	21,091	38,436	55,056	71,479
	Other livestock and poultry purchased	(Farms)	1,747	1,803	2,260	2,089
		\$1,000	178,035	177,453	260,977	154,254
	Feed purchased	(Farms)	6,761	6,398	8,484	8,893
		\$1,000	137,943	150,962	320,457	232,319

* Measurement of milk sales in 2002-2007 are not comparable to 2012-2017.

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2018 Animal Agriculture	Cattle and Calves	\$ 1,393,658	\$ 267,397	8,808	\$ 54,014
	Hogs, Pigs, and Other	\$ 149,509	\$ 33,680	1,092	\$ 6,803
	Poultry and Eggs	\$ 26,858	\$ 5,581	123	\$ 1,127
	Dairy	\$ 38,408	\$ 8,509	290	\$ 1,719
	Total	\$ 1,608,433	\$ 315,166	10,313	\$ 63,664
Change from 2008 to 2018	Cattle and Calves	\$ 268,558	\$ 51,527	1,697	\$ 10,409
	Hogs, Pigs, and Other	\$ (12,175)	\$ (2,743)	(89)	\$ (554)
	Poultry and Eggs	\$ (7,332)	\$ (1,524)	(34)	\$ (308)
	Dairy	\$ (8,349)	\$ (1,850)	(63)	\$ (374)
	Total	\$ 240,702	\$ 45,412	1,512	\$ 9,173
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.034	\$ 0.390	12.9	
	Hogs, Pigs, and Other	\$ 1.433	\$ 0.323	10.5	
	Poultry and Eggs	\$ 1.492	\$ 0.310	6.8	
	Dairy	\$ 1.657	\$ 0.367	12.5	
Tax Rates	Federal effective income tax rate				14.0%
	Federal Social Security tax rate				6.2%
	State Effective Rate				0.0%
	Total				20.2%

Sources: 2002, 2007, 2012 and 2017 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

Methodology

Competitiveness of Soybean Meal, Price Elasticities

We used a standard linear programming model to formulate least-cost feed rations for broilers, finishing hogs, layers and turkeys. The model solves for an optimal feed ration mix specifying the amount of each feed ingredient to use that minimizes total feed cost and meets all nutritional requirements, given feed ingredient prices.

After thorough consultation with nutritionists for each species, we collected data on nutritional requirements, nutritional composition of commonly used feed ingredients and feed ingredient prices for the period 2014-2017.

Price data were obtained from various USDA publications and other industrial sources. Statistical Analytical Software (SAS), R and Excel Solver have been used internally as analytical tools. SMEs utilized a myriad of ration formulation software packages specific to certain species.

A sample of optimal mix of feed ingredients that minimizes feed cost and at the same time meets all the nutritional requirements of each species was obtained. Then we simulated 500 iterations based on the distribution parameters for each sample.

To obtain elasticity estimates, we employed a partial equilibrium framework. The quantity demanded of SBM was depicted as a function of SBM price, substitute prices, and livestock and poultry populations. By using time-series econometrics, we then estimated log-linear models as shown in Equation (1). Maximum likelihood method is used as an estimation technique. Note that estimated parameters represent values of elasticities.

$$(1) \ln Q_{it}^{SBM} = \ln \alpha_{it} + \beta_{i1} \ln P_{it}^{SBM} + \gamma_{ik} \sum_{k=1}^n \ln P_{ikt} + \delta_i \ln INV_{it} + \varepsilon_{it}$$

Where, Q_{it}^{SBM} is the quantity of SBM inclusion in species i diets at time t ; P_{ikt} is the prices of competing ingredient k for species i at time t ; INV_i is the population of species i at time t ; $\alpha, \beta, \gamma, \delta$ represent estimated parameters, and ε is the random error term.

Competitiveness of Soybean Meal, Component Price Elasticities

To estimate each component demand elasticities of SBM, first we broadly identified digestible crude protein and metabolizable energy as the major two components in SBM and other competing feedstuffs. Then we estimate the derived values and quantities of crude protein and metabolizable energy for SBM and other ingredient.

We also broke down the digestible crude protein into digestible lysine. In order to derive the quantities and values for digestible lysine content, we use Standardized ileal digestibility coefficients (SID) for both swine and poultry separately as outlined in Table 31 and Table 32. For example, we assume that lysine is the primary nutrient of interest and then assign all of the price of the ingredient to the amount of lysine that is contributed. Note that SBM contains 3% lysine and assume that the price of the SBM is \$350/ton. Then a short ton of SBM that has 3% lysine will have 60 lbs. of lysine, which implies a unit value of lysine is \$5.83/lb. This derived value can be adjusted to represent ileal digestible content of lysine. Following this method, we estimate the derived values and quantities of digestible lysine, digestible crude protein and, metabolizable energy for several feedstuffs which compete with SBM. We then applied the same methodology described in the estimation of the own and cross-price price elasticities of SBM demand.

Table 31, Standardized ileal digestibility coefficients (SID) for Swine

Swine	Soybean Meal	Corn	DDGS	Canola Meal	Cottonseed Meal	Meat and Bone Meal	Wheat Middings
Lysine	87	73	65	75	57	72	80
Threonine	83	76	72	73	70	69	77
Methionine	89	85	85	84	65	83	86

Source: http://nutrition.ansci.illinois.edu/feed_database.html

Table 32, Standardized ileal digestibility coefficients (SID) for Poultry

Poultry	Soybean Meal	Corn	DDGS	Canola Meal	Cottonseed Meal	Meat and Bone Meal	Wheat Middings
Lysine	87	78	60	77	48	75	80
Threonine	86	83	77	76	54	71	77
Methionine	88	92	88	86	51	75	86

Source: http://nutrition.ansci.illinois.edu/feed_database.html

Economic Impact Analysis

To estimate the impact of livestock production on the overall economy of any given geographic area, it is necessary to quantify the relationship between the livestock industry and each of the other major components of the area's economy. Input-output (I-O) models are commonly used for this purpose. To estimate the impact of animal agriculture on each study area's economy, we applied RIMS II multipliers from the Department of Commerce, Bureau of Economic Analysis.

RIMS II is based on BEA's 2007 benchmark I-O table and 2013 regional data. It is comprised of approximately 500 industries. The model traces the interactions among these industries so that the effect of a given level of output in one industry on all other industries can be measured. These measures take the form of multipliers or factors that can be applied to output measured in dollars. They indicate the total economic activity in the state associated with a dollar of sales in that industry. In addition to measuring the value of output, multipliers are also derived for measuring impacts on earnings and employment.

Multipliers are generally stated in the form of "per million dollars" of output. As it relates to this analysis, multipliers are stated as the activity related to every million dollars of economic output in animal agriculture. The employment multiplier is the number of total jobs in a study area associated with one million dollars of sales in that industry. This includes jobs not just in the cattle industry, for example, but jobs in feed, finance, insurance, grocery stores, retailing, transportation, housing, etc.

Given the complexity of tracing these effects throughout the economy, some simplification in methodology was required to keep the task manageable. The first simplifying step in constructing RIMS II was to collapse the nearly 1,200 industries identified in the Census Bureau's North American Industry Classification System (NAICS) to a smaller number of industries. For purposes of this analysis, unique multipliers are now available for four industries that include all livestock and poultry production:

- Cattle ranching and farming
- Dairy cattle and milk production
- Poultry and egg production
- Hogs, aquaculture, and other animal production

A second important step in estimating multipliers is in defining the geographic region of interest. The RIMS II model permits the region of examination to be as small as an individual county or as large as a set of contiguous states (multipliers are no longer available for the nation as a whole). The choice of region can have an important effect on the outcome, depending on whether the associated industries are located within the region. Generally, the

more broadly a region is defined, the greater the likelihood that associated industries are represented within the region and the larger the associated multipliers.

For this analysis, we have defined individual states as the regions of principal interest. While there are variations in the degree to which associated industries are represented (and, correspondingly, in the size of the multipliers), states are generally of sufficient size to capture most of the impact of livestock production within their borders. The tables below give a sense of the variability in multipliers among states and species.

Beef Cattle						
	Output (\$)		Earnings (\$)		Employment (Jobs)	
Min	1.364	Alaska	0.247	Alaska	4.666	Delaware
Max	2.619	Minnesota	0.543	Texas	17.408	Kentucky
Avg	1.953		0.390		10.334	
Dairy Cattle						
	Output (\$)		Earnings (\$)		Employment (Jobs)	
Min	1.401	Alaska	0.294	Alaska	6.341	Delaware
Max	2.464	Minnesota	0.560	Minnesota	18.168	Kentucky
Avg	2.003		0.453		12.218	
Poultry and Eggs						
	Output (\$)		Earnings (\$)		Employment (Jobs)	
Min	1.359	Alaska	0.272	Alaska	5.740	Alaska
Max	3.057	Missouri	0.659	Minnesota	18.074	Kentucky
Avg	2.219		0.472		11.267	
Hogs and Others						
	Output (\$)		Earnings (\$)		Employment (Jobs)	
Min	1.303	Alaska	0.282	Delaware	5.244	Delaware
Max	1.872	Illinois	0.431	Illinois	13.631	Kentucky
Avg	1.598		0.366		9.564	

The first table above summarizes the multipliers for beef cattle. Alaska, Hawaii, and the northeast and mid-Atlantic states have low multipliers due to either small size or low state output, so output multipliers ranged from about 1.4 in several states to more than 2.6 in Minnesota. Earnings multipliers were mostly within the 0.2-0.5 range. Employment multipliers were as low as 4.6 in Delaware and as high as 17.4 in Kentucky.

The second table summarizes the multipliers for dairy cattle and milk production. The highest output multipliers for dairy are almost 2.5 for Minnesota, and the lowest is 1.4 for Alaska. The average is 2.0. The average earnings multiplier is 0.45, but is as high as 0.56 for Minnesota. The

employment multiplier ranges from 6.3 in Delaware to 18.2 in Kentucky. The average employment multiplier is 12.2.

The third table summarizes the RIMS-II multipliers for poultry and egg production. Output multipliers range from 1.3 for several states to over 3.0. The earnings multipliers range from 0.27 in Alaska to 0.66 in Minnesota. The employment multiplier ranges from 5.7 in Alaska to 18.1 in Kentucky.

Finally, the multipliers for Industry 112A00, “animal production, except cattle, poultry and eggs” (i.e. hogs and pigs and smaller sectors like aquaculture) are summarized in the fourth table. They average 1.6 for output, 0.37 for income, and 9.6 for employment.

The tables on the next two pages detail the multipliers for each industry and each state under study.

Table 33, Animal Agriculture Multipliers

Multipliers - Beef Cows			
	Output (\$M)	Earnings (\$M)	Employment
Alabama	1.945	0.397	12.053
Alaska	1.364	0.247	5.326
Arizona	1.808	0.380	12.283
Arkansas	2.439	0.493	12.772
California	1.851	0.387	7.401
Colorado	2.411	0.507	13.917
Connecticut	1.391	0.261	8.637
Delaware	1.516	0.250	4.666
Florida	1.597	0.337	8.927
Georgia	1.824	0.382	7.881
Hawaii	1.508	0.296	8.933
Idaho	2.293	0.469	9.891
Illinois	2.076	0.424	8.264
Indiana	2.030	0.403	8.261
Iowa	2.360	0.476	10.060
Kansas	2.526	0.490	9.791
Kentucky	2.572	0.519	17.408
Louisiana	1.886	0.385	8.021
Maine	1.541	0.313	10.948
Maryland	1.459	0.275	7.683
Massachusetts	1.392	0.255	5.357
Michigan	1.782	0.367	10.290
Minnesota	2.619	0.536	11.514
Mississippi	2.198	0.439	9.710
Missouri	2.530	0.502	13.866
Montana	2.364	0.482	15.312
Nebraska	2.369	0.487	10.271
Nevada	1.563	0.305	8.652
New Hampshire	1.415	0.270	5.955
New Jersey	1.551	0.300	8.536
New Mexico	2.134	0.419	9.646
New York	1.433	0.266	7.688
North Carolina	1.824	0.381	9.770
North Dakota	2.375	0.459	11.239
Ohio	2.003	0.406	12.523
Oklahoma	2.448	0.493	15.844
Oregon	2.219	0.451	15.513
Pennsylvania	1.798	0.360	11.314
Rhode Island	1.374	0.254	5.590
South Carolina	1.621	0.331	11.601
South Dakota	2.288	0.467	9.706
Tennessee	1.974	0.399	12.908
Texas	2.581	0.543	16.827
Utah	2.043	0.423	14.070
Vermont	1.645	0.322	10.611
Virginia	1.624	0.313	7.146
Washington	1.966	0.403	9.298
West Virginia	1.664	0.305	6.938
Wisconsin	2.409	0.499	13.013
Wyoming	2.034	0.390	12.854

Multipliers - Dairy Cows			
	Output (\$M)	Earnings (\$M)	Employment
Alabama	2.112	0.485	15.112
Alaska	1.401	0.294	6.892
Arizona	1.843	0.449	13.894
Arkansas	2.304	0.521	14.512
California	2.052	0.492	9.899
Colorado	2.222	0.528	14.555
Connecticut	1.574	0.343	11.341
Delaware	1.697	0.319	6.341
Florida	1.856	0.454	12.654
Georgia	2.256	0.531	11.382
Hawaii	1.630	0.373	11.943
Idaho	2.165	0.500	11.042
Illinois	2.435	0.551	11.106
Indiana	2.316	0.513	10.891
Iowa	2.259	0.511	11.229
Kansas	2.354	0.507	10.653
Kentucky	2.426	0.544	18.168
Louisiana	2.049	0.474	11.649
Maine	1.746	0.405	14.233
Maryland	1.660	0.363	10.984
Massachusetts	1.577	0.338	7.472
Michigan	1.947	0.456	12.915
Minnesota	2.464	0.560	12.194
Mississippi	2.215	0.495	11.453
Missouri	2.452	0.537	16.458
Montana	2.128	0.491	15.927
Nebraska	2.262	0.521	11.467
Nevada	1.576	0.359	9.125
New Hampshire	1.607	0.358	8.320
New Jersey	1.748	0.388	9.495
New Mexico	1.810	0.407	10.059
New York	1.636	0.351	10.072
North Carolina	2.237	0.525	12.691
North Dakota	2.166	0.472	11.427
Ohio	2.340	0.529	14.584
Oklahoma	2.222	0.501	16.130
Oregon	2.018	0.466	15.705
Pennsylvania	2.067	0.467	14.564
Rhode Island	1.521	0.325	7.626
South Carolina	1.867	0.436	15.262
South Dakota	2.165	0.497	10.803
Tennessee	2.077	0.474	15.148
Texas	2.356	0.553	17.113
Utah	2.135	0.499	16.596
Vermont	1.786	0.400	14.190
Virginia	1.800	0.398	9.516
Washington	2.103	0.493	11.254
West Virginia	1.537	0.326	7.912
Wisconsin	2.304	0.533	14.444
Wyoming	1.657	0.367	12.500

Multipliers – Hogs and Other Livestock			
	Output (\$M)	Earnings (\$M)	Employment
Alabama	1.637	0.378	10.771
Alaska	1.303	0.283	6.126
Arizona	1.516	0.364	11.006
Arkansas	1.690	0.383	8.909
California	1.600	0.380	7.199
Colorado	1.731	0.411	12.058
Connecticut	1.368	0.304	9.811
Delaware	1.422	0.282	5.244
Florida	1.520	0.366	10.283
Georgia	1.692	0.398	8.072
Hawaii	1.443	0.336	10.252
Idaho	1.665	0.385	8.038
Illinois	1.872	0.431	8.376
Indiana	1.788	0.406	8.184
Iowa	1.722	0.392	7.991
Kansas	1.768	0.391	8.580
Kentucky	1.814	0.412	13.631
Louisiana	1.580	0.369	7.568
Maine	1.545	0.364	12.278
Maryland	1.425	0.318	9.760
Massachusetts	1.384	0.301	9.557
Michigan	1.584	0.374	10.564
Minnesota	1.856	0.426	8.716
Mississippi	1.701	0.386	8.348
Missouri	1.831	0.408	12.113
Montana	1.650	0.381	12.196
Nebraska	1.721	0.398	8.085
Nevada	1.383	0.320	8.509
New Hampshire	1.395	0.315	6.851
New Jersey	1.481	0.335	10.784
New Mexico	1.504	0.342	8.304
New York	1.411	0.311	7.747
North Carolina	1.747	0.411	9.276
North Dakota	1.657	0.364	8.207
Ohio	1.813	0.417	11.284
Oklahoma	1.730	0.396	12.819
Oregon	1.565	0.361	12.137
Pennsylvania	1.650	0.378	11.862
Rhode Island	1.355	0.300	6.552
South Carolina	1.528	0.357	12.195
South Dakota	1.665	0.383	7.734
Tennessee	1.604	0.370	8.329
Texas	1.771	0.418	13.064
Utah	1.736	0.409	13.539
Vermont	1.467	0.334	11.368
Virginia	1.494	0.338	7.584
Washington	1.616	0.377	8.630
West Virginia	1.342	0.295	6.606
Wisconsin	1.716	0.401	10.636
Wyoming	1.433	0.323	10.467

Multipliers – Poultry			
	Output (\$M)	Earnings (\$M)	Employment
Alabama	2.612	0.560	14.160
Alaska	1.359	0.272	5.740
Arizona	1.654	0.373	8.862
Arkansas	2.830	0.598	12.863
California	2.090	0.464	8.732
Colorado	2.304	0.517	13.215
Connecticut	1.512	0.313	8.889
Delaware	2.042	0.360	6.721
Florida	1.736	0.391	9.754
Georgia	2.760	0.610	12.349
Hawaii	1.479	0.318	9.749
Idaho	2.373	0.510	11.264
Illinois	2.771	0.600	11.600
Indiana	3.041	0.643	13.202
Iowa	2.822	0.598	12.349
Kansas	2.560	0.519	10.305
Kentucky	2.999	0.627	18.074
Louisiana	2.351	0.513	10.779
Maine	1.872	0.408	12.173
Maryland	1.892	0.392	10.227
Massachusetts	1.501	0.306	6.109
Michigan	1.989	0.442	11.081
Minnesota	3.052	0.659	13.388
Mississippi	2.740	0.570	12.300
Missouri	3.057	0.631	17.179
Montana	2.200	0.473	11.440
Nebraska	2.695	0.578	11.945
Nevada	1.456	0.314	6.838
New Hampshire	1.544	0.324	6.779
New Jersey	1.654	0.350	9.913
New Mexico	1.788	0.373	8.540
New York	1.601	0.324	8.557
North Carolina	2.754	0.606	12.978
North Dakota	2.343	0.472	10.641
Ohio	2.918	0.631	15.796
Oklahoma	2.736	0.586	16.588
Oregon	1.959	0.419	12.345
Pennsylvania	2.497	0.534	14.258
Rhode Island	1.444	0.295	6.230
South Carolina	2.002	0.437	13.419
South Dakota	2.671	0.569	11.653
Tennessee	2.182	0.473	13.317
Texas	2.626	0.586	15.749
Utah	2.361	0.524	15.123
Vermont	1.872	0.386	11.428
Virginia	2.183	0.455	9.956
Washington	2.183	0.476	10.634
West Virginia	1.672	0.340	7.412
Wisconsin	2.712	0.594	13.927
Wyoming	1.492	0.310	6.839

Animal Agriculture Soybean Meal Use

One of the primary objectives of this analysis has been to estimate soybean meal use by animal species by life stage (as appropriate) by state and region. Efforts to ascertain soybean meal use in this fashion have been undertaken in the past. However, the methodology we utilized differs in some ways. In general, our approach to estimating soybean meal use starts from the very beginning of the protein production cycle. Rather than beginning with the end (pounds of meat or eggs produced), we focus on the appropriate rations fed to the many segments of animal agriculture, essentially employing a bottom up approach to estimating soybean meal usage by animal agriculture segments.

To better understand the current state of the soybean meal feeding industry, we made targeted contact with about twenty-five industry and university nutritionists and subject matter experts (collectively referred to herein as SME's) who have many years of practical industry experience (see Appendix B for a complete list of SME's). In our discussions with these SME's, we sought to understand the following for each of the animal species under study:

1. **Population** by state/region
 - a. Broken out by stage of life, as appropriate
 - b. Relevant production and practice trends taking place
 - i. Recognition and identification of geographic shifts in production areas taking place as part of a mid- to longer-term trend
 - ii. An understanding of "best management practices" with regard to rations that may be changing in a way that has implications for overall demand for soybean meal and its substitutes
2. **Typical ration ingredients and associated inclusion rates**
 - a. Regional differences in production practices and ration ingredient availability and their impact on rations
 - b. Characteristic(s) of soybean meal that make it attractive for feeding
 - c. An understanding of the nutritional profiles of competing substitutes to soybean meal, particularly the traits that give rise to effectively competing with soybean meal

The above outline was used to collect notes in numerous phone, web conference, and email conversations with our chosen SME's. As we discussed the above with SME's, specific conditions unique to some species were identified and incorporated in our estimates of soybean meal use. Further considerations were made for converting livestock and other species production data (which tend to be on calendar year) to a soybean marketing year so as to present a more accurate picture with regard to the production and marketing of soybeans. What follows is an explanation of the approach we took to estimate soybean meal use by species.

Broilers

The following methodology was adopted to estimate soybean meal usage for broilers:

1. Broiler production and slaughter numbers are available in monthly and/or annual reports produced by USDA/National Agricultural Statistics Service (USDA/NASS) for twenty major broiler producing states. While this covers a majority of the annual production, the reports do not provide a sound basis for distributing the “Other States” data. Using publicly available data and internally developed methodology and resources we allocated the “Other States” data to the “missing” states.
2. Distribution of broiler production by target weight needs to account for varying finishing weights. Broilers are typically raised to one of four target weights (3.75 lbs, 5.25 lbs, 7 lbs and 9 lbs). Since the grow-out period and resulting feed consumption is different for each range it is important to estimate the number of birds grown to each target weight.
3. Converted annual 2017 and 2018 broiler production data to 2017/18 soybean marketing year.
4. Worked with Justin Fowler (University of Georgia) to determine four regional diets (see Figure 72). These diets were then weighted based upon their estimated usage. For example, Nebraska’s applied diet was 75% weighted to the Midwest diet and 25% weighted to the West diet. Similar weighting was done for other states as applicable.
5. Average broiler finishing weight in 2018 was approximately 6.18 pounds. Diets were adjusted to four finishing weights to account for varying total feed intake and weighted by their respective shares (by count) in each state.
6. Summarized soybean meal and other ration ingredient quantities.

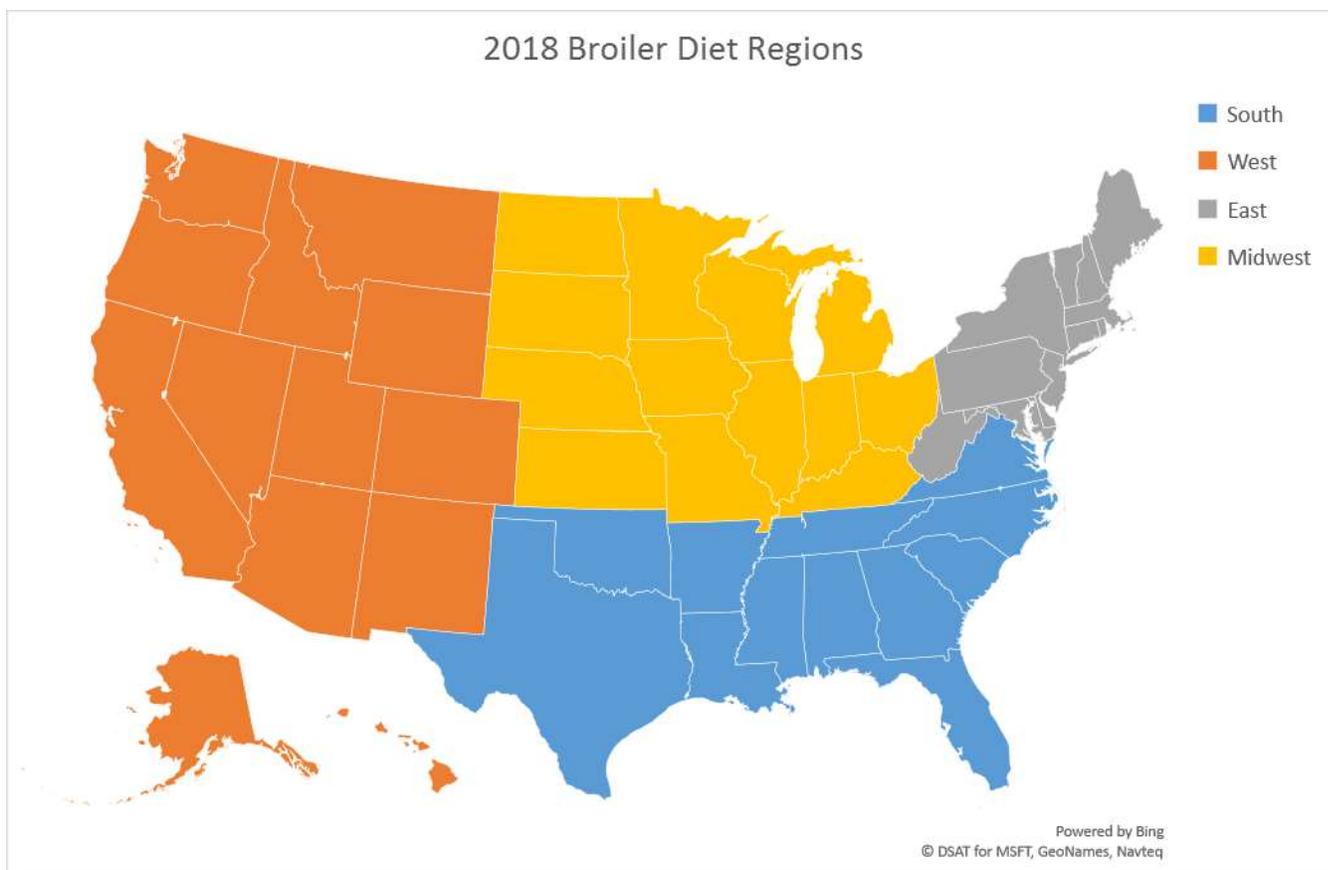


Figure 72, Broiler Ration Regions

Layers

The following methodology was adopted to estimate soybean meal usage for layers:

1. Recognize that there are four general types of layers to account for the feeding of soybean meal to, each of which has differing nutritional requirements and feed intake. These types of layers are:
 - a. Table egg layers
 - i. Layers that lay eggs for table egg consumption
 - b. Table egg layer pullets
 - i. Pullets ages 0-18 weeks of age that will become table egg layers
 - c. Breeder table layers
 - i. Laying hens that lay eggs which become table egg pullets
 - d. Breeder broiler layers
 - i. Laying hens that lay eggs which become broiler pullets
2. Obtained 2017 and 2018 monthly table egg layer data from the “Chicken and Eggs Summary” report from USDA, which contains inventory estimates by state for table and broiler layers. This report was used as the basis for estimating all four types of layers.

3. Worked with Justin Fowler (University of Georgia) to determine four regional diets (see Figure 73). These diets were then weighted based upon their estimated usage. For example, Missouri's applied diet was 75% weighted to the Midwest diet and 25% weighted to the South diet. Similar weighting was done for other states as applicable.
4. Summarized soybean meal and other ration ingredient quantities.



Figure 73, Layer Ration Regions

Turkeys

The following methodology was adopted to estimate soybean meal usage for turkeys:

1. Obtained 2018 turkey production from USDA's "Poultry – Production and Value, 2018 Summary" report. This report includes data for nineteen major turkey producing states. While this covers a majority of the annual production, the reports do not provide a sound basis for distributing the "Other States" data. Using publicly available data and internally developed methodology and resources we allocated the "Other States" data to the "missing" states.
2. Monthly turkey production data (from USDA/NASS) was collected and summarized according to the soybean marketing year (September to August of following year).
3. Worked with Meghan Schwartz, a private turkey nutritionist, to determine four regional rations (see Figure 74). These diets were then weighted based upon their estimated usage. For example, Oklahoma's applied diet was 75% weighted to the South diet and

25% weighted to the Midwest diet. Similar weighting was done for other states as applicable. Diets were also adjusted by the following turkey production categories:

- a. Toms (50% of total turkeys)
 - b. Light Hens (65% of 50% of total turkeys)
 - c. Heavy Hens (35% of 50% of total turkeys)
4. Summarized soybean meal and other ration ingredient quantities.

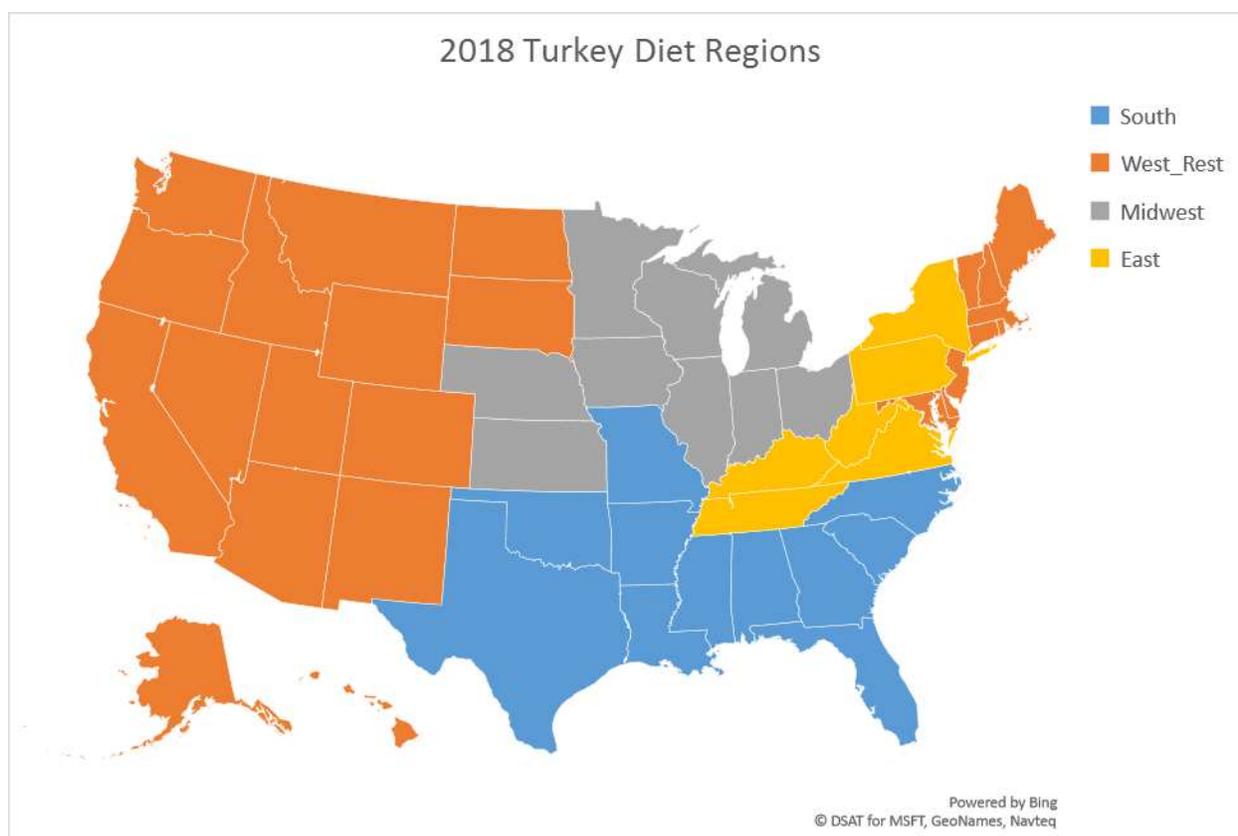


Figure 74, Turkey Ration Regions

Hogs

The following methodology was adopted to estimate soybean meal usage for hogs:

1. Obtained 2017 and 2018 marketings data from the USDA's "Meat Animal Production, Disposition, and Income 2017 Summary" report.
2. Converted 2017 and 2018 marketings data to 2017/18 soybean marketing year.
3. Worked with nutritionists to determine three (see Figure 75) appropriate regional rations for the following hog life stages. These diets were then weighted based upon their estimated usage. For example, Colorado's applied diet was 75% weighted to the West diet and 25% weighted to the Midwest diet. Similar weighting was done for other states as applicable. These diets also reflected the following:
 - a. A composite Gestation/Lactation ration based upon two sub-phases

- b. A composite Nursery ration based upon four sub-phases
 - c. A composite Grower/Finisher based upon six sub-phases
4. Adapted hog inventory by weight and breeding stock data from USDA to coincide with corresponding rations provided by nutritionists.
5. Summarized soybean meal and other ration ingredient quantities.



Figure 75, Hog Ration Regions

Dairy Cows

The following methodology was adopted to estimate soybean meal usage for dairy cows:

1. Obtained monthly 2017 and 2018 inventory data by state from the USDA/NASS.
2. Calculated average inventory by state for months making up the 2017/18 soybean marketing year.
3. Worked with primarily Mike Hutjens (University of Illinois) to determine appropriate regional rations for lactating dairy cattle (see Figure 76). These diets were then weighted based upon their estimated usage. For example, Iowa's applied diet was 75% weighted to the 70/30 Corn Silage/Alfalfa diet and 25% weighted to the 50/50 Corn Silage/Alfalfa diet. Similar weighting was done for other states as applicable.
4. Summarized soybean meal and other ration ingredient quantities.

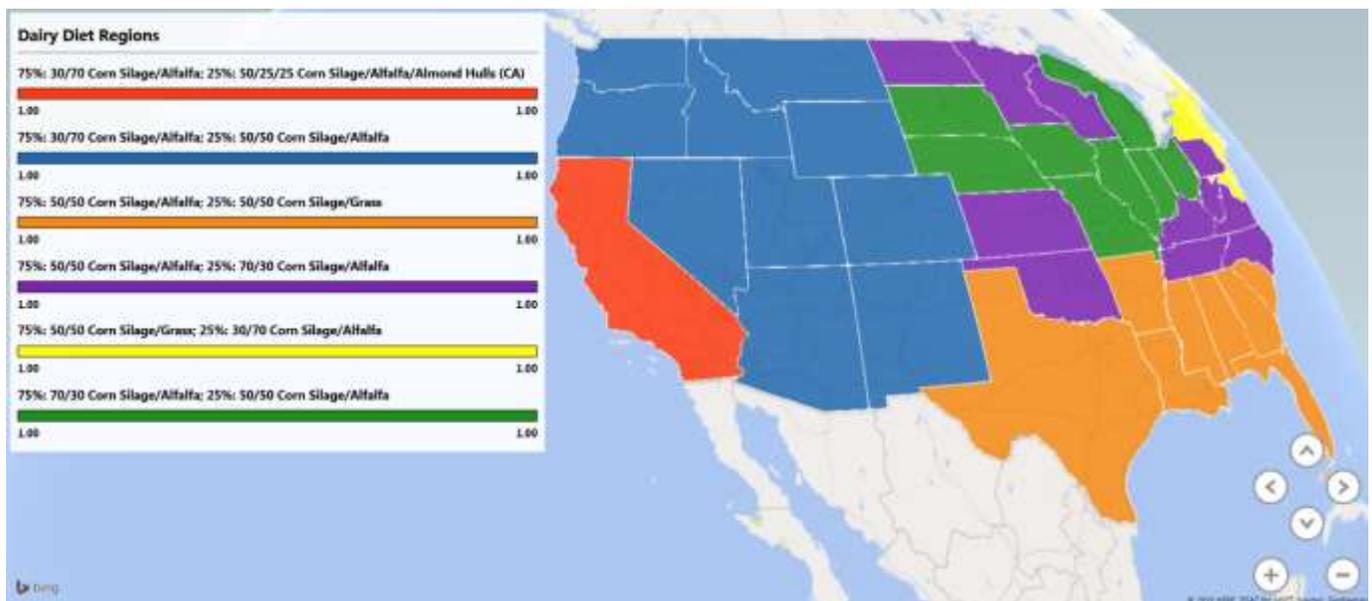


Figure 76, Dairy Ration Regions

Beef Cows

The following methodology was adopted to estimate soybean meal usage for beef cows:

1. Obtained 2017 and 2018 marketings data from the USDA's "Meat Animal Production, Disposition, and Income 2018 Summary" report.
2. Converted 2017 and 2018 marketings data to 2017/18 soybean marketing year.
3. Worked with SMEs', including Eric Bailey (University of Missouri) as well as online resources from the University of Missouri and Kansas State University to determine appropriate rations for beef production
 - a. Creep feed for young calves at or around weaning time
 - b. Receiving and Finishing diets for both calf-feds and yearlings
 - i. Determined two (see Figure 75) appropriate regional rations for finishing cattle. These diets were then weighted based upon their estimated usage. For example, Utah's applied diet was 75% weighted to the Southern diet and 25% weighted to the Northern diet.
4. Summarized soybean meal and other ration ingredient quantities.

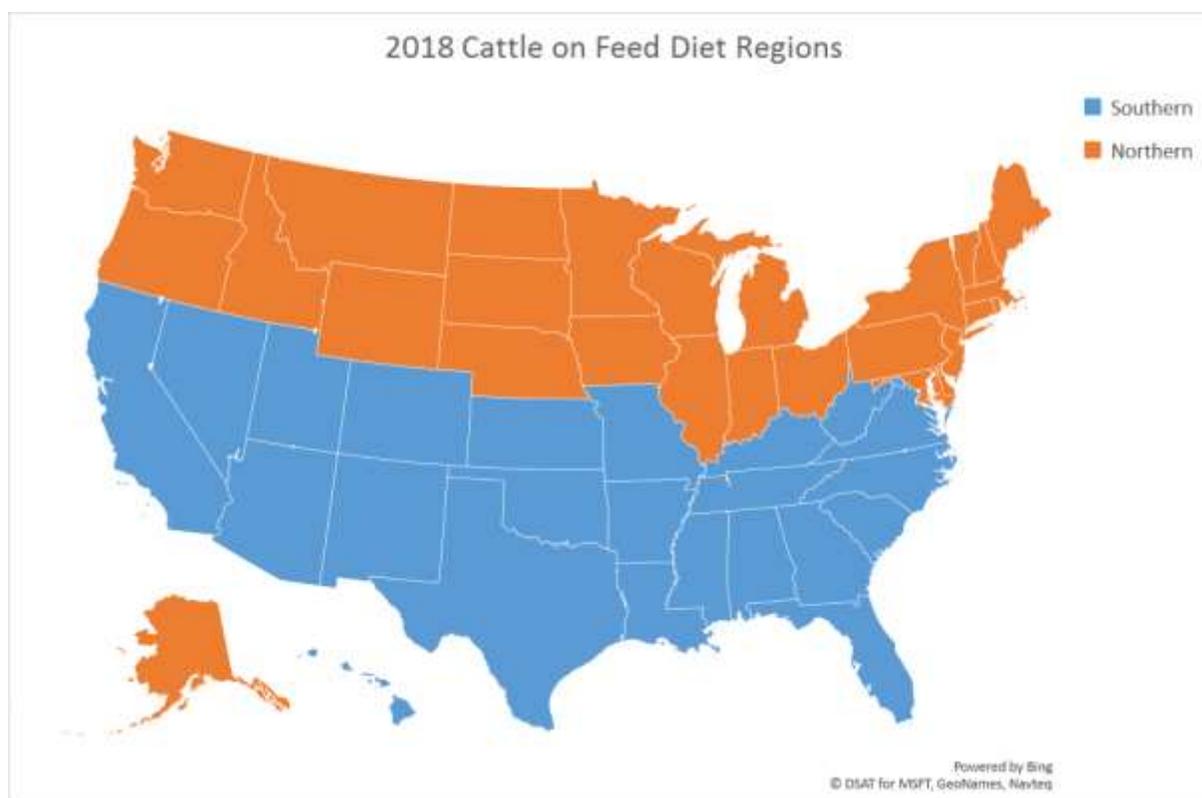


Figure 77, Cattle on Feed Ration Regions

Aquaculture

The 2017 USDA Census of Agriculture provides information on the number of aquaculture operations with sales within each state. However, species level detail is only available for Catfish and Trout. The other categories are Food Fish, Bait Fish, Crustaceans, Mollusks, Ornamental Fish, Sport Fish, Aquaculture, Other. The 2018 USDS Census of Aquaculture will not be released in time for use in this report.

Five major food fish were included in previous studies. They are; catfish, trout, tilapia, hybrid striped bass, yellow perch. Saltwater shrimp and freshwater prawns were included in the shrimp category. For this report the 2017 USDA Census of Aquaculture Census Table number 31, Aquaculture Sales was used.

In most species of food fish, the sales information is reported in four life stages: broodstock, fingerlings and fry, stockers and food size. This breakdown is not available for bait fish, hybrid striped bass and yellow perch and is not applicable to crustaceans.

For trout and catfish, the USDA also produces annual reports for the previous two years. The data included in these USDA/NASS reports are very similar to the data included in the 2013 Census providing updated data on catfish and trout production. However, the number of operations data is not updated or included in the annual reports.

For all other species, using input from SME's and datasets from FishStatJ⁵, we established a growth percentage from the 2013 census to create the 2017 estimates. The 2017 populations for each species include an adjustment for losses through the specific life stage growth period.

Working with industry experts, average target weights, feed conversion ratios (FCR), and soybean meal inclusion rates were determined for each species (catfish, trout, tilapia, hybrid striped bass, yellow perch, baitfish and shrimp). In addition, we created an estimate for the percent of death losses for each species. A loss factor was established based on the assumption that losses occur evenly over the grow-out period. These factors were used to calculate the estimated soybean meal consumption per head in each life stage category.

Companion Animals

Soybean meal usage by companion animals was greatly aided by the "2012 U.S. Pet Ownership and Demographics Sourcebook", a report published by the American Veterinary Medical Association. This document provided estimates of horses, cats and dogs per household for 2011 and estimates of total animal populations for the years 1996, 2001, 2006 and 2011. Data from this report were used as a basis to estimate companion animals by state for 2018. SME's provided additional context regarding the degree to which soybean meal is included in these companion animal diets. Following are additional details related to estimating soybean meal usage for each type of companion animal.

Horses

The following methodology was adopted to estimate soybean meal usage for horses:

1. Using historical horse population data from the AVMA publication, 2018 estimated horse populations by state for were generated.
2. Worked with James Lattimer (K-State) to determine appropriate soybean meal inclusion rates for horses.
3. Average daily consumption of soybean meal was factored against total 2018 horse populations by state.

Dogs

The following methodology was adopted to estimate soybean meal usage for Dogs:

1. Using historical dog population data from the AVMA publication, dog population by state estimates for 2018 were generated.
2. Contrary to estimates for cats, which are quite uniform in their weight and food consumption, dogs required additional considerations. Mature dogs weigh between 2-

⁵ Food and Agriculture Organization of the UN, <http://www.fao.org/fishery/statistics/software/fishstatj/en>

200 pounds and therefore have wide ranges of food requirements. Accounting for different sized dogs was addressed.

3. While estimates of total dogs was provided by AVMA, a breakdown by breed was not available. To better reflect the popularity of breeds of dogs, an exponential curve was estimated to give more popular breeds a higher weight (i.e., Labrador Retrievers are in higher number than Fox Terriers) for determining pet food consumption.
4. Average daily consumption of soybean meal by dogs is a function of dog weight (varies by breed), food intake (varies by breed), soybean meal inclusion rate and share of dog food market that utilizes soybean meal. This function yields an estimated 5.26 lbs of soybean meal per year per dog.
5. The above variables were factored against total estimated 2018 dog populations by state.

Cats

The following methodology was adopted to estimate soybean meal usage for Cats:

1. Using historical cat population data from the AVMA publication, cat population by state estimates for 2018 were generated.
2. Worked with SME's to determine appropriate soybean meal inclusion rates for cats.
3. Average daily consumption of soybean meal by cats is a function of cat weight, food intake, and soybean meal inclusion rate and share of cat food market that utilizes soybean meal. This function yields an estimated 0.8 lbs of soybean meal per year per cat.
4. The above variables were factored against total estimated 2018 cat populations by state.

Animal Unit Trends

Animal units (AUs) allow equal standards for all animal based on size and manure produced. The calculation of AUs is based on the prevailing concept of an AU being one 1,000-pound beef cow consuming an average of 2.6% of its body weight daily, however, daily consumption varies throughout the year. Other species are calculated as 0.1 AU per 100 pounds of body weight (e.g., a 425 pound sow =0.425 AU). See Table 2 for AUs description for all the species included in this study. U.S. “Total” AUs figure summarizes the AUs for the following species: dairy cows, beef cows, hogs, broilers, layers, and turkeys.

In general, all animal unit (AU) trend data were retrieved from the same sources as listed in the soybean meal consumption section. Below is a brief summary of sources for data which were used to analyze AU trends (companion animals and aquaculture are not included in this component of the analysis). AU conversions were made according to factors in Table 34:

- Broilers Poultry – Production and Value, Summary annual reports (USDA)
- Layers Average layers from December Chicken and Eggs reports (USDA)
- Turkeys Poultry – Production and Value, Summary annual reports (USDA)
- Hogs Meat Animal Production, Disposition, and Income Summary annual reports (USDA)
- Dairy Cows Average January dairy inventory from QuickStats (USDA’s online query tool)
- Beef Cows Meat Animal Production, Disposition, and Income Summary annual reports (USDA)

Table 34, Animal Unit Factors

Equivalent Animal Units Based on Live Weights			
Animal Type	Animal Name	Average Live Weight (pounds)	Animal Unit (One animal unit is 1,000 pounds live weight)
Hogs	Nursery Pigs	20	0.020
	Finishers	150	0.150
	Sows	425	0.425
Beef	Beef Calves	450	0.450
	Beef Cattle	1,200	1.200
Dairy	Dairy Cattle	1,400	1.400
Chickens	Broilers	3.0	0.003
	Layers	3.5	0.004
Other	Turkeys	15.0	0.015
Notes: Sows were given the same factor as "breeding/gestation sows." Beef cattle were given the same factor as "mature cows (beef)"			
Source: USDA, data provided by the Indiana Department of Environmental Management (IDEM).			

Appendix A, 2018 State by Species Soybean Meal Usage

State	State Abbrev	Broilers	Turkeys	Layers	Hogs, MEAL	Hogs, HULLS
Alabama	AL	1,853,160	5,324	32,079	10,053	-
Alaska	AK	4,318	2,010	726	170	7
Arizona	AZ	8,763	3,748	8,785	12,010	375
Arkansas	AR	1,936,643	273,288	57,490	29,879	22
California	CA	46,484	101,026	129,398	9,568	176
Colorado	CO	40,900	14,631	40,126	121,943	3,492
Connecticut	CT	14,686	5,106	4,131	178	22
Delaware	DE	433,576	1,086	4,210	1,037	88
Florida	FL	108,693	11,888	59,227	1,653	-
Georgia	GA	2,266,188	6,176	103,891	20,299	-
Hawaii	HI	3,937	272	2,374	559	66
Idaho	ID	27,052	9,234	12,898	3,358	132
Illinois	IL	31,104	10,305	47,392	520,605	7,019
Indiana	IN	106,641	197,675	302,591	423,832	3,182
Iowa	IA	149,211	115,052	512,700	2,238,367	13,353
Kansas	KS	28,863	4,389	13,715	204,644	2,074
Kentucky	KY	616,270	10,710	32,690	48,047	18
Louisiana	LA	39,305	2,587	10,272	682	-
Maine	ME	39,816	12,330	6,359	469	44
Maryland	MD	488,373	7,333	25,730	2,940	154
Massachusetts	MA	20,452	6,029	5,381	897	88
Michigan	MI	226,755	51,718	137,129	109,139	1,497
Minnesota	MN	129,182	398,668	94,445	837,231	7,454
Mississippi	MS	1,240,271	2,502	25,552	52,394	-
Missouri	MO	636,891	162,377	71,844	373,047	5,771
Montana	MT	13,240	4,563	9,381	23,876	743
Nebraska	NE	43,029	3,306	69,471	364,809	5,365
Nevada	NV	2,413	1,521	1,937	100	7
New Hampshire	NH	16,971	7,659	3,799	355	26
New Jersey	NJ	11,314	4,291	6,467	753	44
New Mexico	NM	8,255	4,360	10,336	335	13
New York	NY	60,376	24,059	42,641	4,029	264
North Carolina	NC	1,428,656	288,127	74,943	799,083	-
North Dakota	ND	11,836	1,767	2,655	31,192	437
Ohio	OH	214,728	66,221	292,309	211,866	2,402
Oklahoma	OK	357,539	9,683	34,749	369,056	9,973
Oregon	OR	69,472	19,338	21,380	747	33
Pennsylvania	PA	347,795	74,333	225,818	112,308	5,236
Rhode Island	RI	2,937	978	789	153	13
South Carolina	SC	398,710	10,843	29,259	11,620	-
South Dakota	SD	14,064	38,612	23,472	230,353	3,041
Tennessee	TN	314,163	9,396	30,924	27,927	11
Texas	TX	1,129,373	30,887	165,334	126,975	3,223
Utah	UT	10,033	15,846	45,514	57,118	1,736
Vermont	VT	27,849	6,573	4,742	465	44
Virginia	VA	462,411	168,504	11,629	15,840	-
Washington	WA	47,881	17,708	63,421	1,880	66
West Virginia	WV	150,378	34,241	15,666	365	44
Wisconsin	WI	120,022	21,131	57,922	41,417	570
Wyoming	WY	8,652	2,499	5,326	14,023	743
U.S. Total	Short Tons	15,769,637	2,281,911	2,991,018	7,469,643	79,074

State	State Abbrev	Dairy Cows, MEAL	Dairy Cows, HULLS	Beef Cows, MEAL	Beef Cows, HULLS	Sheep	Meat Goats
Alabama	AL	2,176	986	2,413	9,435	74	4
Alaska	AK	112	-	3	9	4	-
Arizona	AZ	74,071	8,818	1,364	6,400	195	3
Arkansas	AR	2,000	907	2,896	11,325	85	3
California	CA	574,517	43,968	2,406	22,582	1,492	7
Colorado	CO	60,732	7,230	5,197	24,387	1,391	2
Connecticut	CT	7,189	-	13	79	26	-
Delaware	DE	1,850	-	6	38	8	-
Florida	FL	34,132	15,472	535	2,512	103	4
Georgia	GA	7,673	3,478	995	4,151	84	5
Hawaii	HI	824	-	15	48	27	1
Idaho	ID	214,421	25,526	2,654	8,302	1,184	1
Illinois	IL	23,930	39,171	7,632	25,280	309	2
Indiana	IN	47,817	78,272	6,044	20,021	350	3
Iowa	IA	56,595	92,641	48,767	161,540	849	4
Kansas	KS	40,220	39,502	30,554	191,172	339	4
Kentucky	KY	16,525	16,230	1,236	7,735	256	5
Louisiana	LA	3,885	1,761	611	2,391	57	1
Maine	MN	11,230	-	18	115	53	-
Maryland	MD	18,107	-	51	318	72	1
Massachusetts	MA	4,452	-	9	55	47	-
Michigan	MI	109,606	179,415	3,548	13,876	375	2
Minnesota	MN	117,054	114,964	15,780	74,051	688	2
Mississippi	MS	3,115	1,412	1,129	4,416	53	2
Missouri	MO	23,725	38,835	12,694	59,568	604	6
Montana	MT	5,164	615	3,271	15,350	1,385	1
Nebraska	NE	15,537	25,433	73,171	343,369	503	2
Nevada	NV	11,014	1,311	494	1,546	227	1
New Hampshire	NH	5,051	-	7	46	36	-
New Jersey	NJ	2,467	-	4	27	83	1
New Mexico	NM	117,392	13,975	1,899	8,913	276	2
New York	NY	220,973	-	575	2,699	410	1
North Carolina	NC	12,467	12,245	1,012	4,747	122	4
North Dakota	ND	4,408	4,330	10,453	49,052	345	0
Ohio	OH	67,434	110,382	4,242	16,589	672	4
Oklahoma	OK	10,932	10,736	13,160	41,171	231	7
Oregon	OR	43,321	5,157	567	3,548	857	3
Pennsylvania	PA	134,803	132,396	892	4,188	485	3
Rhode Island	RI	322	-	1	6	5	-
South Carolina	SC	4,481	2,031	474	1,976	43	3
South Dakota	SD	30,755	50,343	10,732	33,575	1,565	1
Tennessee	TN	11,853	11,642	1,168	7,311	251	8
Texas	TX	147,989	67,083	32,558	101,855	2,113	67
Utah	UT	34,999	4,167	856	2,677	1,739	1
Vermont	VT	45,180	-	42	260	56	-
Virginia	VA	22,041	21,648	436	2,726	460	4
Washington	WA	97,590	11,618	590	3,694	233	2
West Virginia	WV	2,283	2,242	284	1,335	195	2
Wisconsin	WI	328,390	322,526	12,461	58,475	430	2
Wyoming	WY	2,246	267	1,865	8,754	1,741	0
U.S. Total	Short Tons	2,835,050	1,518,735	317,787	1,363,694	23,187	182

State	State Abbrev	Companion Animals	Aquaculture	State Total, MEAL	State Total, HULLS	State GRAND Total
Alabama	AL	8,413	37,565	1,951,261	10,421	1,961,683
Alaska	AK	848	26	8,216	16	8,232
Arizona	AZ	12,555	264	121,757	15,593	137,349
Arkansas	AR	5,419	7,768	2,315,472	12,254	2,327,726
California	CA	40,324	2,282	907,504	66,727	974,231
Colorado	CO	10,071	695	295,688	35,109	330,796
Connecticut	CT	4,142	220	35,691	101	35,792
Delaware	DE	11,024	17	452,815	126	452,941
Florida	FL	26,119	306	242,659	17,984	260,643
Georgia	GA	14,203	551	2,420,065	7,629	2,427,694
Hawaii	HI	1,347	62	9,417	114	9,531
Idaho	ID	3,192	6,356	280,352	33,961	314,313
Illinois	IL	12,007	53	653,339	71,470	724,809
Indiana	IN	9,746	390	1,095,089	101,475	1,196,564
Iowa	IA	5,263	257	3,127,065	267,534	3,394,599
Kansas	KS	5,778	94	328,599	232,748	561,346
Kentucky	KY	10,280	89	736,107	23,983	760,090
Louisiana	LA	5,537	769	63,706	4,152	67,858
Maine	MN	1,634	445	72,355	159	72,514
Maryland	MD	5,306	160	548,075	473	548,547
Massachusetts	MA	5,048	285	42,600	143	42,743
Michigan	MI	11,209	433	649,914	194,788	844,702
Minnesota	MN	7,833	114	1,600,998	196,469	1,797,467
Mississippi	MS	5,305	80,730	1,411,053	5,828	1,416,880
Missouri	MO	12,530	453	1,294,172	104,175	1,398,347
Montana	MT	3,464	245	64,590	16,709	81,299
Nebraska	NE	3,706	300	573,834	374,167	948,000
Nevada	NV	3,959	58	21,724	2,864	24,588
New Hampshire	NH	1,289	139	35,306	72	35,379
New Jersey	NJ	7,044	48	32,471	71	32,542
New Mexico	NM	4,711	237	147,805	22,901	170,706
New York	NY	17,164	354	370,582	2,963	373,545
North Carolina	NC	12,064	2,679	2,619,157	16,992	2,636,149
North Dakota	ND	1,764	54	64,475	53,818	118,293
Ohio	OH	15,474	196	873,147	129,374	1,002,521
Oklahoma	OK	8,395	39	803,791	61,880	865,671
Oregon	OR	6,685	631	163,000	8,739	171,739
Pennsylvania	PA	14,064	975	911,476	141,819	1,053,295
Rhode Island	RI	877	47	6,108	19	6,127
South Carolina	SC	6,230	344	462,007	4,007	466,015
South Dakota	SD	2,626	124	352,306	86,960	439,266
Tennessee	TN	13,106	462	409,259	18,964	428,223
Texas	TX	37,304	9,377	1,681,977	172,162	1,854,139
Utah	UT	4,039	509	170,654	8,579	179,233
Vermont	VT	1,140	158	86,204	304	86,508
Virginia	VA	10,971	465	692,761	24,374	717,135
Washington	WA	10,344	1,626	241,276	15,378	256,654
West Virginia	WV	3,325	317	207,057	3,621	210,677
Wisconsin	WI	7,565	192	589,533	381,571	971,104
Wyoming	WY	2,051	222	38,625	9,765	48,390
U.S. Total	Short Tons	434,496	160,181	32,283,093	2,961,503	35,244,596

Appendix B, Subject Matter Experts

Name	Role	Company Name
Alison Crane Ph.D.	Industry Expert - Sheep & Meat Goats	Kansas State University
Andy Tauer	Industry Expert - Aquaculture	Indiana Soybean Alliance
Bart Gorg Ph.D.	Industry Expert - Swine	Standard Nutriton Services
D Allen Davis Ph.D.	Industry Expert - Aquaculture	Auburn University
Dale Blasi Ph.D.	Industry Expert - Beef	Kansas State University
Eric Bailey Ph.D.	Industry Expert - Beef	University of Missouri
George Collings Ph.D.	Industry Expert - Pet Food	Collings Nutrition Solutions
Greg Aldrich Ph.D.	Industry Expert - Pet Food	Kansas State University
James Drouillard Ph.D.	Industry Expert - Beef	Kansas State University
James Lattimer Ph.D.	Industry Expert - Equine	Kansas State University
Jaymelynn Farney Ph.D.	Industry Expert - Beef	Kansas State University
Jenny Jennings Ph.D.	Industry Expert - Beef	Texas A&M University
Justin Fowler Ph.D.	Industry Expert - Broilers	University of Georgia
Justin Waggoner Ph.D.	Industry Expert - Beef	Kansas State University
Karla Jenkins Ph.D.	Industry Expert - Beef	University of Nebraska - Lincoln
Kevin Fitzsimmons Ph.D.	Industry Expert - Aquaculture	The University of Arizona
Kwamena Quagraine Ph.D.	Industry Expert - Aquaculture	Perdue University
Meghan Schwartz Ph.D.	Industry Expert - Turkeys	Schwartz Consulting Services, Inc
Menghe Li Ph.D.	Industry Expert - Aquaculture	Mississippi State University
Michael Brouk Ph.D.	Industry Expert - Dairy	Kansas State University
Michael Hutjens Ph.D.	Industry Expert - Dairy	University of Illinois
Nick Shelton Ph.D.	Industry Expert - Swine	NutriQuest
Steven Hart Ph.D.	Industry Expert - Aquaculture	Global Aquaculture Alliance
Terry Hanson Ph.D.	Industry Expert - Aquaculture	Auburn University