

2018 Soybean Meal Demand Assessment

UNITED STATES

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for:



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Contents

Acknowledgements.....	5
Executive Summary.....	6
Introduction	8
Competitiveness of Soybean Meal	10
Soybean Meal.....	12
Canola Meal	17
Cottonseed Meal.....	22
Dried Distillers Grains with Solubles (DDGS)	24
Synthetic Amino Acids	28
Competitiveness of Soybean Meal Results.....	30
Broilers.....	30
Layers	36
Turkeys.....	42
Hogs	47
Dairy Cows	53
Beef Cows.....	61
Companion Animals.....	64
Aquaculture.....	68
Sheep	71
Meat Goats	72
Competitiveness of Soybean Meal Remarks	72
National Results	75
U.S. Economic Impact of Animal Agriculture.....	75
U.S. Total Animal Agriculture Soybean Meal Consumption	87
U.S. Total Animal Unit (AU) Trends.....	103
State Level Results	120
2007-2017 Animal Agriculture: ALABAMA	120
2007-2017 Animal Agriculture: ALASKA	134
2007-2017 Animal Agriculture: ARIZONA.....	148
2007-2017 Animal Agriculture: ARKANSAS.....	162
2007-2017 Animal Agriculture: CALIFORNIA	176

2007-2017 Animal Agriculture: COLORADO	190
2007-2017 Animal Agriculture: CONNECTICUT	204
2007-2017 Animal Agriculture: DELAWARE.....	218
2007-2017 Animal Agriculture: FLORIDA.....	232
2007-2017 Animal Agriculture: GEORGIA.....	246
2007-2017 Animal Agriculture: HAWAII	260
2007-2017 Animal Agriculture: IDAHO	274
2007-2017 Animal Agriculture: ILLINOIS.....	288
2007-2017 Animal Agriculture: INDIANA.....	302
2007-2017 Animal Agriculture: IOWA	316
2007-2017 Animal Agriculture: KANSAS	330
2007-2017 Animal Agriculture: KENTUCKY.....	344
2007-2017 Animal Agriculture: LOUISIANA	358
2007-2017 Animal Agriculture: MAINE.....	372
2007-2017 Animal Agriculture: MARYLAND	386
2007-2017 Animal Agriculture: MASSACHUSETTS.....	400
2007-2017 Animal Agriculture: MICHIGAN.....	414
2007-2017 Animal Agriculture: MINNESOTA.....	428
2007-2017 Animal Agriculture: MISSISSIPPI	442
2007-2017 Animal Agriculture: MISSOURI.....	456
2007-2017 Animal Agriculture: MONTANA	470
2007-2017 Animal Agriculture: NEBRASKA.....	484
2007-2017 Animal Agriculture: NEVADA	498
2007-2017 Animal Agriculture: NEW HAMPSHIRE	512
2007-2017 Animal Agriculture: NEW JERSEY	526
2007-2017 Animal Agriculture: NEW MEXICO.....	540
2007-2017 Animal Agriculture: NEW YORK	554
2007-2017 Animal Agriculture: NORTH CAROLINA	568
2007-2017 Animal Agriculture: NORTH DAKOTA.....	582
2007-2017 Animal Agriculture: OHIO	596
2007-2017 Animal Agriculture: OKLAHOMA	610
2007-2017 Animal Agriculture: OREGON	624

2007-2017 Animal Agriculture: PENNSYLVANIA.....	638
2007-2017 Animal Agriculture: RHODE ISLAND.....	652
2007-2017 Animal Agriculture: SOUTH CAROLINA.....	666
2007-2017 Animal Agriculture: SOUTH DAKOTA.....	680
2007-2017 Animal Agriculture: TENNESSEE	694
2007-2017 Animal Agriculture: TEXAS.....	708
2007-2017 Animal Agriculture: UTAH.....	722
2007-2017 Animal Agriculture: VERMONT	736
2007-2017 Animal Agriculture: VIRGINIA.....	750
2007-2017 Animal Agriculture: WASHINGTON.....	764
2007-2017 Animal Agriculture: WEST VIRGINIA.....	778
2007-2017 Animal Agriculture: WISCONSIN.....	792
2007-2017 Animal Agriculture: WYOMING	806
Methodology.....	820
Competitiveness of Soybean Meal, Price Elasticities.....	820
Competitiveness of Soybean Meal, Component Price Elasticities.....	821
Economic Impact Analysis.....	822
Animal Agriculture Soybean Meal Use	827
Animal Unit Trends	837
Appendix A, 2017 State by Species Soybean Meal Usage	839
Appendix B, Subject Matter Experts.....	842

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- Justin Fowler, Ph.D., University of Georgia
- Michael Hutjens, Ph.D., University of Illinois
- Steven Hart, Ph.D., Global Aquaculture Alliance
- Meghan Schwartz, Ph.D., Schwartz Consulting Services
- Nick Shelton, Ph.D., NutriQuest

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

Executive Summary

The purpose of this research has been to analyze the competitive environment for protein sources in animal diets. This includes not only calculation of price elasticities for competing feedstuffs in diets, but calculation of demand elasticity estimates for the components which drive their inclusion in rations. Determining component elasticity estimates is an undertaking which has yielded powerful insights that will inform the strategy to enable continued strength of soybean meal (SBM) as a key ingredient in livestock and poultry diets.

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.

Our research suggests that 31.2 million tons of SBM was fed to animal agriculture during the 2016/17 soybean marketing year. Of this amount, broilers were the highest consumer of SBM (forty-eight percent), followed by hogs (twenty-four 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. A combined total of 2.7 million tons of soy hulls were fed to hogs, dairy and beef cattle.

Using a partial equilibrium framework that supported estimated log-linear models, own and cross-price elasticities of SBM demand were derived using a theoretically-consistent method for broiler, hog, layers and turkey rations. Own-price elasticities ranged from being relatively inelastic for layers (-0.003) to turkeys (-0.052). The price elasticities of SBM demand indicate higher prices of SBM can reduce SBM inclusion rates in broiler, hog, layer and turkey diets.

In terms of component elasticity estimates, we found that both broilers and layers place a premium on digestible lysine in the SBM, but not hogs and turkeys. SBM is a very good source of providing not only lysine but many other favorable nutritional characteristics in a balanced fashion. In particular, we found that if SBM were to contain 5 percent more digestible lysine:

- Broiler producers would theoretically be willing to pay up to approximately 91 percent more for SBM.
- Layer producers would theoretically be willing to pay approximately 196 percent more for SBM.

Other key findings related to the competitiveness of SBM include:

- With regard to broiler diets, we find synthetic lysine can compete with the lysine component in SBM. Also, the lysine component in DDGS and canola meal can also

compete with the lysine component in SBM. DDGS as analyzed by metabolizable energy values competes with the metabolizable energy in SBM.

- With respect to layers, synthetic lysine and canola meal can pose a threat for the lysine component in SBM. The crude protein component in canola meal can compete with crude protein component in SBM. Again, canola meal is competing with the SBM's energy component, but not corn and DDGS. With respect to turkeys, synthetic lysine poses a greater threat for the lysine component in SBM than corn and DDGS. Corn can compete for metabolizable energy with the energy component in the SBM.
- With respect to hog diets, synthetic lysine provides competition for SBM. We also find that canola meal tends to compete with SBM for crude protein. The results for hogs show that corn and DDGS compete with SBM for metabolizable energy.

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 2017 animal agriculture's support of the national economy included:

- \$347.3 billion in economic output
- 1,842,110 jobs
- \$75.1 billion in earnings
- \$17.8 billion in income taxes
- \$7.4 billion in the form of property taxes

In addition, from 2007-2017, U.S. animal agriculture increased gross national product by \$32.6 billion in economic output, boosted household earnings by over \$6.8 billion and supported an additional 159,786 jobs.

Introduction

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. Through these external challenges, however, animal agriculture has shown its ability to rebound from unexpected challenges.

In addition to consumer's interest in animal welfare issues, the discussion surrounding animal agriculture's sustainability and its impact on water quality has amplified in recent years. As consumer awareness and interest in sustainability and animal husbandry continues to increase, livestock farmers will need to address any concerns, scientifically-valid or not.

Having two years passed since the 2016 election, legal uncertainty associated with immigration and labor issues continues to be a concern for animal agriculture. Other policy directives currently having an impact on U.S. animal agriculture include international soybean and soybean meal trade. The issue of trade is far from settled and will continue to cause uncertainty in the soybean/meal and livestock and poultry industries.

Access to competing 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. Unless soybean meal can match its competing substitutes' strong points, soybean meal inclusion rates and prices will decrease. 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.

5. 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.

The balance of this report serves to address the above objectives of this analysis.

Competitiveness of Soybean Meal

The animal feed industry uses the majority of SBM production, which is used primarily as an amino acid and protein source 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 viability of the agriculture industry. The continued prevalence of SBM use in animal feed is dependent upon 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 the correct 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 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-eight percent), followed by hogs (twenty-four 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-three percent (19.8 million tons) of total SBM consumed by animal agriculture during the 2016/17 soybean marketing year.

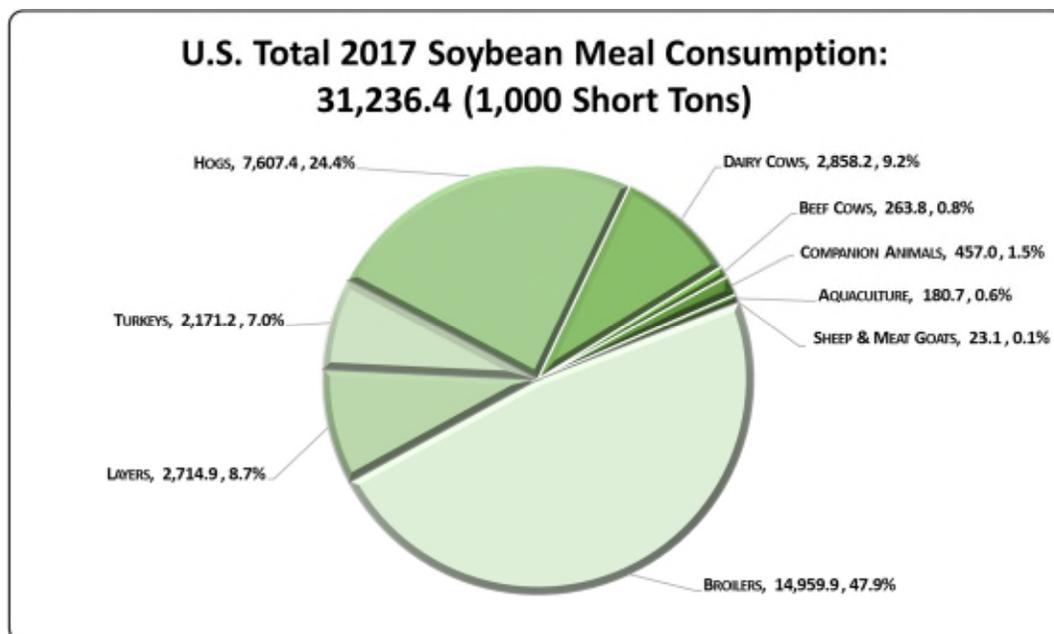


Figure 1, Total Soybean Meal by Major Species 2016/17 (Short Tons)

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 present, available 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 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	Speices	Metabolizable Energy (kcal/lb)	Crude Protein (%)	Lysine (%)	Threonine (%)	Methionine (%)	Crude Fiber (%)	Crude Fat (%)
Soybean Meal, dehulled	Swine	1575	48.27	3.02	1.85	0.67	3.49	3
	Poultry	1140						
Corn, Grain (yellow dent)	Swine	1542	7.92	0.26	0.28	0.17	1.95	3.9
	Poultry	1522						
Distillers Dried Grains w/Solubles	Swine	1551	27.50	0.84	1	0.55	7.62	9.9
	Poultry	1058						
Canola Meal	Swine	1292	37.70	2.09	1.5	0.73	10.15	3.5
	Poultry	1279						
Cottonseed Meal	Swine	1090	39.92	1.49	1.25	0.55	13.4	2.9
	Poultry	1090						
Meat and Bone Meal	Swine	1225	51.42	2.74	1.65	0.72	7.91	2.8
	Poultry	1303						
Wheat Middlings	Swine	1199	16.06	0.65	0.53	0.25	8.25	3.09
	Poultry	1199						
Alfalfa Meal	Dairy	1242	17.22	0.79	0.74	0.28	30	2.9

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 2016/17.

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 in Illinois was \$324 per ton during the 2015/16 marketing year and declined to \$316 per ton during the 2016/17 marketing year. This is a slight 2 percent decrease. Figure 2 shows the average monthly prices for SBM, corn, DDGS, canola meal, and cottonseed meal from Jan. 2014 to July 2018. Meanwhile, DDGS prices also drifted significantly. The average DDGS price during the 2015/16 marketing year was \$124 per ton and dropped to \$100 per ton in the 2016/17 marketing year, a 20 percent reduction. (see Figure 2).

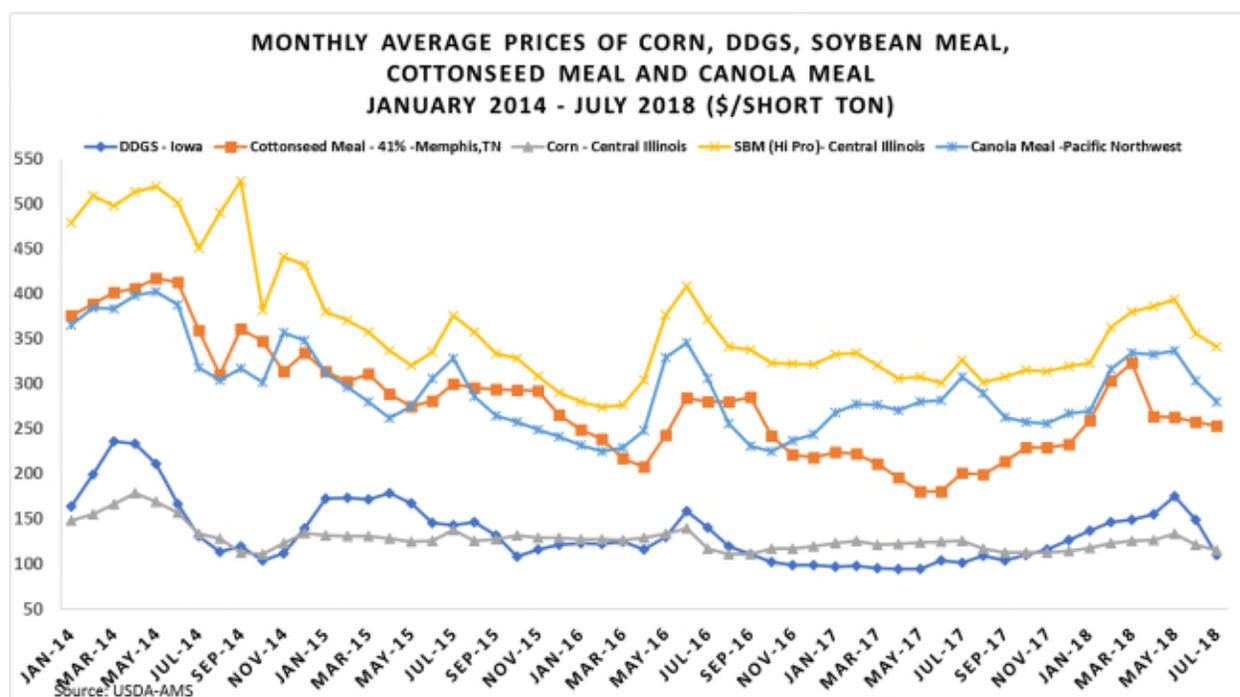


Figure 2, Monthly Average Prices of Major Feedstuffs

Source: www.thejacobsen.com and USDA-AMS

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 listed 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 in 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

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.

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, and 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 SBM prices compared to the prior three-year average (2014-2016). As shown, SBM prices in 2017 were below the three-year average.

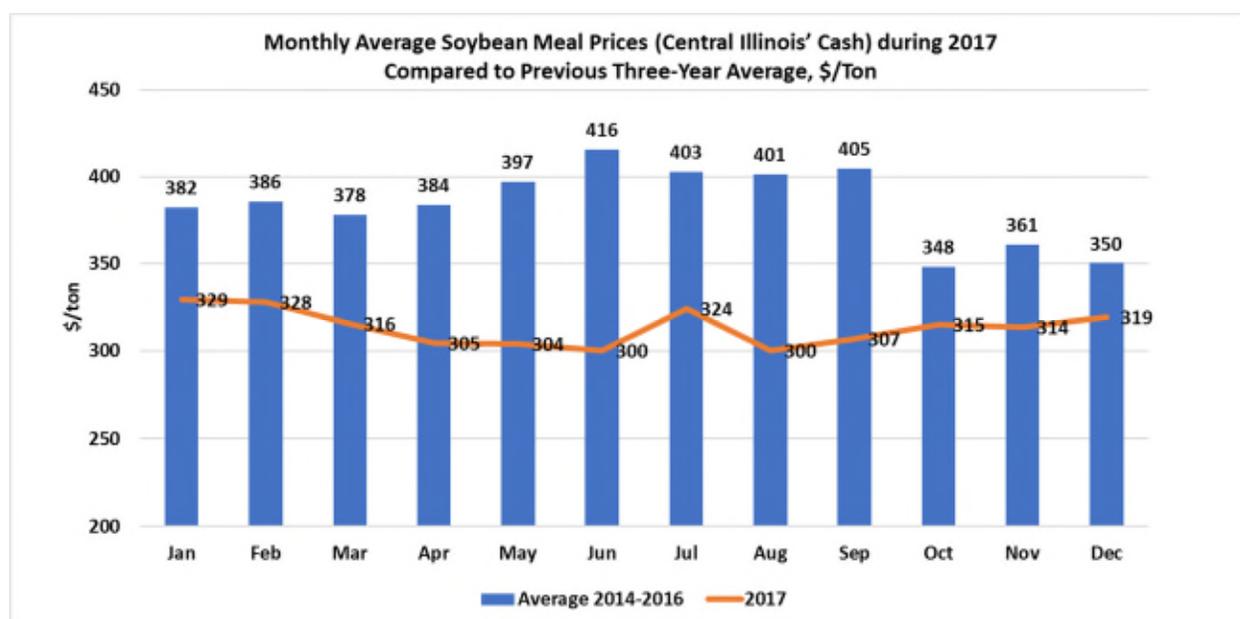


Figure 3, SBM Prices (Central Illinois Cash), 2017 vs. 3-yr Historical Avg.

Source: www.thejacobsen.com

Spatial Differences

Regarding whether the nutritional profile of SBM differs spatially, there is verifiable research that has taken place which documents that there are 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 eight 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 2010-2017 surveys. An eight-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.

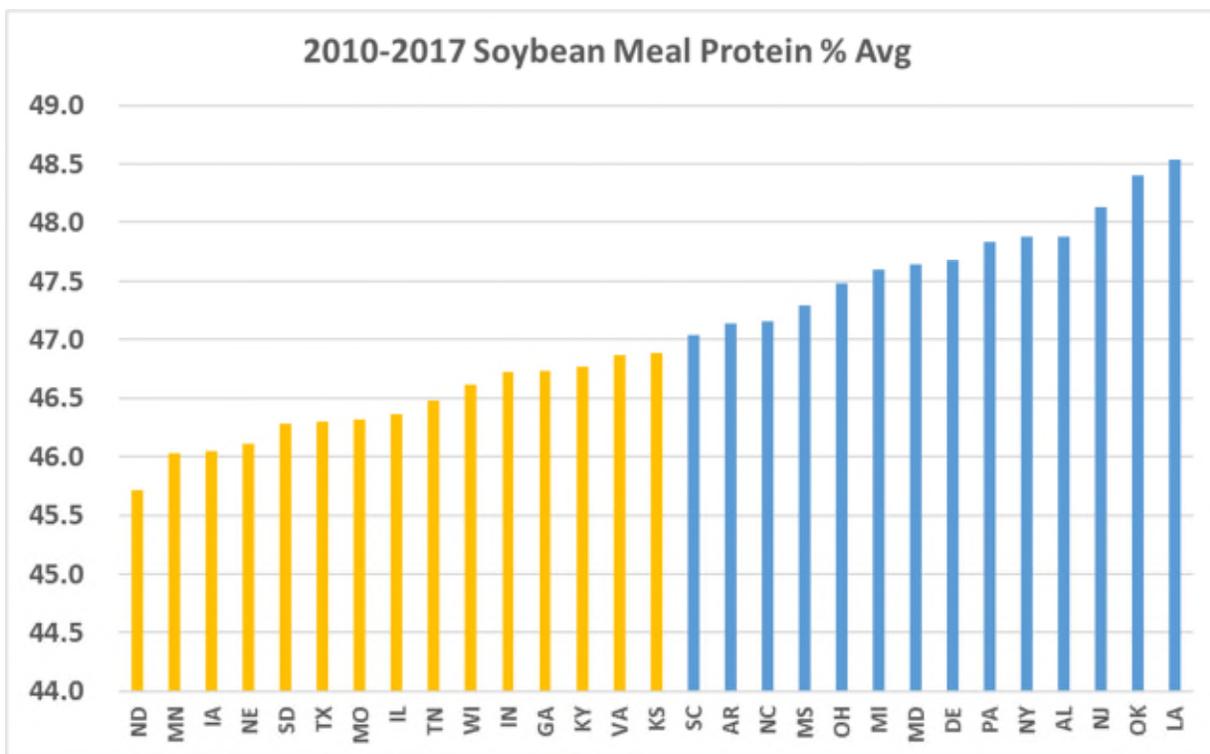


Figure 4, 2010-2017 Soybean Meal Protein % Average

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

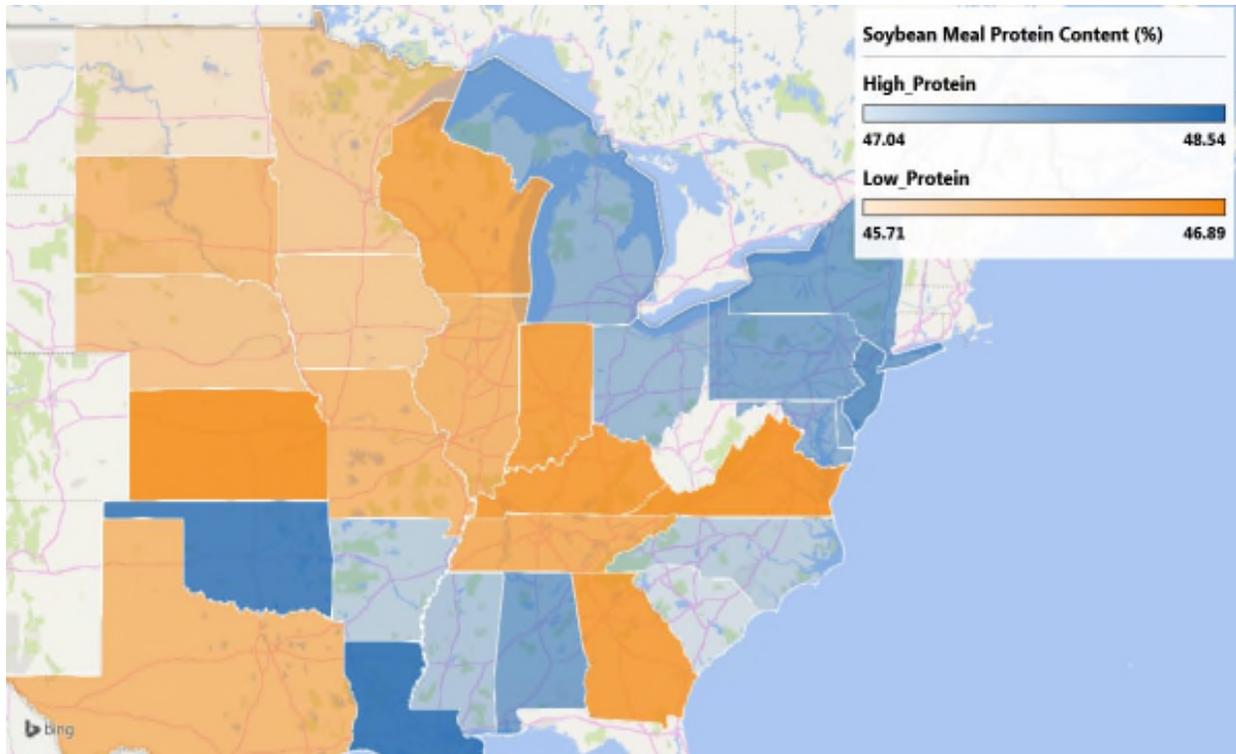


Figure 5, Soybean Protein Content by Region

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

While Figure 5 shows the spatial variance of protein in general, also of interest is the degree of variability in essential amino acids such as lysine. Results from the same sampling data that support Figure 4 and Figure 5 also present lysine content by state. As shown in Table 1, 2013-2017 average lysine content is very consistent across the U.S. soybean growing region, varying only 0.16% between a high of 6.76% of 18 Amino Acids in North Dakota to a low of 6.6% of 18 Amino Acids in New Jersey and Louisiana. This suggests that lysine content in soybeans is consistent despite variances in overall protein. For our analysis, we assume lysine content is consistent throughout the soybean growing region.

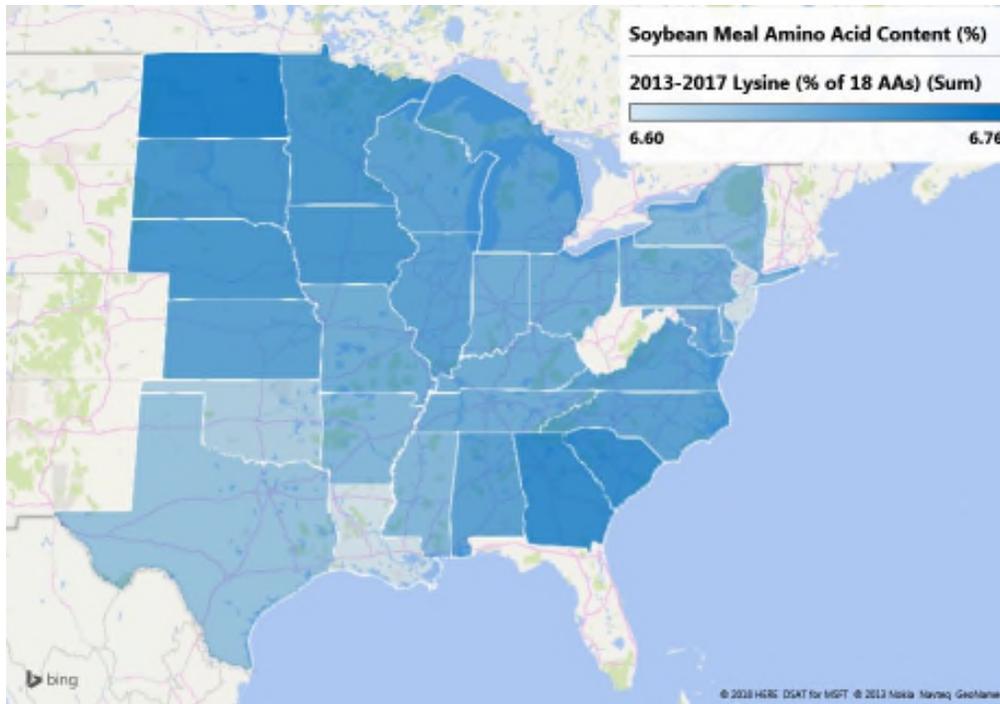


Figure 6, Soybean Lysine Content by Region

As an indication of how widespread soybeans are grown (and the extent to which soybean crushers follow production) in the U.S., Figure 7 depicts the number of soybean crushers by state.

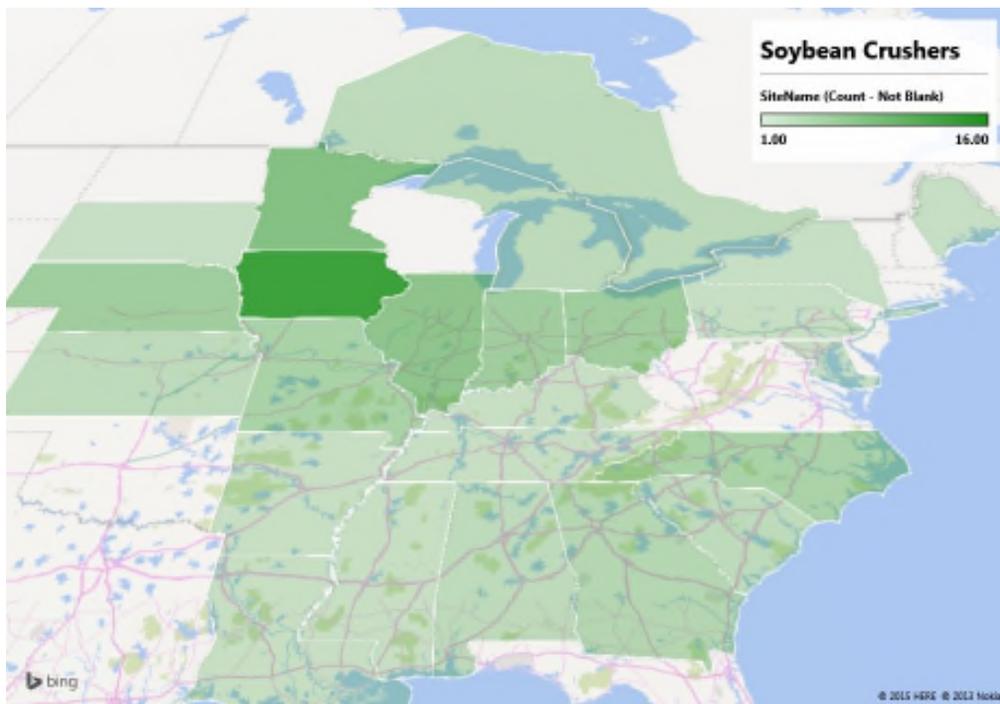


Figure 7, Soybean Meal Crushers by State

In addition to conventional soybeans, new varieties with increased protein concentration or low concentration of oligosaccharides have been introduced recently. This is important because oligosaccharides in SBM are poorly digested by hogs as hogs do not secrete some enzymes that are needed to digest oligosaccharides in SBM, causing reduced growth performance. Crushing of these newer soybean varieties have produced SBM that has characteristics of having high crude protein and low oligosaccharides. Because of the high concentration in amino acids in high protein SBM, greater quantities of digestible amino acids are provided in the high protein SBM than conventional SBM. It is beneficial to reduce the level of oligosaccharides in SBM (i.e., soybean).

Current animal nutrition research indicates the digestibility of amino acids in low oligosaccharides SBM is not different from the digestibility of amino acids in conventional soybean meal. This implies the nutritional values (at least for hogs) on SBM with low oligosaccharides are greater than conventional SBM. This can reduce the quantity of SBM in a diet formulated with a specific amount of digestible amino acids or it can reduce the quantity of synthetic amino acids in diet formulation.

Canola Meal

In addition to DDGS, SBM has been facing increased competition from canola meal, cottonseed meal, meat and bone meal, blood meal, and synthetic amino acids such as lysine and methionine. About 77 percent (3.9 million tons) of the canola meal supply in the U.S. was imported during the 2016/17 soybean marketing year. Total U.S. canola meal imports were 4.0 million tons during the 2015/16 marketing year. Approximately 99 percent of domestic canola meal supply is domestically consumed as shown in Figure 8.

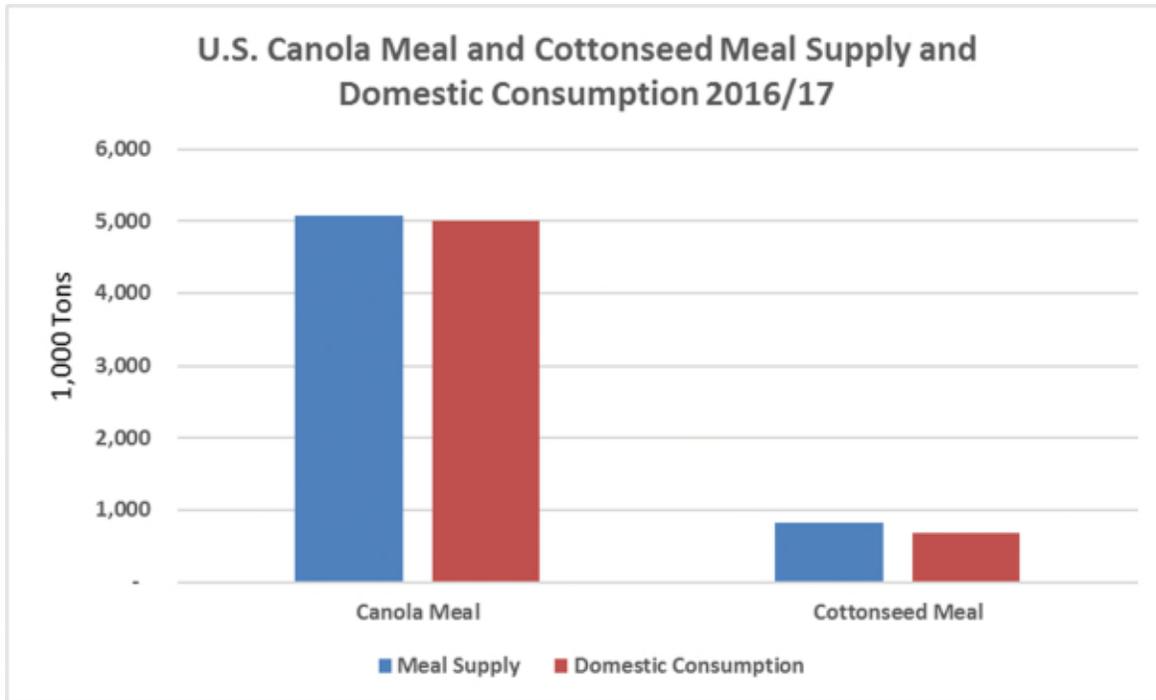


Figure 8, U.S. Canola Meal and Cottonseed Meal Supply and Domestic Consumption 2016/17

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 0.87 from 2014 to July 2018. Canola meal has increasingly become a competing protein source for SBM. Canola meal prices in 2017 have also been below their recent three-year average.

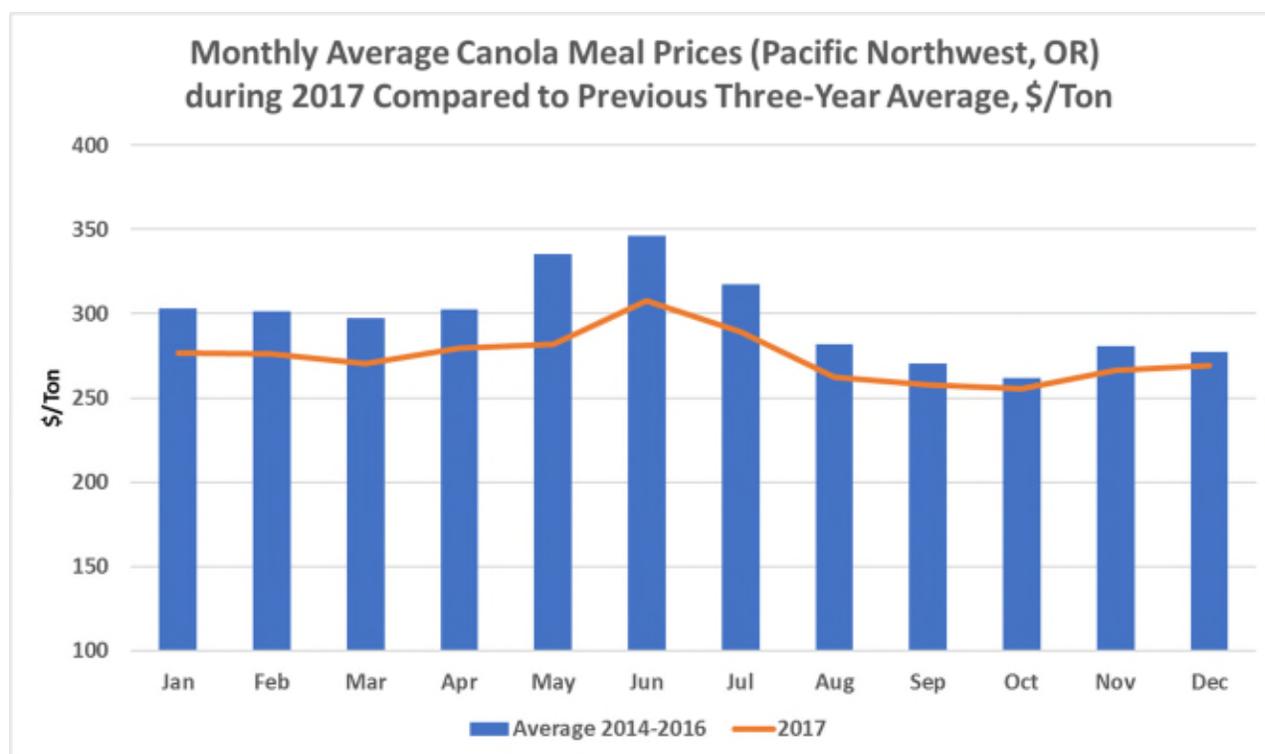


Figure 9, Canola Meal Prices (Pacific Northwest, OR), 2017 vs. Prior 3-yr Average
(Source: USDA-AMS)

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. 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. Canola meal is lower in total crude protein (36 percent) compared to SBM (47.5 percent) as shown in 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 present, available 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 crude fiber and crude fat. Table 1 provides a comparison of these nutritional characteristics for the protein sources included in this analysis.

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Distillers Dried Grains w/Solubles	Swine	1551	27.50	0.84	1	0.55	7.62	9.9
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Canola Meal	Swine	1292	37.70	2.09	1.5	0.73	10.15	3.5
	Poultry	1279						
Cottonseed Meal	Swine	1090	39.92	1.49	1.25	0.55	13.4	2.9
	Poultry	1090						
Meat and Bone Meal	Swine	1225	51.42	2.74	1.65	0.72	7.91	2.8
	Poultry	1303						
Wheat Middlings	Swine	1199	16.06	0.65	0.53	0.25	8.25	3.09
	Poultry	1199						
Alfalfa Meal	Dairy	1242	17.22	0.79	0.74	0.28	30	2.9

Overall protein digestibility of canola meal is also slightly lower compared to the protein 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 digestible energy content compared to SBM. Much of this can be attributed to the higher proportion of hulls compared to what is included in SBM. Canola meal contains up to three times as much crude fiber as SBM. This fiber tends to be lower in digestibility and consequently results in lower energy content of the meal as shown in Table 1. One of the factors 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 are toxic to birds. Recent improvements in canola genetics have mitigated this weakness to a certain extent, but it does still exist.



Figure 10, Canadian 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

In previous iterations of this analysis, mention of Dow Agrosiences ProPound™, an advanced canola meal offering a protein content of 44%, has been mentioned. However, the acreage devoted to this higher protein canola remains small and pricing is not generally available. This makes it difficult to assess its impact on soybean meal demand. In light of the 2015 University of Illinois study conducted on weanling pigs showing improved performance over conventional canola meal and *similar* performance compared with SBM, continued monitoring of this newer variety of canola is important.

Spatial Differences

Regarding whether nutritional profiles of canola differ spatially, nutritional consistency has been assumed. Recall that the U.S. imports 77 percent of its canola requirements. To be imported to the U.S., quality standards must be met, thereby creating 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. We were not able to ascertain nutritional differences in the Kansas/Oklahoma and Pacific Northwest (PNW) regions

in the U.S relative to that imported from Canada. To the extent there are differences, they would be more pronounced in the Kansas/Oklahoma region than in the PNW region, likely in the form of a more favorable protein content, which is similar to what has been described for SBM. Figure 11 shows number of canola crushers by state/province.

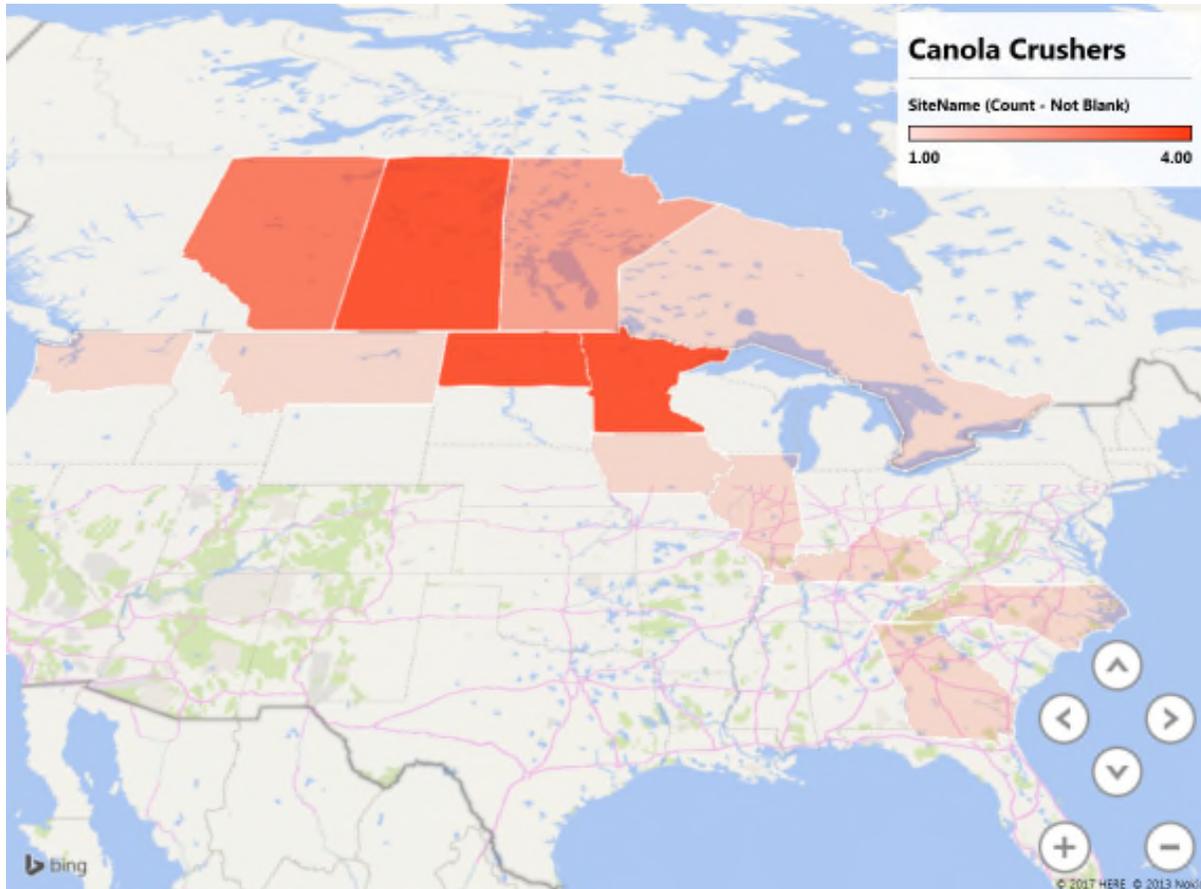


Figure 11, Canola Crushers by State/Province

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 SBM price and cottonseed meal price is 0.86. As shown in Figure 12, cottonseed meal prices also moved down during 2017 compared to the previous three-year average. Also, more than 83 percent of cottonseed meal was domestically consumed during the 2016/17 soybean marketing year (see Figure 8).

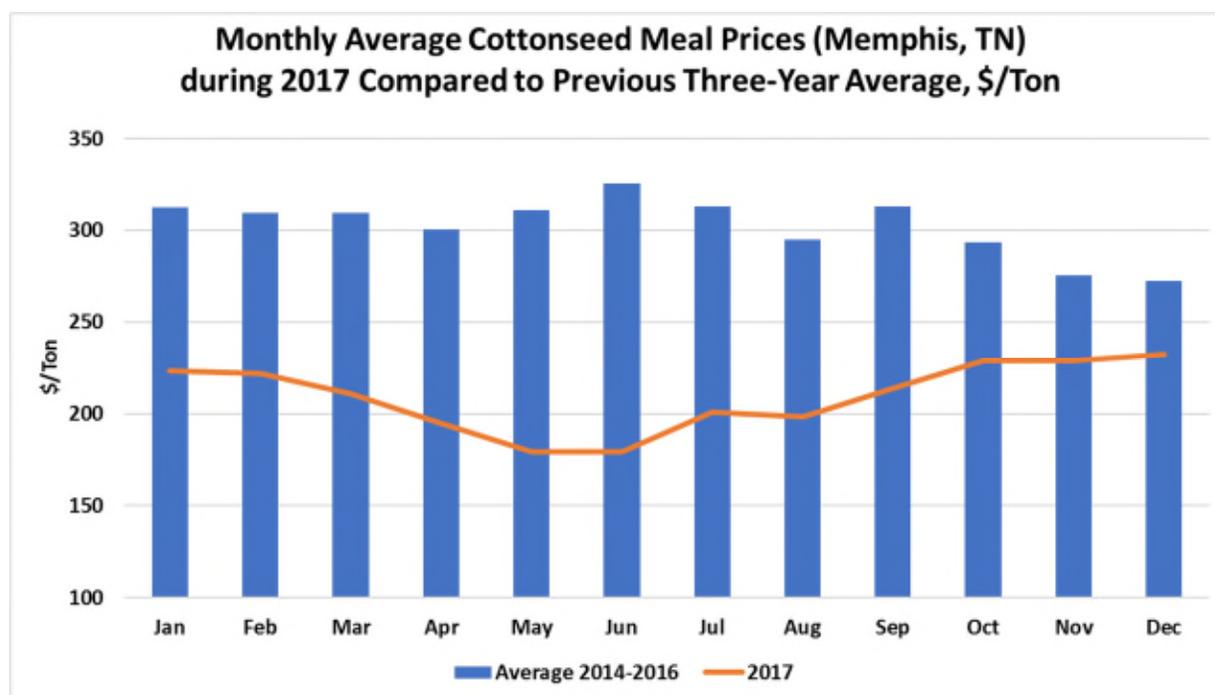


Figure 12, Cottonseed Meal Prices (Memphis), 2017 vs. Prior 3-yr Avg.

Source: USDA-AMS.

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 (39.5%) compared to canola meal (36%), but also less than SBM. The crude fiber level of cottonseed meal is significantly higher than that of SBM. Consequently, the energy content of cottonseed meal is lower than SBM. Essential amino acids content and their ileal digestibility is 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" that the ingredient also has. 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. Hence, it's almost universally avoided as a feed ingredient for table-egg laying birds.

Spatial Differences

Regarding whether nutritional profiles of cottonseed meal differ spatially, we have made 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 13, 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 imports of cottonseed meal are not measurable (i.e., very light if at all), the need to account for availability from areas other than the U.S. is not a worthwhile exercise.

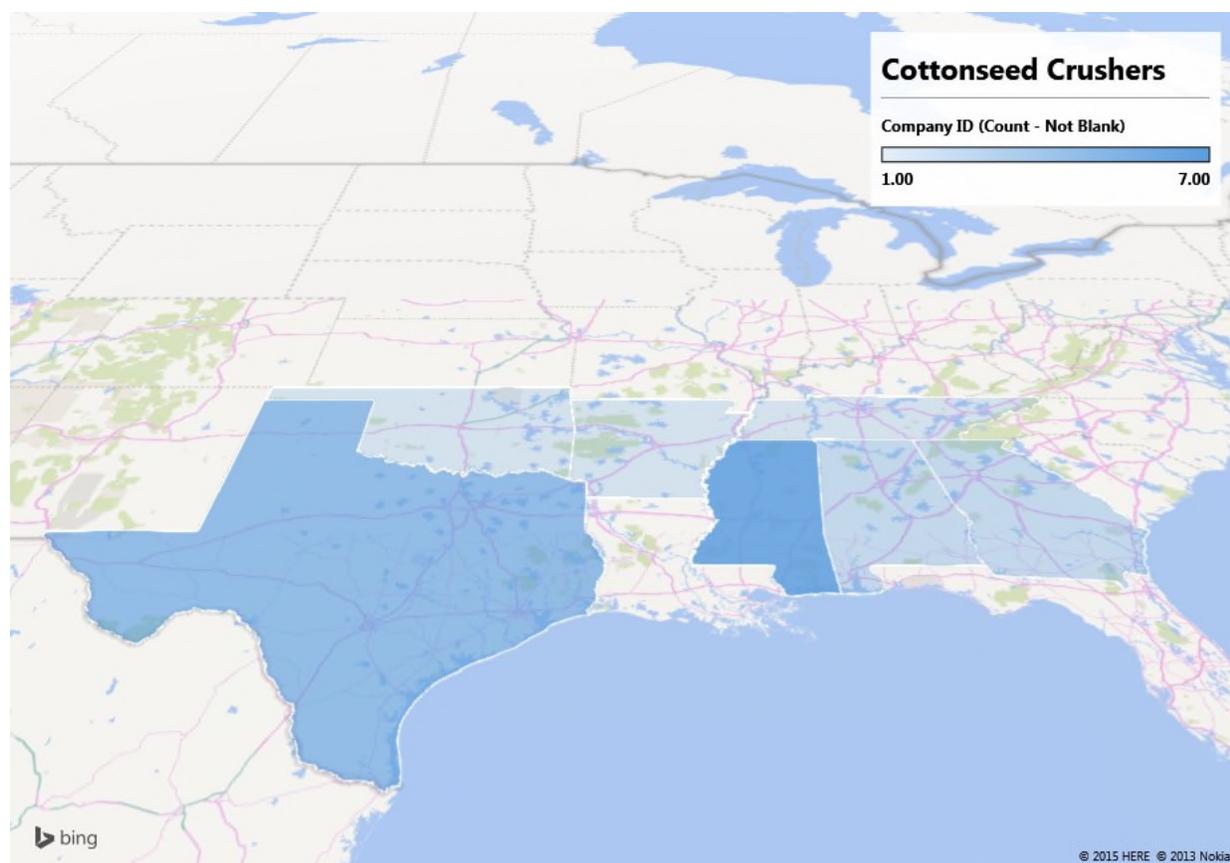


Figure 13, Cottonseed Crushers by State

Dried Distillers Grains with Solubles (DDGS)

The rapid expansion of the U.S. ethanol industry over the last ten years and the resulting increased production of DDGS during the same time have offered livestock and poultry producers a feed ingredient that has the potential of reducing overall diet costs. With tightened margins, DDGS has been treated as more of a co-product as opposed to a byproduct in earlier years. This is evidenced by improvements in consistency and removal of corn oil prior to the production of ethanol. In many cases DDGS has been branded as a premium product 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 (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 has 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 makes DDGS very competitive with SBM. Although the DDGS price is moving along with corn, it must be valued in terms of what it replaces in a diet, not necessarily it's unit cost. DDGS can replace some corn as an energy supplement and some SBM as a crude protein (see Table 1) supplement. These factors make DDGS competitive in the feedstuff market place.

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 of 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. Hence, feeding DDGS in nursery and grower diets can start impacting carcass fat quality as well as reduce carcass yield of market pigs. DDGS generally contains high levels of unsaturated fatty acids which lead to elevated unsaturated fats in the meat.

Due to the use of sulphuric acid in the process of making this feedstuff, DDGS may be high in sulphate, which increases the risk of sulphur toxicity in poultry diets. In addition, mycotoxins are another risk factor. Recent research shows that mycotoxin concentrations can be about three-fold in DDGS compared to the original grain corn due to the concentration that non-starch components undergo during the distillery process.

While regular DDGS consist of 10-15 percent oil, the low-oil variety of DDGS contains much less oil (i.e., 3-5) and has different characteristics and feeding values than regular DDGS do. Low-oil DDGS profiles don't contain high metabolizable energy content compared to regular DDGS, which is a limitation for increased usage. Also, while variability within a supplier is often low, variability among different DDGS suppliers can be common.

While it is widely known that the price of DDGS is related to the price of corn, the exact nature of this relationship and how DDGS pricing is related to other feeding ingredients is not yet

properly understood. In general, simple correlation analysis shows that DDGS prices have followed the price of corn very closely over the last few years. The correlation coefficient between the price of corn and the price of DDGS shows 0.79 for the 2014 to July 2018 time period. However, the correlation between the price of SBM and the price of DDGS is as low as 0.63 from 2014 to July 2018. As shown in Figure 14, DDGS prices in 2017 have declined compared to the previous three-year average from January 2017 to September 2017. From October 2017 to December 2017, DDGS price has gone above the three-year average.

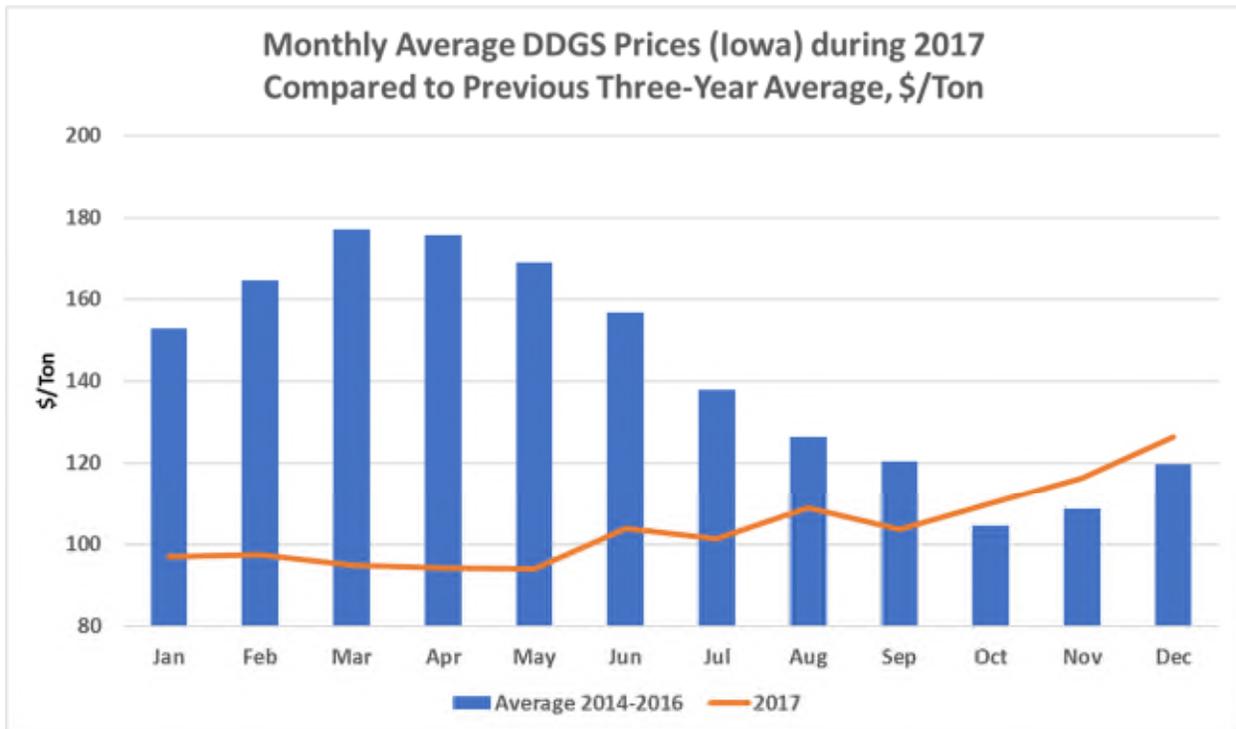


Figure 14, Monthly Average DDGS Prices (Iowa Cash) During 2017 Compared to Previous Three-Year Average.

Source: USDA-AMS

Approximately 70 percent of total DDGS supply is domestically consumed with the rest being exported (see Figure 15). As shown in the Figure 15, approximately 29.9 million short tons of DDGS were used in the livestock and poultry industries during the 2016/17 marketing year.

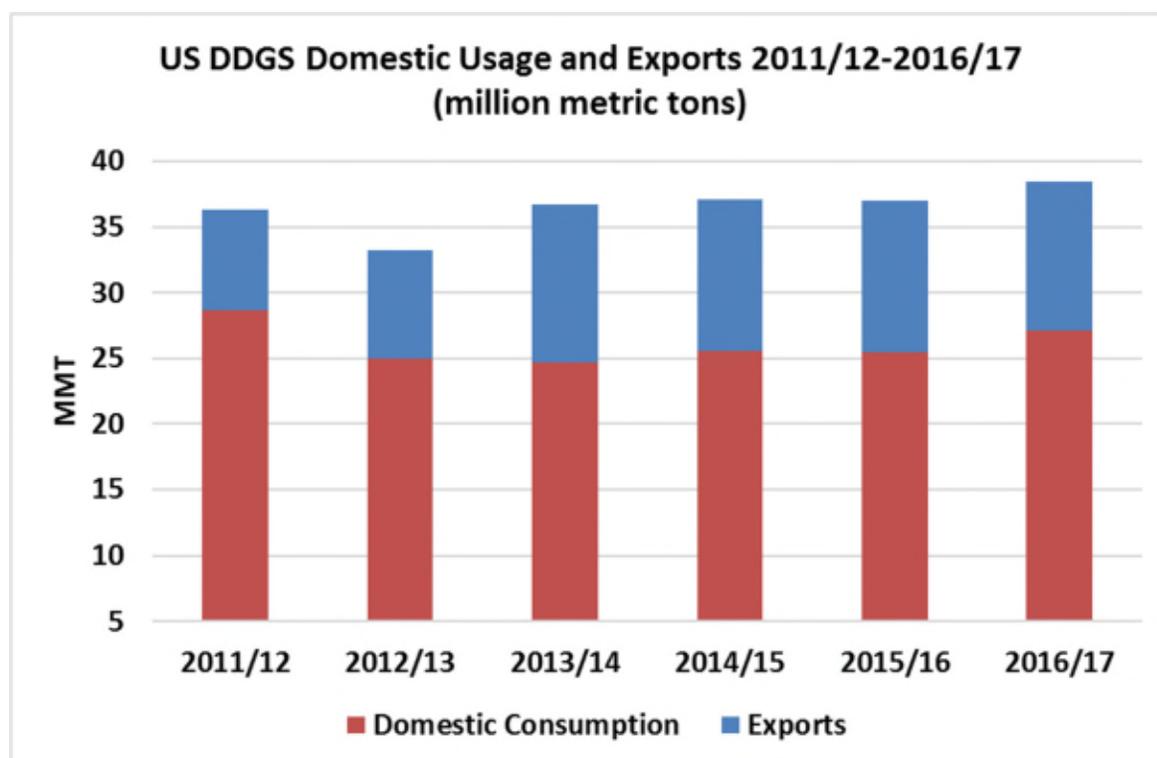


Figure 15, Estimated U.S. Dried Distillers Grains with Solubles (DDGS) Domestic Usage and Exports
(Source: USDA-ERS)

Spatial Differences

Regarding whether nutritional profiles of SBM 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 16 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.

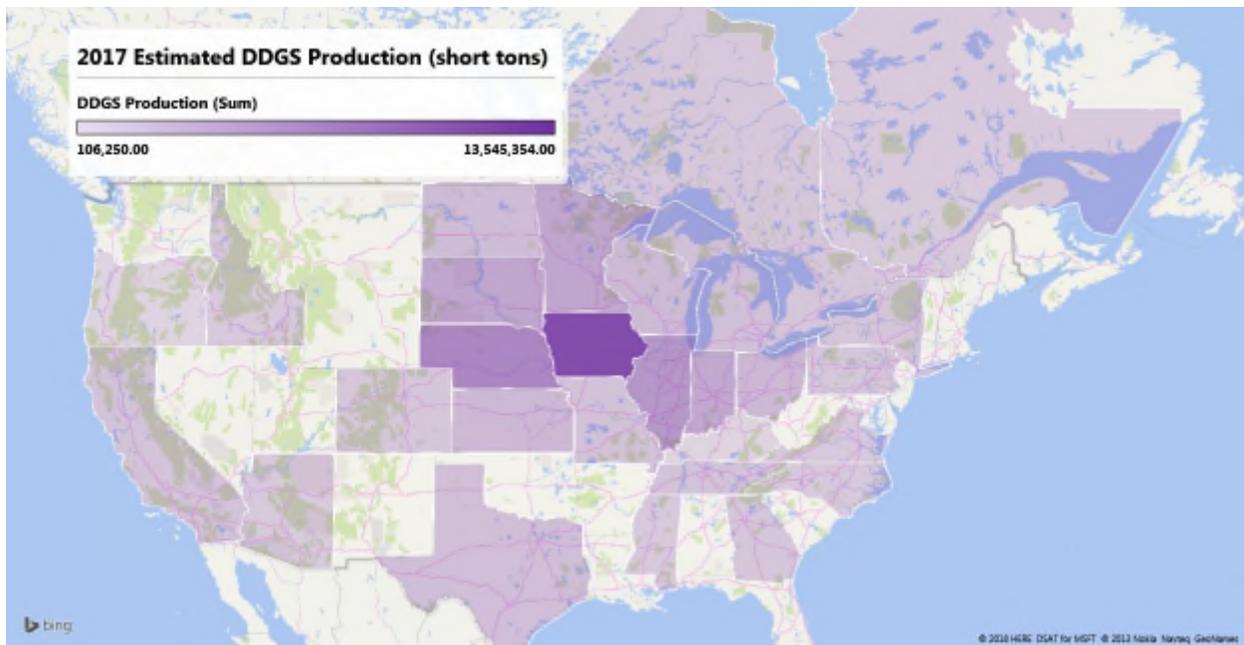


Figure 16, Estimated DDGS Production

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 17, synthetic lysine prices fluctuated between \$0.72 per lb. and \$0.81 per lb. during the 2016/17 marketing year.

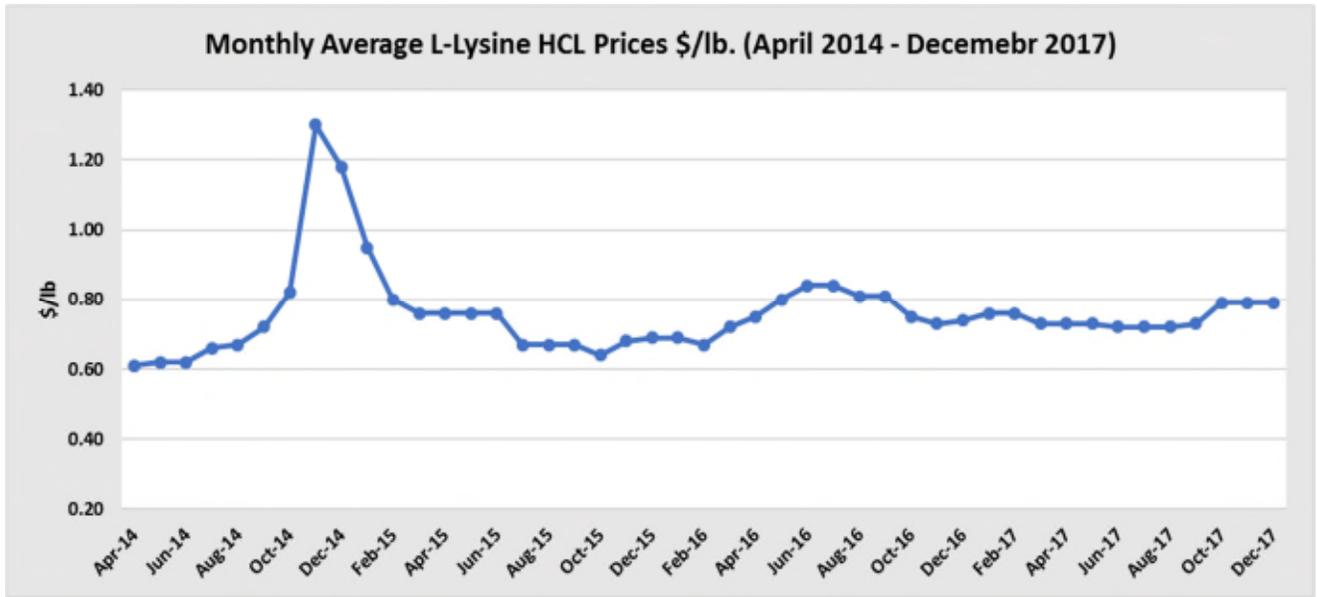


Figure 17, Monthly Average Synthetic Lysine Prices Apr.2014-Dec.2017.

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. The modern broiler industry produces nutritious, high-quality products that have become more affordable to domestic and international consumers. Much of the success of the broiler industry can be attributed to a more efficient structural organization, improved production and processing technologies and a continuing responsiveness to consumer demands.

Table 2 shows two key production performance indicators analyzed for broilers from 2006-2017: 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 2005-2017

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Market Weight (lbs)	5.47	5.51	5.58	5.59	5.7	5.8	5.85	5.92	6.01	6.12	6.16	6.18
Feed to Meat Gain	1.96	1.95	1.93	1.92	1.92	1.92	1.9	1.88	1.89	1.89	1.86	1.85

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. Larger broiler production farms are particularly sensitive to costs of production and have a need for high quality feeds, such as SBM, to help keep feed conversion ratios low. SBM is one of the few oilseed crops that is an exception to this “lower cost is better” principle because of the low oil yield in the meal and its high crude protein content with an excellent balance of essential amino acids. SBM continues to be the dominant meal source of protein for 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. However, comparing to SBM prices, canola meal presents a very 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. Solvent extracted cottonseed meal is the most common type of meal and contains gossypol, a polyphenolic aldehyde, which can make cottonseed meal toxic to animals if fed in too high of concentrations. Cottonseed meal is low in both lysine and methionine and also very low in digestibility.

As seen Figure 18, across all ration regions, SBM generally accounts for twenty-eight percent of broiler diets, forty-eight percent corn, eight percent bakery meal, eight percent DDGS, three percent sorghum, one percent canola meal and one percent meat and bone 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.

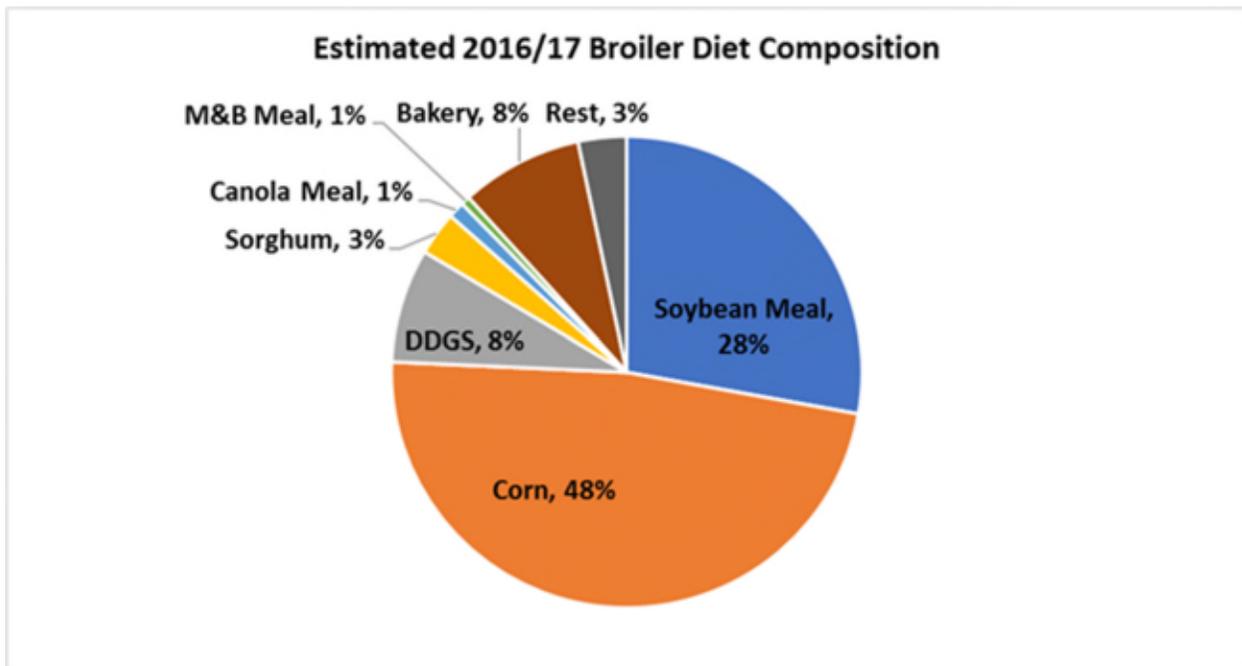


Figure 18, Estimated 2016/17 Broiler Diet Composition

Table 3, 2016/17 Broiler Ration Ingredient Estimates (Short Tons)

State	SBM	Corn	DDGS	Sorghum	Canola	DL-Met	L-Lys	Bakery Meal	Other	Total
ALABAMA	1,826,799	3,133,799	510,669	251,095	-	17,609	14,348	652,195	219,138	6,625,653
ALASKA	2,707	3,950	693	866	-	23	20	-	402	8,660
ARIZONA	10,710	15,627	2,741	3,426	-	93	79	-	1,590	34,265
ARKANSAS	1,795,058	3,005,264	492,433	180,616	-	16,732	13,761	625,510	197,192	6,326,566
CALIFORNIA	49,549	72,295	12,680	15,851	-	428	365	-	7,355	158,522
COLORADO	34,698	51,504	8,916	8,358	-	298	254	2,786	4,583	111,396
CONNECTICUT	17,657	37,698	5,813	-	7,266	145	182	-	3,822	72,584
DELAWARE	375,251	801,154	123,540	-	154,424	3,088	3,861	-	81,227	1,542,546
FLORIDA	108,458	186,055	30,319	14,908	-	1,045	852	38,721	13,010	393,369
GEORGIA	2,293,396	3,934,227	641,103	315,229	-	22,107	18,013	818,778	275,109	8,317,963
HAWAII	2,589	3,778	663	828	-	22	19	-	384	8,284
IDAHO	23,774	34,688	6,084	7,605	-	205	175	-	3,529	76,060
ILLINOIS	46,093	71,971	11,988	-	-	390	330	14,985	3,791	149,547
INDIANA	78,057	121,881	20,301	-	-	660	558	25,376	6,420	253,253
IOWA	81,531	127,306	21,204	-	-	689	583	26,506	6,706	264,525
KANSAS	30,457	48,649	8,059	975	-	266	223	10,128	2,772	101,529
KENTUCKY	536,425	856,835	141,944	17,169	-	4,682	3,924	178,377	48,831	1,788,187
LOUISIANA	33,114	56,805	9,257	4,552	-	319	260	11,822	3,972	120,100
MAINE	38,151	81,452	12,560	-	15,700	314	393	-	8,258	156,828
MARYLAND	445,618	951,386	146,706	-	183,382	3,668	4,585	-	96,459	1,831,802
MASSACHUSETTS	18,664	39,847	6,144	-	7,681	154	192	-	4,040	76,721
MICHIGAN	130,172	203,256	33,855	-	-	1,100	931	42,319	10,707	422,339
MINNESOTA	103,252	161,222	26,854	-	-	873	738	33,567	8,492	334,997
MISSISSIPPI	1,244,543	2,134,963	347,903	171,064	-	11,997	9,775	444,321	149,292	4,513,857
MISSOURI	538,419	840,712	140,031	-	-	4,551	3,851	175,039	44,285	1,746,888
MONTANA	11,136	16,530	2,861	2,683	-	96	81	894	1,471	35,752
NEBRASKA	42,559	65,351	11,024	3,445	-	362	307	10,335	4,213	137,595
NEVADA	5,061	7,384	1,295	1,619	-	44	37	-	751	16,191
NEW HAMPSHIRE	21,317	45,511	7,018	-	8,772	175	219	-	4,614	87,628
NEW JERSEY	11,985	25,588	3,946	-	4,932	99	123	-	2,594	49,267
NEW MEXICO	6,355	9,273	1,626	2,033	-	55	47	-	943	20,333
NEW YORK	83,621	178,530	27,530	-	34,412	688	860	-	18,101	343,742
NORTH CAROLINA	1,389,485	2,383,604	388,421	190,986	-	13,394	10,913	496,067	166,679	5,039,548
NORTH DAKOTA	10,117	15,534	2,620	819	-	86	73	2,457	1,001	32,707
OHIO	167,079	280,859	45,862	-	14,332	1,405	1,304	42,995	18,416	572,251
OKLAHOMA	355,094	594,494	97,412	35,729	-	3,310	2,722	123,737	39,008	1,251,505
OREGON	57,317	83,628	14,668	18,336	-	495	422	-	8,508	183,374
PENNSYLVANIA	288,226	566,303	88,976	-	83,415	2,391	2,697	27,805	50,911	1,110,723
RHODE ISLAND	5,215	11,134	1,717	-	2,146	43	54	-	1,129	21,437
SOUTH CAROLINA	409,447	702,390	114,458	56,279	-	3,947	3,216	146,179	49,116	1,485,033
SOUTH DAKOTA	18,024	27,676	4,669	1,459	-	153	130	4,377	1,784	58,271
TENNESSEE	297,414	497,928	81,589	29,925	-	2,772	2,280	103,638	32,672	1,048,218
TEXAS	1,113,682	1,833,049	304,188	208,169	-	10,433	8,597	289,795	142,193	3,910,106
UTAH	8,592	12,536	2,199	2,748	-	74	63	-	1,275	27,487
VERMONT	38,700	82,624	12,741	-	15,926	319	398	-	8,377	159,084
VIRGINIA	446,279	807,570	129,727	47,582	41,196	4,161	3,749	123,589	63,195	1,667,048
WASHINGTON	62,025	90,497	15,873	19,842	-	536	456	-	9,206	198,435
WEST VIRGINIA	136,047	267,304	41,998	-	39,373	1,129	1,273	13,124	24,031	524,279
WISCONSIN	99,477	155,328	25,872	-	-	841	711	32,340	8,182	322,751
WYOMING	10,550	15,660	2,711	2,541	-	91	77	847	1,394	33,871
U.S. Total	14,959,947	25,752,605	4,193,458	1,616,736	612,958	138,556	119,082	4,518,608	1,861,132	53,773,082

Soybean Meal Price Elasticity Estimates for Broilers

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

We expect that 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.

Table 4, Estimated Elasticities for Broilers (2016-2017).

Feed Ingredient	Estimated Elasticity
Soybean Meal Price	-0.0194
Corn Price	0.1731
DDGS Price	0.2783
Canola Meal Price	0.6689

Notes: Dependent Variable is the quantity of SBM included in the broiler's ration.

** denotes significant at the 5% level based on the estimated coefficients;

* denotes significant at the 10% level based on the estimated coefficients.

The estimated coefficient of SBM price for broilers is -0.0194 and statistically insignificant as shown in Table 4. If we ignore the statistical significance for ease of exposition, the estimated Table 4 coefficient of SBM price for broilers indicates that a 10% increase in SBM price will decrease SBM inclusion by nearly 0.1% in broiler rations. The estimated coefficients for corn price is 0.1731 and statistically insignificant at 5% level. This shows an increase in corn price will increase SBM inclusion in broiler rations. The estimate for DDGS price has a positive sign, indicating its substitutability with SBM, but is statistically insignificant. The estimated coefficient of canola meal shows a positive sign, indicating canola meal acts as a substitute for SBM in broiler diets.

Component Price Elasticities for Broilers

In addition to the above elasticity estimates of SBM at an aggregate level, Table 5 shows the estimated elasticities for the key components of SBM: derived value for lysine, crude protein, and metabolizable energy content. Here, we are looking for the perceived value of the characteristics of the SBM compared to other feedstuffs. It is vital to know what soybean components are worth when compared to alternative ingredients.

Table 5: Soybean Meal Component Price Elasticities (Broilers)

Feed Ingredient	Lysine	Crude Protein	Metabolizable Energy
Digestible Component Value in Soybean Meal	0.0546	0.2041	0.3479
Digestible Component Value in Corn	0.3000	-0.8132	-0.2880
Digestible Component Value in DDGS	0.2887	-0.1063	0.2065
Digestible Component Value in Canola Meal	0.6581	0.5261	-0.6588
Digestible Component Value in Synthetic Lysine	0.1808		

Note: Dependent variable is the quantity of soybean components: digestible quantity of lysine, crude protein, and metabolizable energy in SBM included in broiler diets separately. * denotes significant at the 10% level based on the estimated coefficients.

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 (see Table 20).

As shown in Table 5, the estimated coefficients for lysine in SBM show positive (expected) signs for all competing ingredients. The estimated coefficient of synthetic lysine is 0.18, indicating a relatively less 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 1.8% but is statistically insignificant. This shows that when synthetic lysine acid is included anytime in the broiler diets, it will reduce the amount of SBM going into broiler diet.

The estimated coefficients of DDGS and canola meal are positive but statistically insignificant at the 10% level. The positive signs of estimated coefficients indicate they tend to compete with lysine in SBM. The estimated coefficient for canola meal shows relatively larger value indicating a high elastic nature with the lysine demand in SBM.

As shown in Table 5, in addition to estimating component elasticities for lysine for broiler diets, we also did the component analysis of crude protein as well as metabolizable energy. The estimated coefficient for crude protein show varied signs and they all are statistically insignificant at 10% level. Among the competing ingredients, only canola meal shows positive signs indicating that they are competing on a crude protein basis with SBM. Canola meal has a relatively high crude protein level compared to others. The estimates for corn and DDGS are negative, indicating they are not competing with the crude protein in SBM.

As shown in Table 5, the estimated coefficients of metabolizable energy show negative signs for all ingredients except for DDGS. This indicates that corn and canola meal are not competing for metabolizable energy with SBM. It is important to understand that it's not just energy itself creating nutritional value for broilers but is a balance between metabolizable energy and crude protein that matters most in the broiler diets. The results show DDGS can compete with SBM with respect to metabolizable energy.

The estimated coefficient of lysine component for SBM is 0.05 as shown in Table 5. This indicates that the higher the derived value of digestible in SBM, the higher quantity demand for digestible lysine from SBM in broiler diets. This surfaces an important opportunity for improving a quality characteristic of SBM. Based on this estimate, we find that if digestible lysine in SBM were to be increased by 5 percent, broiler producers would theoretically be willing to pay approximately 91 percent more for SBM.

Conclusion

SBM is added to broiler diets primarily as a source of digestible crude protein, and more specifically, as a source of amino acids. Lysine is the amino acid that most limits the use of SBM in broiler diets. The price elasticities of SBM demand confirm that higher prices of SBM can reduce SBM inclusion rates in broiler diets. Also, the cross-price elasticities of SBM demand also indicate that corn, DDGS, and canola meal tend to compete with SBM in aggregate.

The SBM component analysis shows that synthetic lysine may compete with SBM as a replacement of the lysine requirement in broiler rations. Also, the lysine component in DDGS and canola meal can also compete with the lysine component in SBM.

The above results show how SBM components would impact the relative value of SBM. Specifically, we find that if digestible lysine in SBM were to be increased by 5 percent, broiler producers would theoretically be willing to pay approximately 91 percent more for SBM.

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 19 shows a key production performance indicator analyzed for layers from 2000-2017: eggs per layer per day. Eggs per layer per day have significantly increased over time.

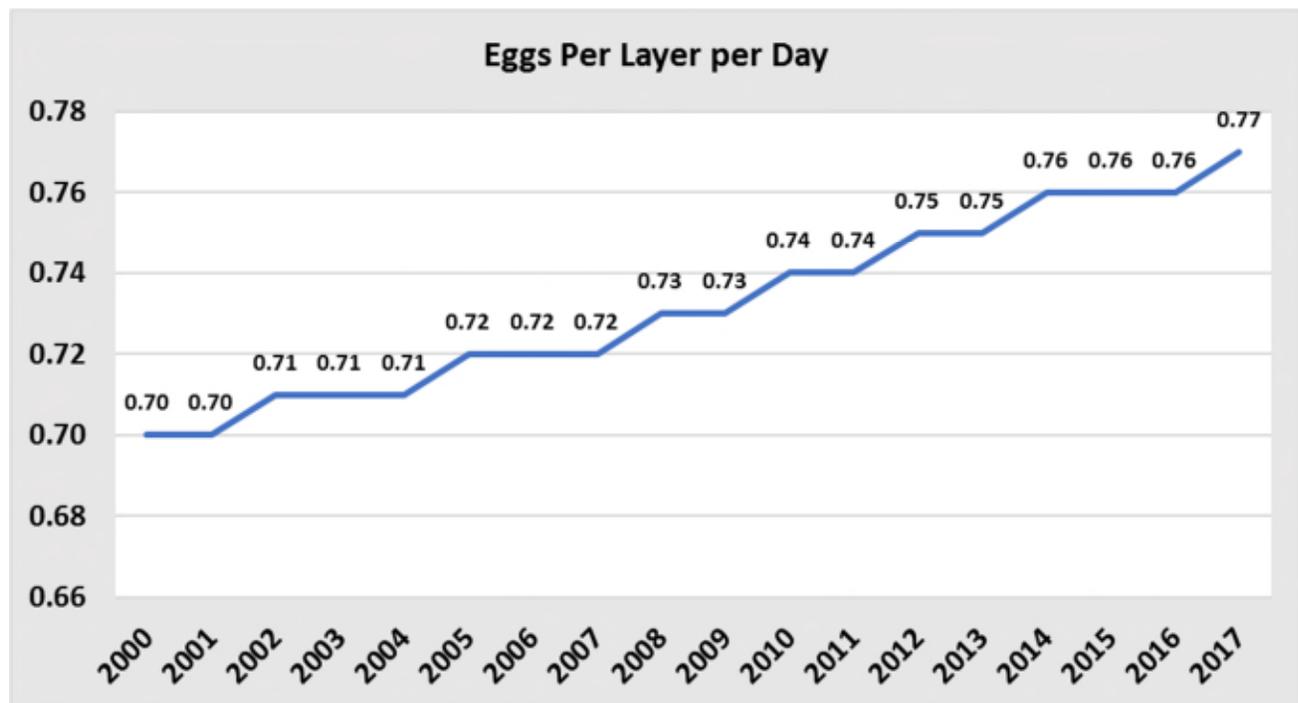


Figure 19, U.S. Layer Chickens Average Productivity from 2000-2017 (Source: USDA-NASS)

Competing Feedstuff Analysis

As shown in Figure 20, SBM accounts for 16 percent in layer diets and 9 percent of DDGS. Sorghum and canola meal 6 percent and 5 percent respectively. This figure is based upon data contained in Table 6, 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.

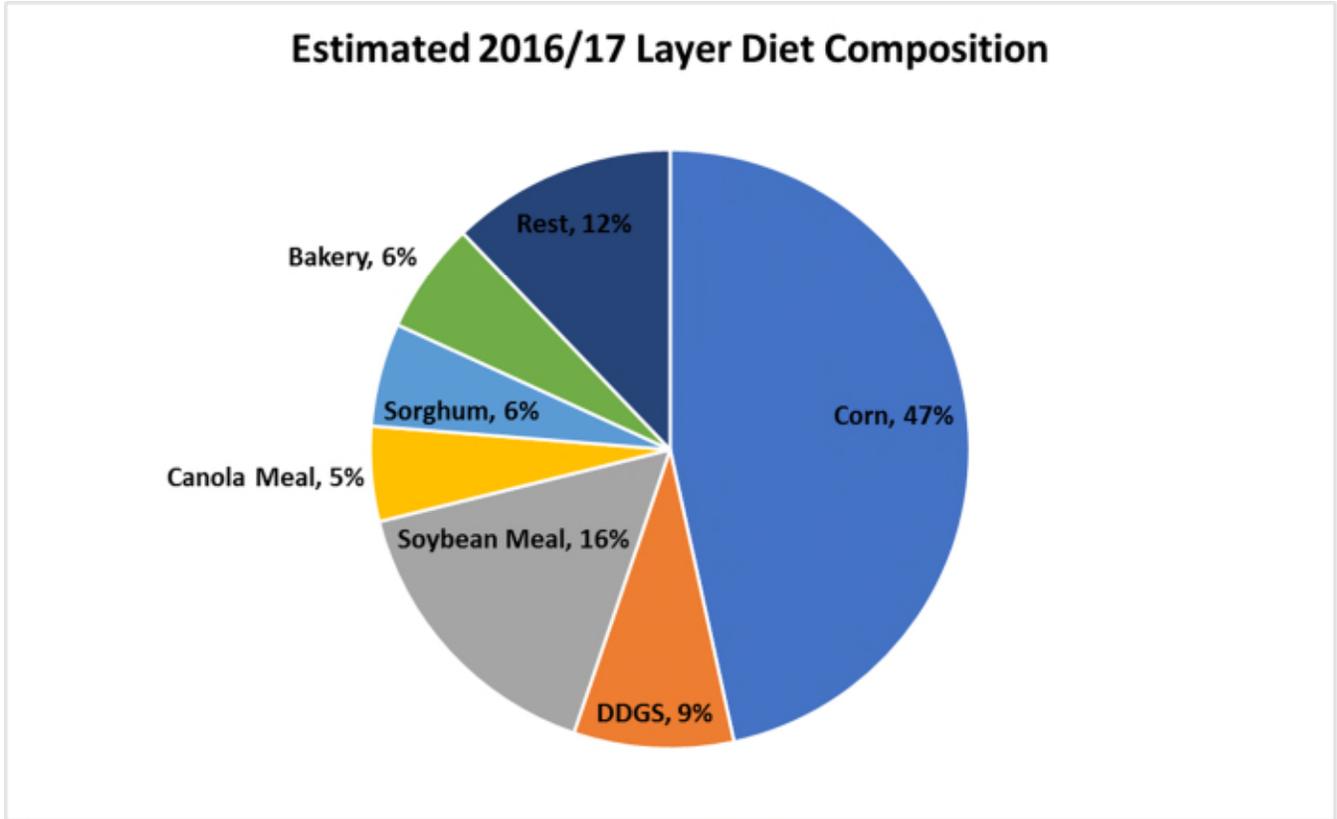


Figure 20, Estimated 2016/17 Layer Diet Composition

Table 6, 2016/17 Layer Ration Ingredient Estimates (Short Tons)

State	Corn	DDGS	Sorghum	SBM	Canola Meal	Bakery Meal	DL-Met	Others
Alabama	265,545	44,597	13,294	25,901	40,103	5,618	419	61,278
Alaska	1,235	294	683	688	85	-	4	439
Arizona	17,085	4,416	11,904	11,729	771	-	56	6,696
Arkansas	295,572	52,277	27,825	45,447	41,964	16,329	535	72,729
California	174,354	45,850	126,949	124,635	6,968	-	587	69,719
Colorado	70,226	16,310	33,164	40,730	5,174	4,935	199	23,951
Connecticut	15,008	2,259	-	5,027	683	-	27	3,265
Delaware	60,947	9,681	-	4,315	9,378	-	84	13,107
Florida	112,175	30,320	71,684	63,528	6,086	30,293	468	46,785
Georgia	435,245	85,229	91,605	98,021	54,261	38,711	995	122,522
Hawaii	3,676	946	2,535	2,500	170	-	12	1,434
Idaho	22,199	5,610	14,565	14,426	1,149	-	70	8,471
Illinois	101,789	17,966	-	35,318	13,696	21,539	191	23,771
Indiana	672,134	119,144	-	241,764	89,705	148,480	1,274	157,513
Iowa	1,140,733	202,324	-	412,243	152,082	253,406	2,165	267,452
Kansas	36,865	7,092	4,151	13,819	4,473	7,890	83	9,776
Kentucky	122,286	21,494	6,863	26,388	17,162	13,046	221	29,345
Louisiana	18,238	4,662	10,113	9,101	1,243	4,273	69	7,119
Maine	30,043	4,527	-	9,915	1,428	-	54	6,534
Maryland	136,235	20,984	-	30,502	12,407	-	221	29,493
Massachusetts	23,620	3,541	-	8,397	876	-	43	5,142
Michigan	310,427	54,815	-	108,102	41,734	65,974	582	72,519
Minnesota	228,638	40,356	-	79,342	30,762	48,388	428	53,395
Mississippi	187,415	32,251	13,842	21,830	27,571	5,849	316	44,659
Missouri	220,675	37,961	-	59,995	31,107	34,573	384	50,468
Montana	17,583	4,060	8,153	10,032	1,323	1,213	49	5,957
Nebraska	167,561	32,279	22,231	70,437	19,566	29,775	361	44,278
Nevada	5,409	1,376	3,616	3,575	269	-	17	2,081
New Hampshire	18,428	2,774	-	6,193	830	-	33	4,009
New Jersey	17,629	2,639	-	6,370	611	-	32	3,839
New Mexico	12,134	3,153	8,569	8,434	529	-	40	4,785
New York	145,339	21,734	-	53,322	4,711	-	269	31,658
North Carolina	283,232	57,244	69,864	71,947	33,625	29,523	693	82,973
North Dakota	8,675	1,638	1,018	3,283	1,056	1,363	18	2,243
Ohio	692,520	117,012	-	251,837	71,109	107,514	1,305	158,901
Oklahoma	93,541	19,063	22,263	28,115	10,812	13,065	234	27,468
Oregon	38,572	9,539	23,842	23,743	2,237	-	118	14,346
Pennsylvania	660,381	102,474	-	243,607	34,282	30,221	1,231	146,129
Rhode Island	4,586	690	-	1,546	205	-	8	998
South Carolina	90,441	18,872	25,720	25,689	10,177	10,869	236	27,574
South Dakota	51,944	9,986	6,810	21,613	6,092	9,121	111	13,696
Tennessee	84,033	17,380	21,364	26,649	9,462	12,537	217	25,127
Texas	372,741	87,038	167,407	159,549	31,875	51,716	1,170	130,260
Utah	72,592	19,246	53,957	52,886	2,721	-	247	29,307
Vermont	25,445	3,845	-	8,059	1,348	-	45	5,531
Virginia	78,021	13,564	6,932	12,080	10,440	2,929	140	18,981
Washington	103,712	26,849	72,534	71,448	4,633	-	341	40,714
West Virginia	53,015	8,298	-	14,061	4,648	1,618	90	11,619
Wisconsin	122,417	21,508	-	40,811	16,613	24,686	226	28,481
Wyoming	10,863	2,474	4,813	5,950	858	716	30	3,620
US Total	7,933,176	1,469,643	948,267	2,714,897	871,066	1,026,170	16,748	2,052,154

Soybean Meal Price Elasticity Estimates for Layers

In this section, we present the own-price demand elasticity of SBM and the cross-price demand elasticities of SBM with corn, DDGS, and canola meal. Note that these are aggregate measures of how soybean meal is substituted or complemented with corn, DDGS, and canola meal. Estimated coefficients are provided for the net effects of both protein and energy, not the individual components of SBM.

We expect that SBM demand for feed should be inversely related to the price of SBM and positively related to corn, DDGS, and canola prices. Hence, we anticipate SBM prices to have negative estimated coefficients and the rest of the estimated coefficients to be positive.

Table 7, Estimated Elasticities for Layers (2016-17)

Feed Ingredient	Estimated Elasticity
Soybean Meal Price	-0.0029
Corn Price	0.0337
DDGS Price	-0.0038
Canola Meal Price	0.0187

Notes:** denotes significant at the 5% level based on the estimated coefficients;

* denotes significant at the 10% level based on the estimated coefficients.

Dependent Variable is the quantity of SBM included in the layer ration.

The estimated coefficient of SBM price for layers is -0.0029 and statistically insignificant as shown in Table 7. This tells us that a 10% increase in SBM price will decrease SBM inclusion in layer diets by approximately 0.02%. The estimated coefficients for corn and canola meal are positive but statistically insignificant. The estimated coefficient for DDGS is negative and statistically insignificant. Overall, corn and canola meal are competing with SBM as substitutes. Again, none of the estimates are statistically significant.

Component Price Elasticities for Layers

In addition to the above elasticity estimates of SBM as an aggregate level, Table 8 shows the estimated elasticities 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. It is vital to know what SBM components are worth when compared to alternative feedstuffs.

Table 8: Soybean Meal Component Price Elasticities (Layers)

Feed Ingredient	Lysine	Crude Protein	Metabolizable Energy
Digestible Component Value in Soybean Meal	0.0255	0.0241	0.0256
Digestible Component Value in Corn	-0.0009	-0.0214	-0.0032
Digestible Component Value in DDGS	-0.0036	-0.0028	-0.0095
Digestible Component Value in Canola Meal	0.0018	0.0032	0.0021
Digestible Component Value in Synthetic Lysine	0.0390		

Note: Dependent variable is the quantity of soybean components: digestible quantity of lysine, crude protein, and metabolizable energy in SBM included in layer diets separately, * denotes significant at the 10% level based on the estimated coefficients.

Essential amino acids from SBM can compete with amino acids from corn, DDGS, canola meal and synthetic amino acids. Lysine is the amino acid that most limits the use of SBM in layer diets. Thus, we include lysine in our layer analysis as we did in the broiler analysis.

We want to 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 (see Table 20).

As shown in Table 8, the estimated coefficient for lysine in SBM shows varied signs but all of them are statistically insignificant. The negative estimates for corn and DDGS indicate that the lysine components in corn and DDGS do not compete with SBM lysine in the layer ration but rather acts a complement. The positive signs of estimated coefficients for canola meal and synthetic lysine indicate that lysine components in canola meal and synthetic lysine compete with the lysine in SBM.

Note that the estimated coefficient of synthetic lysine is 0.039 indicating a 10 percent change in the price of synthetic lysine will change the lysine quantity demanded from SBM by approximately 0.39 percent.

The coefficient estimated of canola meal for lysine is 0.0018 showing that the lysine component in canola meal competes with the lysine component in SBM in layer diets. However, none of the estimates for lysine are statistically significant.

We also did the component analysis of crude protein as well as metabolizable energy as shown in Table 8, the estimated coefficients for crude protein show negative signs (unexpected sign) for corn and DDGS as competing ingredients. This indicates that they are not competing with the crude protein in SBM. The estimated coefficient for canola meal in crude protein value shows a positive sign but is statistically insignificant. The positive sign indicates the crude protein in canola meal tends to compete with crude protein in SBM.

As shown in Table 8, the estimated coefficient of metabolizable energy for canola meal shows a positive sign, indicating that canola meal is competing with metabolizable energy in SBM. The

estimates of corn and DDGS for metabolizable energy are negative, indicating they are not competing with the metabolizable energy components in SBM. However, none of the above estimated coefficients are statistically significant.

Note that the estimated coefficient of the lysine component in SBM is 0.0255 as shown in Table 8. This shows that the higher the derived value of digestible lysine in the SBM, higher quantity demanded for digestible lysine from SBM in layer diets. This raises a point on opportunities for improving quality of SBM. Based on this estimate, we find that if levels of digestible lysine in SBM were increased by 5 percent, layer producers would theoretically be willing to pay approximately 196 percent more for SBM.

Conclusion

SBM is added to layer diets primarily as a source of protein, and more specifically as a source of amino acids. Lysine is the amino acid that most limits the use of SBM in layer diets. As a result, feed mills normally formulate to lysine (and other essential amino acids) level requirements as their primary target and then evaluate whether supplementation of non-essential amino acids is needed.

The own-price elasticity estimate for SBM demand in layer rations confirms that an increase in SBM price will decrease SBM inclusion in layer diets. The cross-price effects show that corn and canola meal can act as substitutes for SBM.

The SBM components analysis shows that synthetic lysine and canola meal can compete with SBM as a replacement of lysine in layer rations. With respect to crude protein in SBM, corn, and DDGS do not compete with SBM. Canola meal tends to compete with SBM in crude protein level. Again, canola meal is competing with the SBM's energy component, but not corn and DDGS. Based on the results, we find that if the level of digestible lysine in SBM were to be increased by 5 percent, layer producers would theoretically be willing to pay approximately 196 percent more for SBM.

Turkeys

The dramatic improvement in growth rate and feed efficiency in commercial turkeys has made the U.S. turkey more able to produce nutritious, high quality meat that has become more affordable to consumers nationwide and around the globe. According to USDA's [Turkey Industry Overview](#) published in 2014, the average weight of turkeys in the United States was 29 pounds in 2008. In 2013, turkeys weighed an average 30.3 pounds, an increase of 1.3 pounds within the five-year period. This gain is directly related to genetic selection, technical advancement, and better production management. In 2008, the United States raised 273 million turkeys. Total raised turkey numbers dropped to 240 million, but the total pounds of turkey produced stayed relatively steady from 2008 to 2013, according to the USDA publication.

Competing Feedstuff Analysis

On a national average, approximately 24 and 43 percent turkey diets are comprised of SBM and corn in their diets, respectively (see Figure 21). Meat and bone meal and DDGS account for 5 percent and 0.1 percent, respectively. Sorghum is nearly 18 percent. This figure is based upon data contained in Table 9, which further breaks down the key ration ingredients by state.

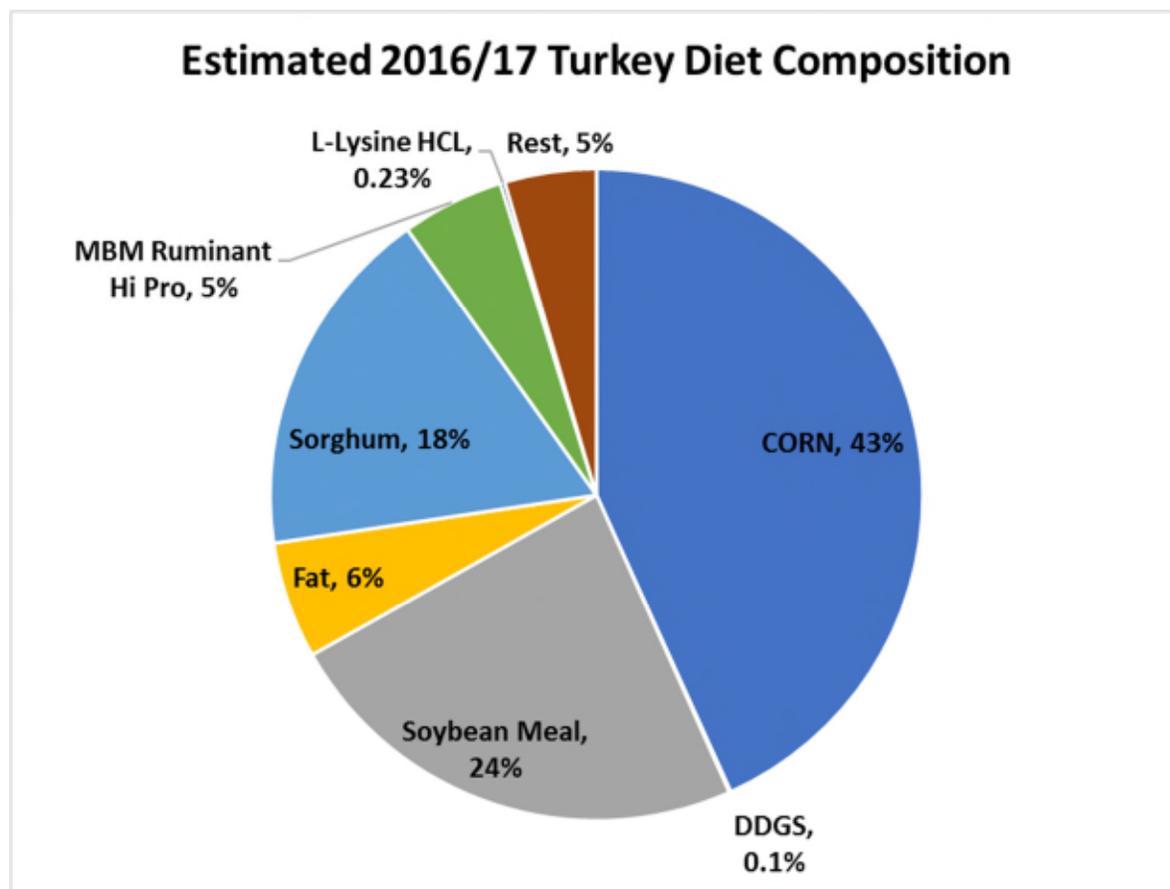


Figure 21, Estimated 2016/17 Turkey Diet Composition

Table 9, 2016/17 Turkey Ration Ingredient Estimates (Short Tons)

State	Corn	Sorghum	DDGS	SBM	MBM	Lysine	Methionene	Threonine	Others
ALABAMA	9,932	3,802	24	5,173	1,046	51	58	8	1,974
ALASKA	2,601	1,116	-	1,459	379	12	16	3	433
ARIZONA	5,094	2,185	-	2,857	742	24	31	5	848
ARKANSAS	450,439	172,429	1,072	234,597	47,456	2,320	2,618	373	89,513
CALIFORNIA	188,378	80,781	-	105,631	27,446	884	1,162	186	31,340
COLORADO	20,364	8,924	-	11,546	3,033	101	128	20	4,030
CONNECTICUT	-	-	-	-	-	-	-	-	-
DELAWARE	650	279	-	365	95	3	4	1	108
FLORIDA	13,781	5,856	-	7,410	1,998	71	85	12	2,384
GEORGIA	8,690	3,327	21	4,526	916	45	51	7	1,727
HAWAII	-	-	-	-	-	-	-	-	-
IDAHO	14,199	6,089	-	7,962	2,069	67	88	14	2,362
ILLINOIS	17,832	8,365	-	10,477	2,846	105	120	18	5,374
INDIANA	316,010	129,863	807	175,338	35,644	1,792	1,965	293	92,060
IOWA	178,673	83,814	-	104,980	28,515	1,051	1,206	179	53,846
KANSAS	8,619	3,950	-	5,002	1,344	48	57	9	2,286
KENTUCKY	17,236	5,390	118	8,611	581	92	92	14	4,729
LOUISIANA	4,703	1,998	-	2,529	682	24	29	4	814
MAINE	25,580	10,969	-	14,344	3,727	120	158	25	4,256
MARYLAND	12,682	5,438	-	7,111	1,848	60	78	13	2,110
MASSACHUSETTS	15,608	6,693	-	8,752	2,274	73	96	15	2,597
MICHIGAN	82,865	34,053	212	45,978	9,347	470	515	77	24,140
MINNESOTA	658,356	301,745	-	382,101	102,625	3,662	4,340	658	174,653
MISSISSIPPI	4,176	1,599	10	2,175	440	22	24	3	830
MISSOURI	306,487	133,366	-	168,330	45,466	1,629	1,925	274	62,151
MONTANA	7,371	3,161	-	4,133	1,074	35	45	7	1,226
NEBRASKA	10,038	4,601	-	5,826	1,565	56	66	10	2,663
NEVADA	5,528	2,371	-	3,100	805	26	34	5	920
NEW HAMPSHIRE	-	-	-	-	-	-	-	-	-
NEW JERSEY	7,804	3,347	-	4,376	1,137	37	48	8	1,298
NEW MEXICO	5,432	2,324	-	3,014	790	26	33	5	913
NEW YORK	51,062	15,656	344	25,287	1,686	258	266	41	12,474
NORTH CAROLINA	561,673	215,010	1,337	292,531	59,175	2,893	3,265	466	111,618
NORTH DAKOTA	3,394	1,487	-	1,924	506	17	21	3	672
OHIO	101,952	41,897	260	56,568	11,500	578	634	94	29,701
OKLAHOMA	9,291	4,043	-	5,103	1,378	49	58	8	1,884
OREGON	29,482	12,643	-	16,532	4,296	138	182	29	4,905
PENNSYLVANIA	132,095	41,305	908	65,993	4,453	703	703	105	36,241
RHODE ISLAND	4,552	1,952	-	2,553	663	21	28	4	757
SOUTH CAROLINA	23,953	10,178	-	12,878	3,472	123	147	21	4,144
SOUTH DAKOTA	66,447	29,119	-	37,676	9,897	330	419	66	13,149
TENNESSEE	13,061	3,996	88	6,401	432	67	68	10	3,208
TEXAS	41,360	17,614	-	22,474	6,003	208	254	37	7,088
UTAH	82,676	35,453	-	46,359	12,046	388	510	82	13,755
VERMONT	23,846	10,226	-	13,371	3,474	112	147	24	3,967
VIRGINIA	307,559	94,103	2,068	150,733	10,173	1,588	1,603	236	75,551
WASHINGTON	32,301	13,851	-	18,112	4,706	152	199	32	5,374
WEST VIRGINIA	65,755	20,561	452	32,850	2,217	350	350	52	18,040
WISCONSIN	39,627	18,589	-	23,283	6,324	233	267	40	11,942
WYOMING	5,094	2,185	-	2,857	742	24	31	5	848
U.S. Total	3,994,310	1,617,703	7,721	2,171,188	469,030	21,137	24,227	3,601	926,903

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, 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, we present the own-price demand elasticity of SBM and the cross-price demand elasticities of SBM with corn and DDGS as we concentrated only on basal diet in the analysis. Note these are aggregate measures of how SBM is substituted or complemented with corn and DDGS. Estimated coefficients are provided for the net effects of both protein and energy, not the individual components of SBM.

We expect that SBM demand for feed 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.

Table 10, Estimated Elasticities for Turkeys (2016-2017).

Feed Ingredient	Estimated Elasticity
Soybean Meal Price	-0.0520
Corn Price	0.0213
DDGS Price	-0.0171

Notes:** denotes significant at the 5% level based on the estimated coefficients;
 * denotes significant at the 10% level based on the estimated coefficients.
 Dependent Variable is the quantity of SBM included in the turkey ration.

As shown in Table 10, the estimated coefficient of SBM price for turkey diets is -0.0520 but not statistically significant. Also, the estimated coefficient of corn price for turkey diets is positive, but statistically insignificant. This indicates that corn acts as a substitute for SBM in turkey rations. The estimated coefficient of DDGS is negative and statistically insignificant. The negative sign of the DDGS parameter shows DDGS does not compete with SBM in turkey rations. However, all the estimated parameters are statistically insignificant.

Component Price Elasticities for Turkey

In addition to the above elasticity estimates of SBM as an aggregate level, Table 11 shows the estimated elasticities for the following components of SBM as an ingredient in turkey 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. It is important to know what the SBM components are worth when compared to the components of other alternative feedstuffs.

Table 11, Soybean Meal Component Price Elasticities (Turkeys)

Feed Ingredient	Lysine	Crude Protein	Metabolizable Energy
Digestible Component Value in Soybean Meal	-0.0675	-0.0176	0.0357
Digestible Component Value in Corn	0.0146	0.0117	0.0267
Digestible Component Value in DDGS	0.0041	-0.0034	-0.0002
Digestible Component Value in Synthetic Lysine	0.1614		

Note: Dependent variable is the quantity of soybean components: digestible quantity of lysine, crude protein, and metabolizable energy in SBM included in turkey diets separately. * denotes significant at the 10% level based on the estimated coefficients.

As shown in Table 11 the estimated coefficients for the lysine component in SBM show positive signs for all competing ingredients other than lysine component in SBM. The positive signs in the estimated coefficients for corn, DDGS, and synthetic lysine show that these feedstuffs tend to compete with the lysine in SBM. The estimated coefficient of synthetic lysine is 0.1614 indicating the relatively high elastic nature with the lysine component demand in SBM. A 10 percent change in the price of synthetic lysine will change the lysine quantity demanded from SBM by approximately 1.6 percent. This shows that when synthetic lysine is included in turkey diets, it will reduce the amount of SBM going into the diet. The estimated coefficients of corn and DDGS for lysine are 0.0146 and 0.0041 respectively, indicating that corn and DDGS still compete with the lysine component in SBM, though both of them are relatively inelastic compared to synthetic lysine. However, none of these estimates are statistically significant.

The estimated coefficient for crude protein shows a negative sign for DDGS. This means that DDGS do not compete with the crude protein component in SBM. As shown in Table 11, the estimated coefficients of metabolizable energy shows positive sign for corn and a negative sign for DDGS. This indicates that corn can compete with SBM in metabolizable energy, but not DDGS. The estimated coefficient of metabolizable energy for corn is 0.0267, indicating that a 10 percent increase in the price of corn (i.e., increase in the derived value of metabolizable energy in corn) will increase the metabolizable energy demand for SBM by 0.26 percent. The price estimate of the lysine component in the SBM is negative but insignificant. This indicates that an increase in price of SBM will decrease the lysine demand from SBM.

Conclusion

The own-price elasticity estimate for SBM demand in turkey rations indicates that an increase in SBM price will decrease SBM inclusion in turkey diets. The cross-price effects show that corn acts as a substitute with SBM, but not DDGS.

The SBM component analysis shows that synthetic lysine can compete with SBM as a replacement of lysine requirements in turkey rations. Compared to corn and DDGS, synthetic lysine shows relatively high elastic price nature with the lysine component demand in SBM. Corn and DDGS also compete with the lysine component in SBM, both of which are relatively inelastic.

The results for the crude protein component in SBM indicate that DDGS don't compete with SBM. However, corn is competing for metabolizable energy with the energy component in the SBM, but DDGS is not.

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 12 shows two key production performance indicators analyzed for conventional finishers from 2010-2015: 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 12: Conventional Finisher Average Productivity from 2011-2016.

Productivity Measure	2011	2012	2013	2014	2015	2016
Finishing Weight (lbs)	271.5 (± 12.8)	269.2 (± 14.1)	272.1 (± 17.2)	279.7 (± 15.1)	277.4 (± 14.5)	272.8 (± 18.1)
Feed Conversion	2.71 (± 0.24)	2.68 (± 0.23)	2.66 (± 0.23)	2.70 (± 0.26)	2.69 (± 0.23)	2.69 (± 0.24)

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

Source: 2016 US Pork Industry Productivity Analysis, Iowa State University (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 22, 17.6 percent of SBM is used in hog diets on average. The usage of DDGS is 12 percent in hog diets. Sorghum usage was approximately 5 percent and Canola meal was 0.3 percent. Wheat and bakery meal were 2 percent and 1 percent respectively. This figure is based upon data contained in Table 13, which further breaks down the key ration ingredients by state.

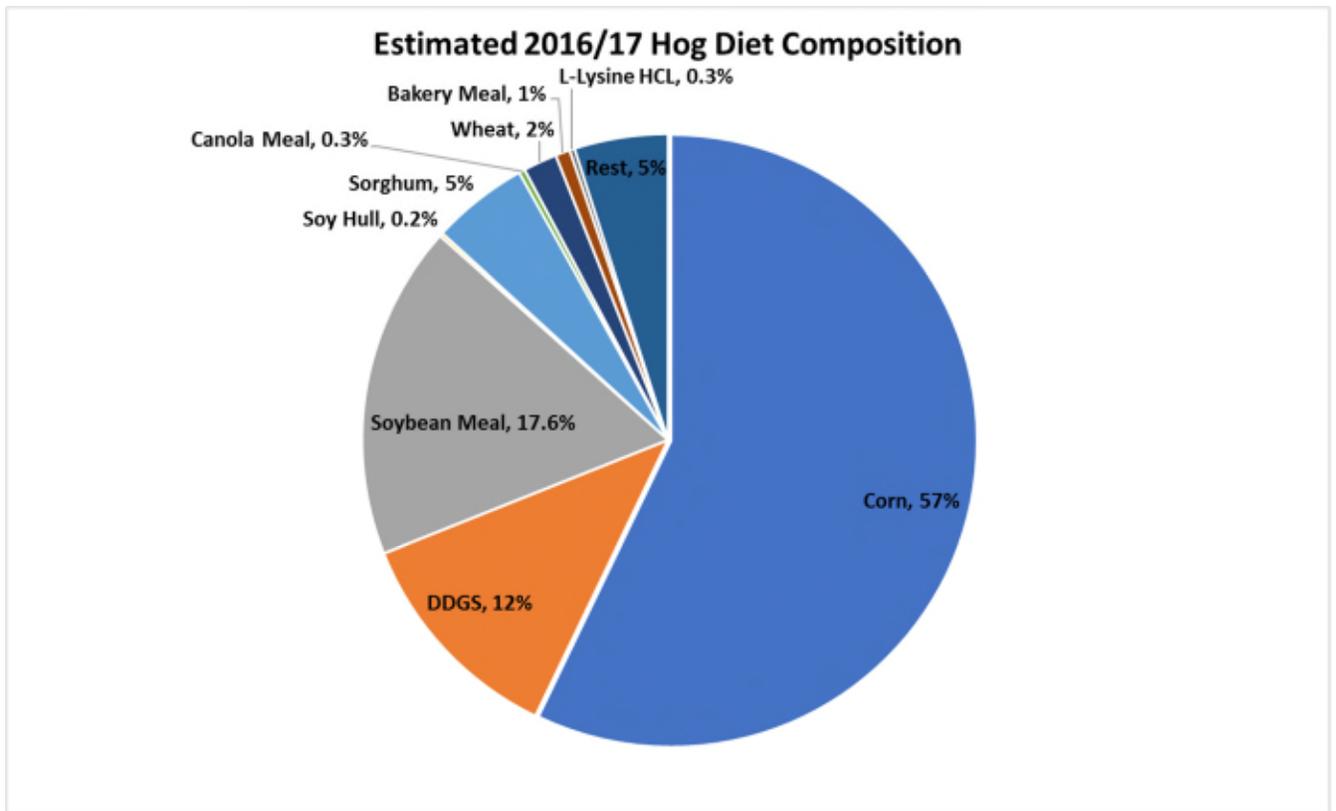


Figure 22, Estimated 2016/17 Hog Diet Composition

Table 13, 2016/17 Hog Ration Ingredient Estimates (Short Tons)

State	Corn	DDGS	Sorghum	Soybean Meal	Soy Hull	Total Soy	Canola Meal	Wheat	Bakery Meal	L-Lysine HCL	Others	Total
ALABAMA	43,045	3,546	-	13,559	-	13,559	-	2,031	2,753	168	3,506	68,608
ALASKA	439	99	371	226	7	233	5	32	0	3	65	1,247
ARIZONA	25,985	5,821	21,881	13,524	416	13,940	289	1,887	19	175	3,914	73,911
ARKANSAS	92,509	8,838	-	28,452	-	28,452	-	3,844	4,335	349	9,460	147,787
CALIFORNIA	16,494	3,272	13,510	8,938	98	9,036	190	1,102	6	117	2,229	45,956
COLORADO	260,067	57,139	217,527	137,372	3,796	141,168	2,926	18,853	201	1,785	39,895	739,562
CONNECTICUT	882	89	-	228	29	257	-	-	20	3	80	1,330
DELAWARE	2,940	299	-	782	98	880	-	-	67	9	287	4,482
FLORIDA	6,060	569	-	1,723	-	1,723	-	254	299	21	473	9,400
GEORGIA	78,489	6,643	-	24,877	-	24,877	-	3,631	4,784	309	6,903	125,636
HAWAII	1,117	267	956	566	24	590	12	85	1	7	177	3,212
IDAHO	2,259	412	1,812	1,266	-	1,266	27	145	1	17	299	6,238
ILLINOIS	1,905,930	458,843	101,309	547,999	6,550	554,549	11,577	50,384	9,829	8,741	159,494	3,260,656
INDIANA	1,431,018	328,132	72,261	419,303	3,244	422,547	9,181	37,102	7,796	6,682	116,180	2,430,900
IOWA	7,394,074	1,649,788	363,268	2,192,035	12,273	2,204,308	48,742	190,217	41,340	34,903	594,478	12,521,119
KANSAS	688,104	162,385	35,743	198,892	2,005	200,897	4,286	17,966	3,646	3,173	56,268	1,172,468
KENTUCKY	162,761	13,722	-	50,330	-	50,330	-	7,536	10,015	621	13,072	258,057
LOUISIANA	2,705	283	-	689	-	689	-	100	97	8	200	4,082
MAINE	1,766	169	-	469	49	518	-	-	44	6	151	2,653
MARYLAND	11,297	1,006	-	3,116	245	3,361	-	-	312	38	929	16,942
MASSACHUSETTS	3,759	326	-	1,055	73	1,128	-	-	108	13	309	5,642
MICHIGAN	406,600	98,084	21,631	116,618	1,408	118,026	2,467	10,728	2,097	1,861	33,845	695,339
MINNESOTA	2,936,918	673,371	148,956	865,357	6,886	872,243	18,764	76,865	15,866	13,775	243,920	5,000,679
MISSISSIPPI	174,850	14,867	-	54,168	-	54,168	-	8,044	10,593	669	14,395	277,586
MISSOURI	1,286,712	317,035	70,846	371,945	5,432	377,377	7,507	35,166	6,297	5,918	115,547	2,222,405
MONTANA	45,558	9,890	38,037	24,074	612	24,686	513	3,257	31	313	6,800	129,085
NEBRASKA	1,321,923	324,015	71,590	377,201	5,126	382,327	7,859	35,185	6,674	6,019	111,746	2,267,339
NEVADA	357	72	293	193	2	195	4	24	0	3	48	997
NEW HAMPSHIRE	1,238	118	-	328	34	362	-	-	31	4	105	1,858
NEW JERSEY	3,649	319	-	1,010	73	1,084	-	-	103	12	292	5,459
NEW MEXICO	549	132	471	276	12	288	6	42	0	4	85	1,577
NEW YORK	18,755	1,550	-	5,343	294	5,637	-	-	567	66	1,462	28,037
NORTH CAROLINA	2,826,405	243,218	-	868,180	-	868,180	-	128,715	167,578	10,694	232,064	4,476,853
NORTH DAKOTA	108,734	26,401	5,923	31,807	428	32,235	643	2,983	537	505	9,896	187,857
OHIO	745,944	176,960	38,998	215,419	2,280	217,700	4,614	19,555	3,922	3,436	61,490	1,272,620
OKLAHOMA	728,702	161,343	610,908	383,200	11,082	394,282	8,168	52,974	565	4,970	111,666	2,073,577
OREGON	1,549	378	1,334	776	37	813	17	119	1	10	247	4,467
PENNSYLVANIA	413,444	32,833	-	120,580	5,203	125,784	-	-	13,093	1,490	32,132	618,776
RHODE ISLAND	618	56	-	168	15	183	-	-	16	2	51	927
SOUTH CAROLINA	46,832	3,816	-	14,719	-	14,719	-	2,227	3,050	183	3,698	74,524
SOUTH DAKOTA	758,775	181,673	40,200	219,352	2,540	221,893	4,627	20,122	3,918	3,496	64,093	1,298,797
TENNESSEE	97,503	8,046	-	30,644	-	30,644	-	4,594	6,218	380	7,911	155,296
TEXAS	230,332	50,401	193,139	120,278	3,184	123,462	2,570	16,341	136	1,556	33,210	651,145
UTAH	120,839	27,011	101,602	63,174	1,929	65,103	1,348	8,812	94	817	18,471	344,097
VERMONT	1,611	158	-	420	49	469	-	-	38	5	139	2,421
VIRGINIA	53,452	4,073	-	17,584	-	17,584	-	2,670	3,836	221	4,337	86,174
WASHINGTON	4,309	786	3,458	2,416	-	2,416	51	277	1	32	571	11,901
WEST VIRGINIA	1,464	149	-	373	49	422	-	-	33	4	128	2,199
WISCONSIN	141,892	34,764	7,687	40,539	551	41,090	843	3,783	715	647	12,042	243,464
WYOMING	29,503	7,237	24,969	15,852	784	16,636	334	2,490	57	207	6,135	87,567
U.S. Total	24,640,717	5,100,405	2,208,682	7,607,394	76,919	7,684,314	137,571	770,140	331,741	114,446	2,134,896	43,122,912

Soybean Meal Price Elasticities for Hogs

As shown in Table 14, the estimated coefficient of SBM price for hog rations is -0.0124 and is statistically insignificant. This indicates that a 10% increase in SBM price will likely reduce the SBM inclusion by 0.1%. The estimated coefficients for DDGS price and canola meal price are positive and statistically insignificant. This indicates that both DDGS and canola meal compete with SBM in hog diets. The results showing the negative estimates for corn is surprising.

Table 14: Estimated Elasticities for Hogs (2016-17)

Feed Ingredient	Estimated Elasticity
Soybean Meal Price	-0.0124
Corn Price	-0.1024
DDGS Price	0.0275
Canola Meal Price	0.0706

Notes: Dependent variable is the quantity of SBM included in conventional finisher hog ration.

**denotes significant at the 5% level based on the estimated coefficients;

* denotes significant at the 10% level based on the estimated coefficients.

Component Price Elasticities for Hogs

In addition to the elasticity estimates of SBM at an aggregate level, Table 15 shows the estimated elasticities for the following components of SBM with regard to hog diets: derived value for lysine, crude protein, and metabolizable energy content. Here, we are looking for perceived value of the characteristics of the SBM (amino acids, energy, etc.) compared to other feedstuffs.

In general, lysine from SBM can compete 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 (see Table 1). 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 the highest ileal digestibility compared to corn and canola meal (see Table 19), 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 such that the soybean will be included only at a level to satisfy the second limiting amino acid. Thus, it becomes an economic decision and we may ask the question - which is

cheaper to satisfy the L-Lysine requirement of the pigs with a diet only including SBM, a diet including a mix of SBM and L-Lysine HCL, or a diet containing high levels of L-Lysine HCL. Here we intend to provide thorough quantitative insights on results shown in Table 15.

Table 15: Soybean Meal Component Price Elasticities (Hogs)

Feed Ingredient	Lysine	Crude Protein	Metabolizable Energy
Digestible Component Value in Soybean Meal	-0.2551	-0.1372	0.2535
Digestible Component Value in Corn	-0.1490	0.1828	0.1280
Digestible Component Value in DDGS	-0.1309	-0.0004	0.1516
Digestible Component Value in Canola Meal	-0.2300	0.0231	-0.0342
Digestible Component Value in Synthetic Lysine	0.1870		

Notes: Dependent variable is the quantity of soybean components: digestible quantity of lysine, crude protein, and metabolizable energy in SBM included in hog diets separately. * denotes significant at the 10% level based on the estimated coefficients.

In this component analysis for hogs, we concentrated on corn, DDGS, canola meal and synthetic lysine. The estimated coefficients for lysine in SBM show mixed signs. Synthetic lysine shows expected positive signs, whereas corn, DDGS and canola meal show negative signs. This results show corn, DDGS and canola meal do not compete with SBM in lysine content, but synthetic lysine competes with lysine in SBM. None of the estimated coefficients are statistically significant.

The estimated coefficient for synthetic lysine is 0.1870 indicating that a 10 percent change in the price of synthetic lysine in the amino acid market will change the lysine quantity demanded from SBM by approximately 1.8 percent. This shows that when synthetic lysine is included in hog diets, it will reduce the amount of SBM that is in the hog diet.

In addition to lysine as the most limiting essential amino acids for hog rations, we also conducted a component analysis of crude protein as a whole for SBM to get a better picture of other dynamics at play within the hog ration. In this case, the estimated coefficients of crude protein for corn and canola meal show positive signs and DDGS coefficient is negative. Hence, we can conclude that DDGS is not competing with SBM as a crude protein source. The estimated coefficient for canola meal is 0.0231 and positive, indicating that canola meal can compete with SBM for crude protein.

As shown in Table 15, the estimated coefficient of metabolizable energy (ME) for corn is 0.1280 and positive. This shows that corn is competing with SBM for ME as it is a very cheap source of energy. A 10 percent change in ME value of corn will change the energy demanded from SBM by 1.2 percent. The estimated coefficients of metabolizable energy for DDGS is 0.1516 indicating DDGS is competing with SBM for ME. The estimated coefficient for canola meal is negative, which indicates that canola meal is not a substitute for energy with SBM.

The importance of an appropriate available energy supply in a balanced diet for efficient protein use by hogs is well known in animal nutrition. A high energy to protein ratio is needed to optimize the use of the protein irrespective of the protein source. Different protein requirements for different age and growth stages of hogs are very well cited in the [literature](#). Examples include the greater need for SBM included in nursery pigs' diets (average inclusion rate of 22% in basal Midwest diets updated for Midwest rations 2016/17) compared to feed for grower-finisher diets where average SBM inclusion rate is approximately 16% in basal Midwest diets (updated for Midwest rations for 2016/17).

As shown in Table 15, the estimated coefficient of the lysine component for SBM shows an unexpected negative sign and is statistically insignificant. Based on this negative estimate, we are unable to find an answer to the question- how much hog producers would be willing to pay if we were able to increase the level of digestible lysine in SBM.

Conclusion

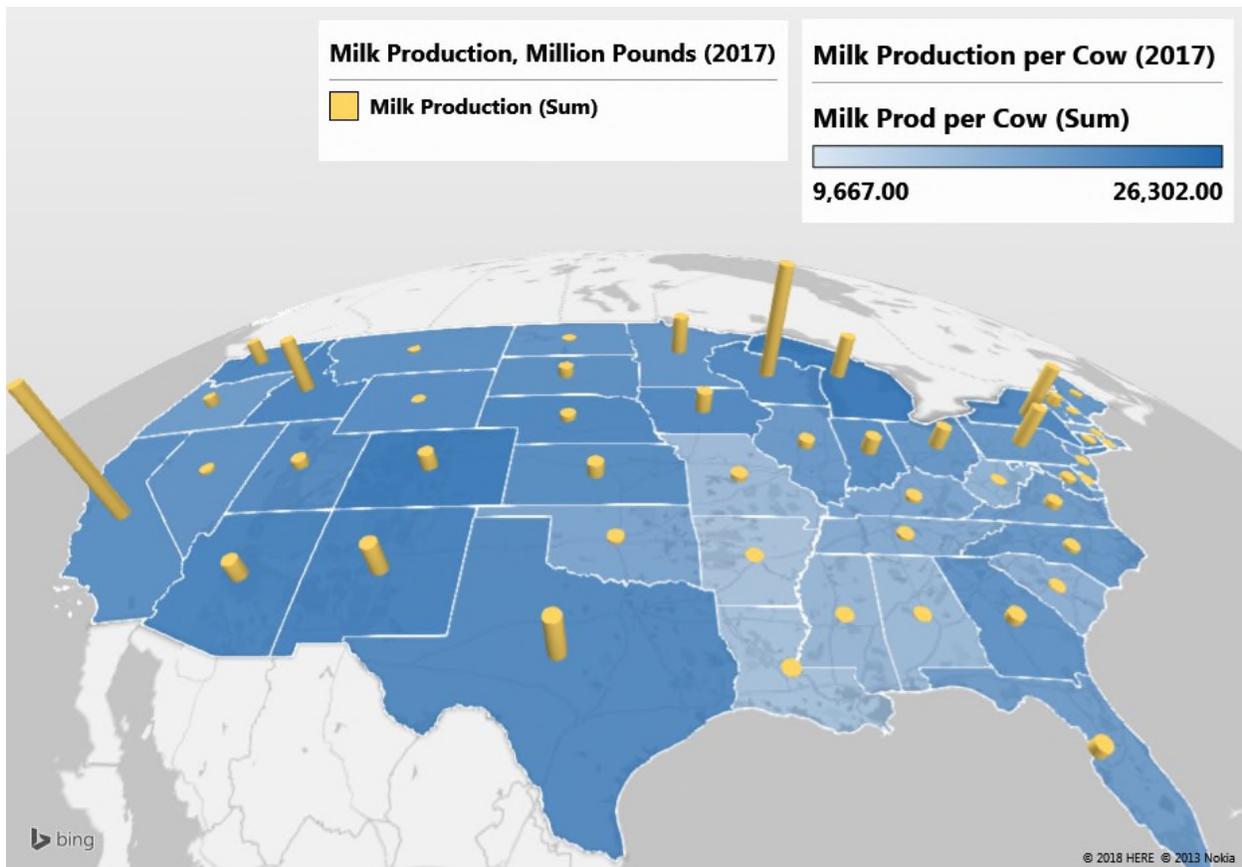
Overall, SBM is added to swine diets primarily as a source of protein, and more specifically as a source of limiting amino acids. There are other components that SBM contributes (energy, minerals, vitamins, etc.) but it is the amino acids that drive the inclusion of SBM because there are other sources of energy that are cheaper, such as corn. In more basal hog diets such as a corn-SBM diet, lysine is the most limiting amino acid for swine and as a result, nutritionists normally formulate to the lysine level as their primary target and then evaluate the other amino acids, supplementing as needed.

The above results show how SBM components would impact the relative value of SBM. The SBM components analysis shows that synthetic lysine can compete with SBM as a replacement of lysine requirement in swine rations. Canola meal is competing with SBM for crude protein content. As expected, corn and DDGS are dominant source of the energy requirements in hog diets and tends to compete with SBM on an energy basis.

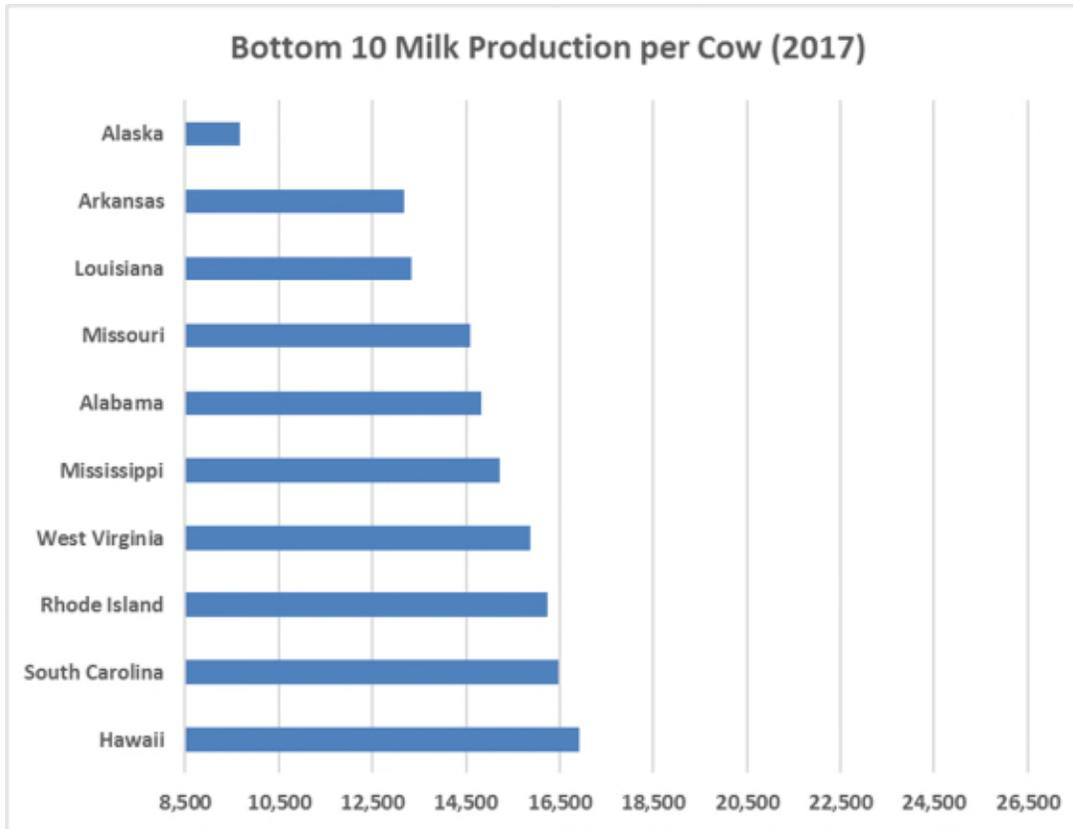
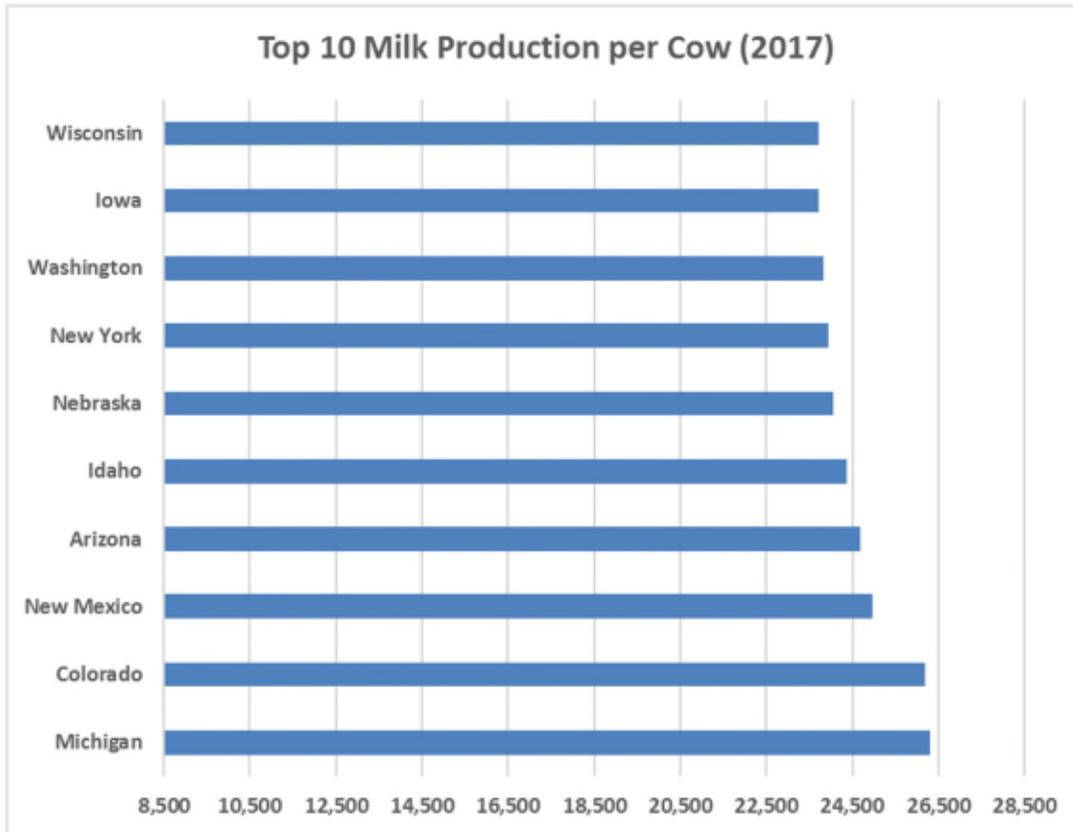
Dairy Cows

The U.S. dairy herd has experienced change during the last ten 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. Access to high quality feed ingredients, proximity to milk and cheese processors, weather patterns (toward more rainfall) and a more stable regulatory environment are key reasons for changes 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, but recent downward prices movements will likely damper placements and heifer retention. Cheapening of rations is already occurring but is not likely to affect higher-producing herds to the degree it will lower producing ones. This will put pressure on SBM inclusion rates, particularly in areas where lower producing herds reside. Below is a map depicting where high producing herds were located in 2017. 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 production per cow.



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



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 which require forage inclusion in rations, they 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. DDGS was competitively priced against SBM in the 2016/17 marketing year, which placed further pressure on dairy producers to reduce inclusion of SBM and soy hulls in rations. DDGS was priced on average 32% to relative value of SBM during the 2016/17 marketing year, compared to 39% in the 2015/16 marketing year. However, SBM continues to be more attractive to higher producing herds than lower producing herds. This is because they are less tolerant to “least costing” their diets too heavily and are therefore more willing to pay higher prices for a protein source that is consistent both in terms of nutritional profile and its ability to carry essential nutrition to where it’s needed (bypass the rumen).

Both SBM and soy hulls are used in dairy diets as shown in Figure 23. 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, primarily due to their high

moisture level. DDGs accounts for three percent during the 2016-17 marketing year. Table 16 breaks down key ration ingredients by state.

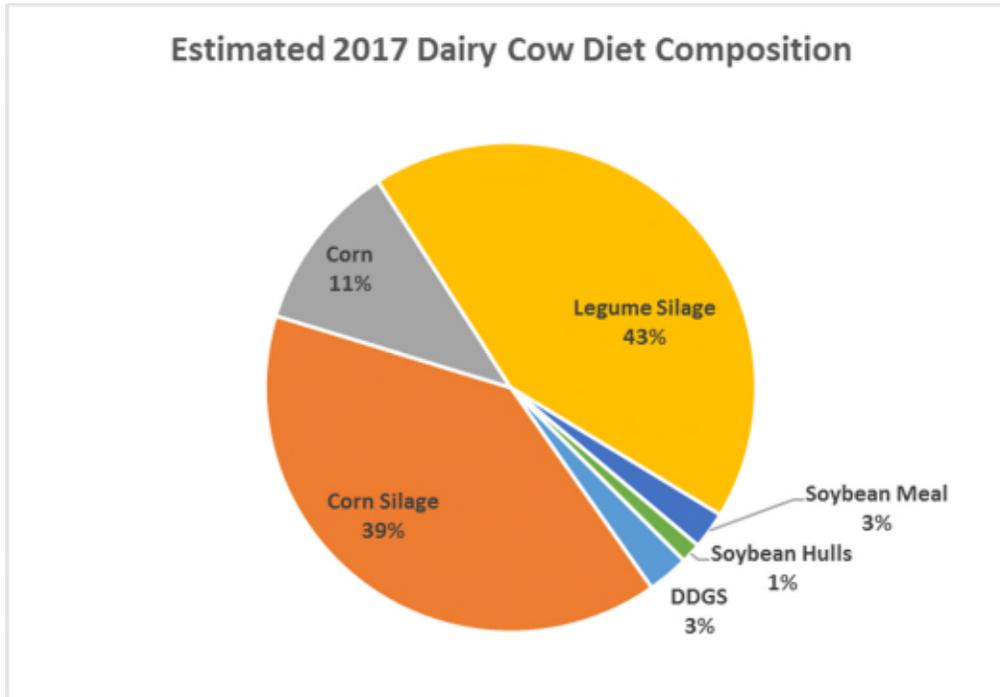


Figure 23, Estimated 2016/17 Dairy Cow Diet Composition

Table 16, 2016/17 Dairy Cow Ration Ingredient Estimates (Short Tons)

State	Soybean Meal	Soybean Hulls	Total Soy	DDGS	Corn Silage	Corn	Legume Silage	Other	Total
ALABAMA	2,264	954	3,218	2,567	39,251	10,174	30,904	3,192	89,306
ALASKA	113	-	113	100	1,332	395	599	149	2,687
ARIZONA	51,638	8,453	60,091	68,236	652,008	331,421	1,505,727	76,228	2,693,710
ARKANSAS	2,045	862	2,906	2,319	35,449	9,189	27,911	2,883	80,657
CALIFORNIA	451,646	73,930	525,576	596,818	5,702,701	2,898,733	13,169,644	666,715	23,560,187
COLORADO	40,413	6,615	47,029	53,403	510,279	259,379	1,178,422	59,658	2,108,170
CONNECTICUT	7,137	-	7,137	6,306	84,358	24,997	37,950	9,431	170,180
DELAWARE	1,851	-	1,851	1,635	21,875	6,482	9,841	2,445	44,129
FLORIDA	36,811	15,514	52,325	41,747	638,240	165,437	502,515	51,902	1,452,165
GEORGIA	24,078	10,148	34,226	27,307	417,476	108,213	328,698	33,949	949,869
HAWAII	846	-	846	747	9,996	2,962	4,497	1,118	20,166
IDAHO	154,312	25,259	179,571	203,912	1,948,416	990,397	4,499,612	227,794	8,049,701
ILLINOIS	35,853	39,242	75,094	31,679	665,822	93,181	317,714	35,389	1,218,879
INDIANA	71,577	78,343	149,920	63,244	1,329,267	186,029	634,293	70,651	2,433,404
IOWA	83,228	91,096	174,324	73,539	1,545,644	216,311	737,543	82,152	2,829,513
KANSAS	45,113	38,026	83,139	51,163	879,906	189,671	718,467	57,155	1,979,501
KENTUCKY	18,048	15,213	33,261	20,468	352,019	75,881	287,433	22,866	791,928
LOUISIANA	3,944	1,662	5,607	4,473	68,390	17,727	53,846	5,561	155,605
MAINE	11,269	-	11,269	9,957	133,197	39,469	59,921	14,891	268,704
MARYLAND	18,304	-	18,304	16,173	216,352	64,110	97,330	24,187	436,455
MASSACHUSETTS	4,506	-	4,506	3,981	53,258	15,782	23,959	5,954	107,440
MICHIGAN	163,760	179,240	343,000	144,696	3,041,216	425,614	1,451,193	161,642	5,567,360
MINNESOTA	137,914	116,249	254,163	156,408	2,689,934	579,837	2,196,404	174,726	6,051,472
MISSISSIPPI	3,210	1,353	4,563	3,641	55,662	14,428	43,826	4,526	126,647
MISSOURI	33,042	36,165	69,207	29,195	613,621	85,875	292,805	32,614	1,123,316
MONTANA	3,516	576	4,092	4,647	44,399	22,568	102,534	5,191	183,431
NEBRASKA	21,150	23,149	44,298	18,687	392,771	54,968	187,421	20,876	719,021
NEVADA	7,223	1,182	8,406	9,545	91,204	46,360	210,623	10,663	376,799
NEW HAMPSHIRE	5,165	-	5,165	4,563	61,046	18,089	27,463	6,825	123,152
NEW JERSEY	2,581	-	2,581	2,281	30,508	9,040	13,725	3,411	61,545
NEW MEXICO	84,046	13,757	97,803	111,060	1,061,203	539,419	2,450,710	124,068	4,384,263
NEW YORK	239,542	-	239,542	211,655	2,831,359	838,992	1,273,742	316,529	5,711,818
NORTH CAROLINA	13,462	11,347	24,808	15,267	262,560	56,597	214,387	17,055	590,674
NORTH DAKOTA	4,754	4,007	8,761	5,391	92,720	19,987	75,708	6,023	208,590
OHIO	101,074	110,628	211,702	89,307	1,877,059	262,692	895,686	99,767	3,436,214
OKLAHOMA	11,466	9,665	21,130	13,003	223,635	48,206	182,604	14,526	503,105
OREGON	31,935	5,228	37,163	42,200	403,232	204,966	931,212	47,143	1,665,917
PENNSYLVANIA	157,619	132,859	290,479	178,756	3,074,284	662,686	2,510,236	199,692	6,916,132
RHODE ISLAND	328	-	328	290	3,882	1,150	1,746	434	7,831
SOUTH CAROLINA	4,461	1,880	6,341	5,059	77,349	20,049	60,900	6,290	175,989
SOUTH DAKOTA	44,968	49,219	94,188	39,733	835,115	116,873	398,496	44,387	1,528,791
TENNESSEE	13,011	10,967	23,979	14,756	253,778	54,704	207,216	16,484	570,917
TEXAS	150,620	63,479	214,099	170,818	2,611,508	676,922	2,056,158	212,368	5,941,872
UTAH	24,059	3,938	27,997	31,792	303,783	154,415	701,546	35,516	1,255,050
VERMONT	49,719	-	49,719	43,930	587,668	174,138	264,374	65,698	1,185,527
VIRGINIA	26,232	22,112	48,344	29,750	511,647	110,289	417,773	33,234	1,151,038
WASHINGTON	70,631	11,562	82,193	93,334	891,826	453,323	2,059,555	104,265	3,684,497
WEST VIRGINIA	2,559	2,157	4,715	2,902	49,903	10,757	40,748	3,242	112,266
WISCONSIN	383,683	323,411	707,095	435,135	7,483,543	1,613,137	6,110,515	486,097	16,835,522
WYOMING	1,507	247	1,754	1,991	19,028	9,672	43,943	2,225	78,613
US Total	2,858,232	1,539,694	4,397,926	3,189,569	45,780,678	12,991,692	49,650,077	3,709,780	119,719,723

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. None of the 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, primarily because of lower protein requirements from feedstuffs because of the need for forage (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.

Hierarchically speaking, if cottonseed meal (normally crushed for its oil, not its meal as is the case for SBM) is cheaper per unit of protein than both SBM and canola meal and is available, it can find its way into dairy rations, generally at a maximum rate of about 5% due to anti-nutritive characteristics. Cottonseed meal is generally available in Missouri, Texas, and other southwestern states in the U.S.

- 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, primarily because of lower protein requirements from feedstuffs other than forage (alfalfa).

DDGS

DDGS were competitively priced relative to many feed ingredients during the 2016/17 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 can limit 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 2016 persists, DDGS will continue to be a competitive feed ingredient in dairy rations. Lower SBM prices in 2017 relative to 2016 will provide support to its inclusion in dairy rations. The relative price of DDGS to SBM was 33% in 2017, compared to 37% in 2016.

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

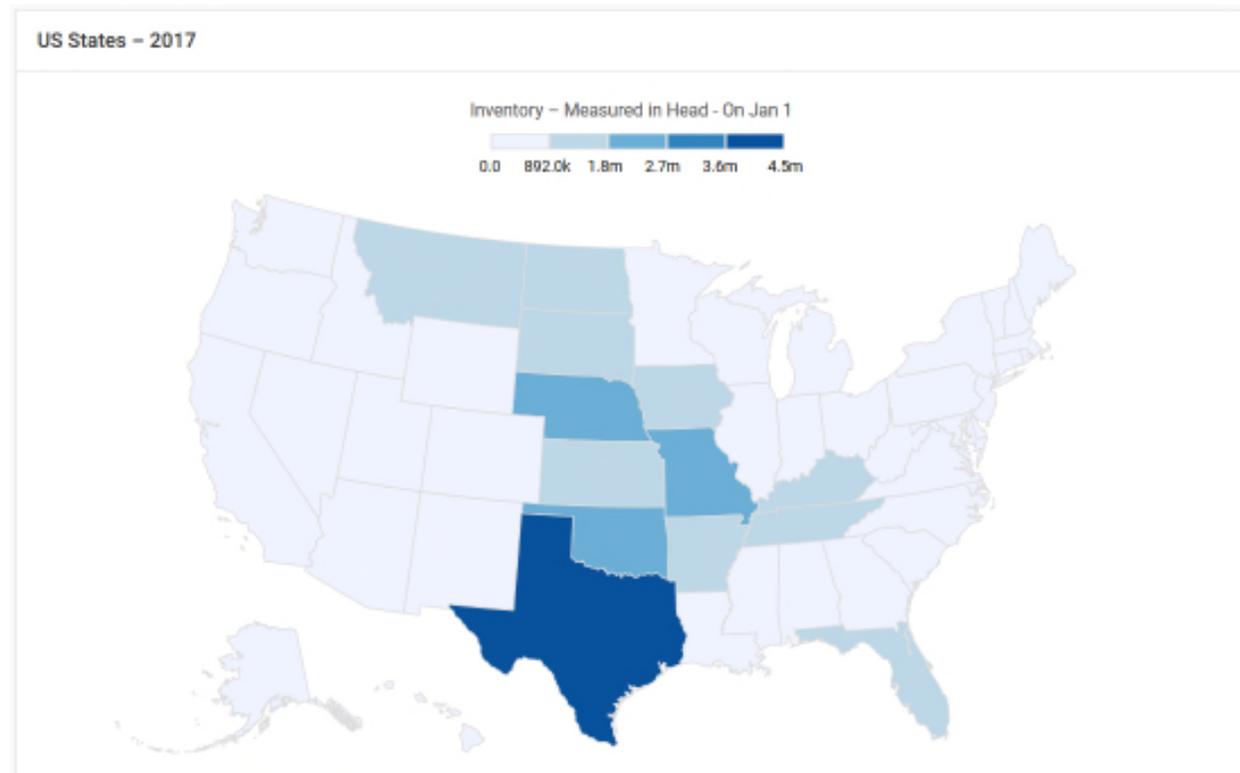
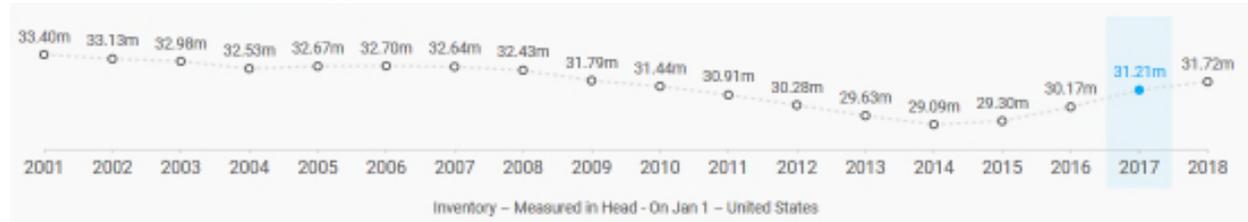
states that lysine requirements are 7.2% of metabolizable protein and methionine requirements are 2.4% of metabolizable protein. In all diets used for this analysis, no supplemental inclusion of these essential amino acids was required. In our discussions with nutritionists, while there may not be nutritional reasons for including synthetic amino acids, there may be regulatory reasons for doing so. For example, in the Chesapeake Bay area, there are restrictions on manure handling and use. If too much protein (nitrogen) finds its way into manure, constraints are placed on the placement and quantity of manure as a fertilizer. It is conceivable in some instances, protein sources for dairy rations will 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. 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 common theme for use of SBM and soy hull usage in dairy rations is that ruminants such as 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. In spite of these two points, however, dairy cattle do represent about 14% of all SBM and soy hulls consumed in the U.S. A lower combined SBM and soy hull inclusion rate factored against large animals who have high dry matter intake leads to a large demand source for soy products.

The year 2017 was a year marked by increased use of competitively-priced DDGS 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 2016, the U.S. beef cattle herd had dropped in size and shifted locations, causing states which have traditionally had modest levels of cattle production to see large increases in both cattle inventory and beef production. Current beef cattle inventory are now the highest (31.21 million head) they've been since 2010, when inventory was 31.44 million head. In 2017 the herd size began to recover from the downward trend. Below are a chart and a map from the USDA that shows current and historical beef cattle inventory by state.



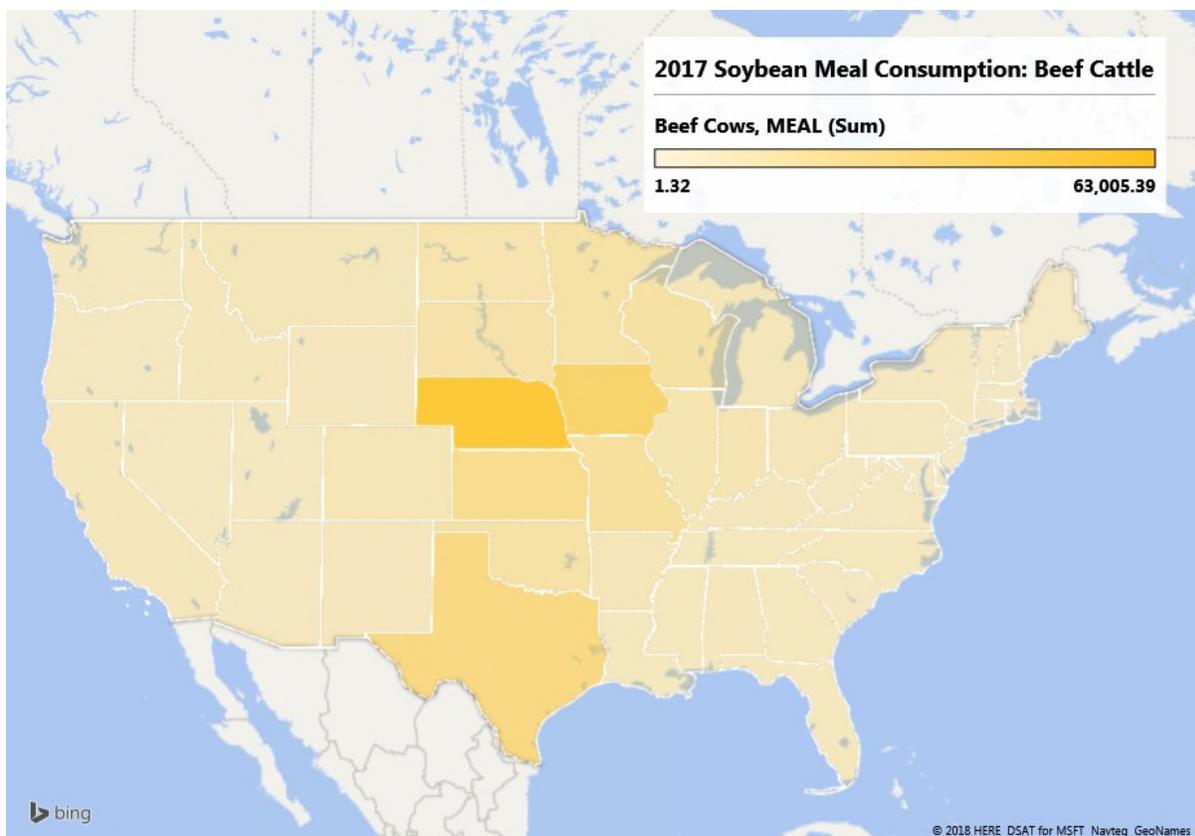
Competing Feedstuff Analysis

In contrast to other livestock (hogs) and poultry (broilers, turkeys and layer), beef cattle are not as reliant upon SBM. This is due to two reasons: 1) ruminant requirement for forage, which provides much of the protein needs for beef cattle, and 2) widespread access to DDGS, particularly in regions of the U.S. that beef cattle have been moving to (Iowa, Nebraska, and South Dakota).

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, as 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.

Our research did not produce enough evidence to justify widespread use of SBM during the finishing phase, so we did not factor the use of SBM at this stage of life. At least for the year 2017, our discussions and research support the conclusion that DDGS was priced very competitively against SBM during 2017. This, coupled with the fact that much of the protein requirements are satisfied by locally grown forage, a negligible amount of SBM was fed during the finishing phase of cattle production during 2017.

The map below depicts our estimate of the amount of SBM fed in U.S. beef production during 2017. The estimated total of about 263,830 short tons represents approximately 0.9% of total estimated SBM consumed by animal agriculture in 2017. During 2017, the use of SBM and hulls was concentrated in the weaning and backgrounding phases of cattle production.



Conclusion

The year 2017 was a year marked by similar reliance upon SBM for beef production as existed in 2016. 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. It is unlikely that SBM and soy hulls will become a competitive substitute for on farm or locally-grown forage and pasture when it is available.

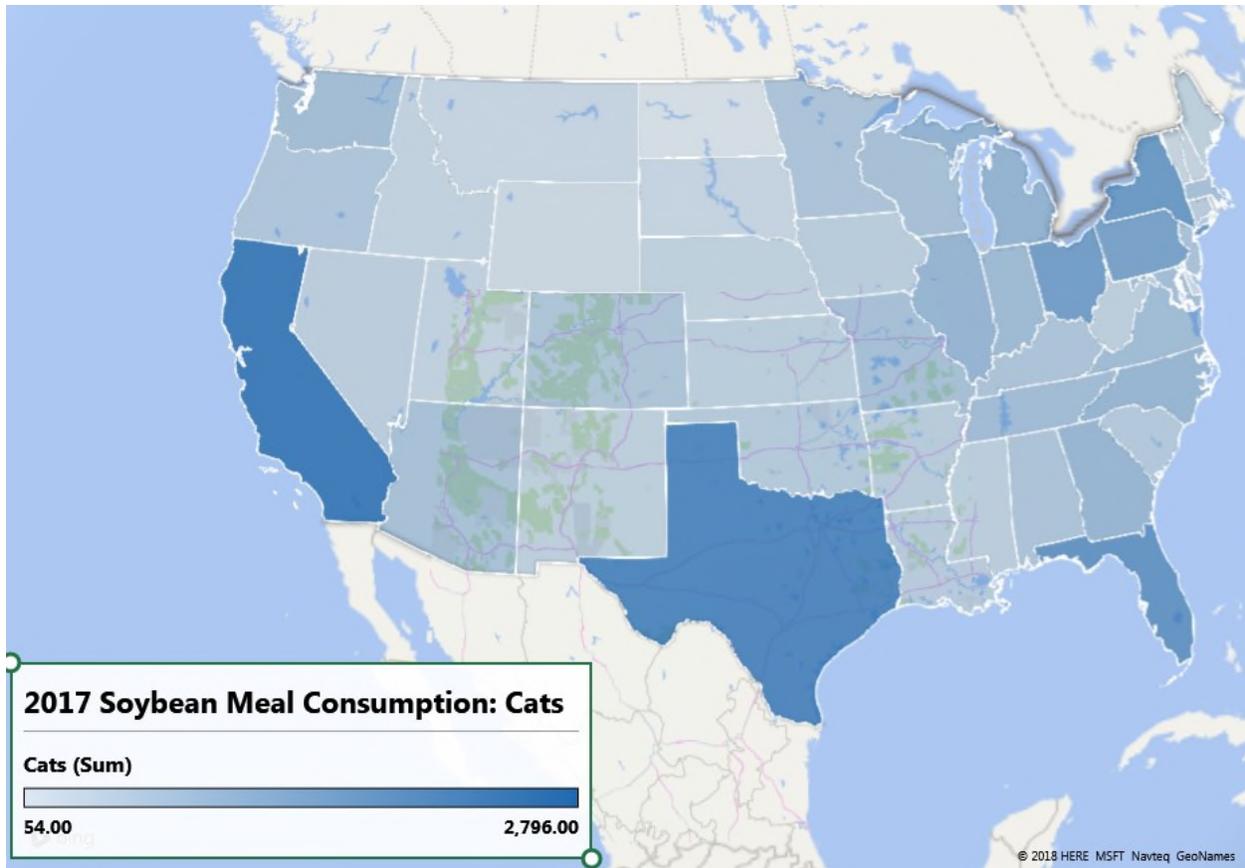
Companion Animals

For purposes of this analysis, we have defined companion animals as a combination of cats, dogs, and horses (equine). In our research we contacted several individuals familiar with the feeding of these animals. 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, despite the high value it offers. Estimated 2017 total SBM consumption for companion animals is about 457,000 tons, which represents about 1.6% of total SBM consumption in 2017. Due to our inability to gather 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.

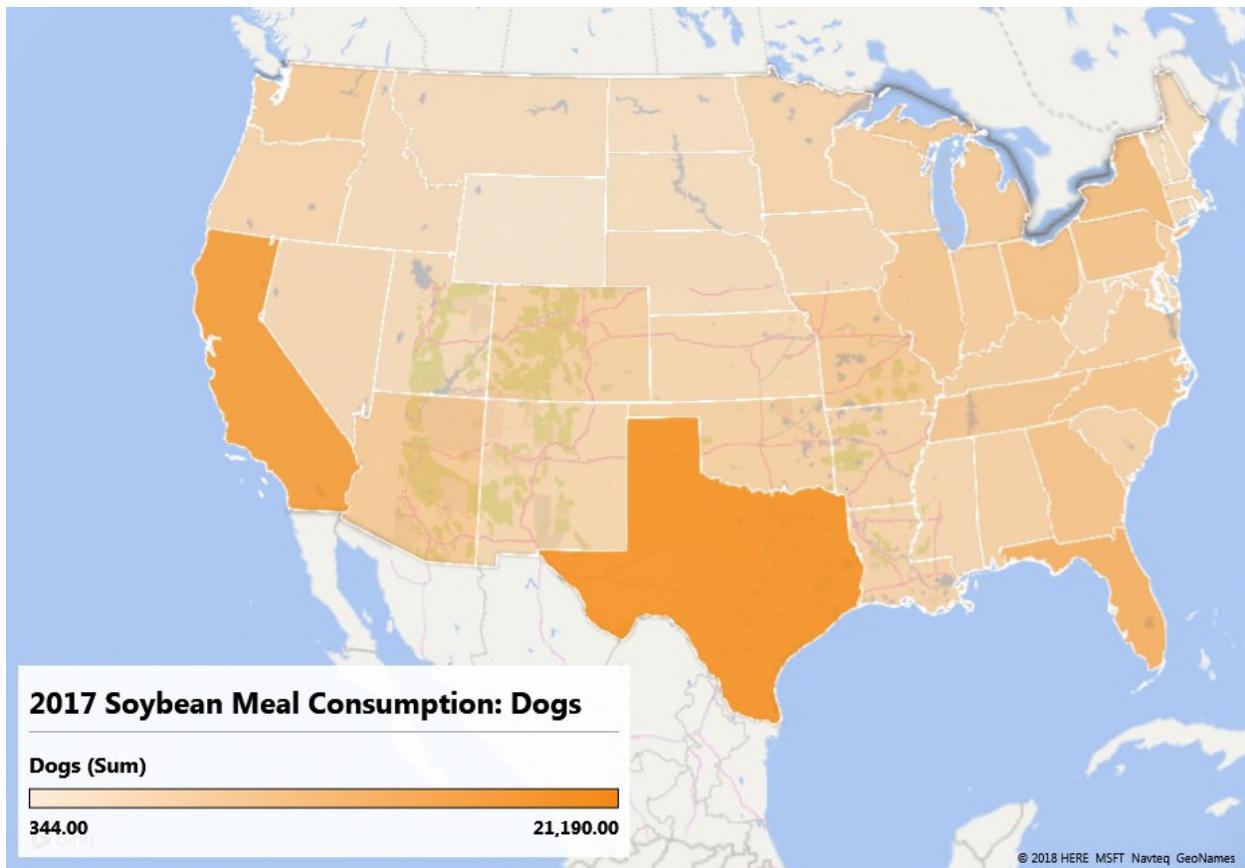
Cats

The use of SBM in cat food is very limited. Estimated SBM consumption by cats during 2017 is just 32,000 tons, or 0.1% of the estimated total for 2017. Not only is the daily food consumption of cats low, the perception of SBM as a cat food ingredient is frowned upon, particularly for cat owners who “want the best” for their cats. 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.).



Dogs

The use of SBM in dog food is very limited. Estimated SBM consumption by dogs during 2017 is about 203,000 tons, or 0.7% of the estimated total for 2017. The perception of SBM as a dog food ingredient is frowned upon, particularly for dog owners who “want the best” for their dogs. 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.).



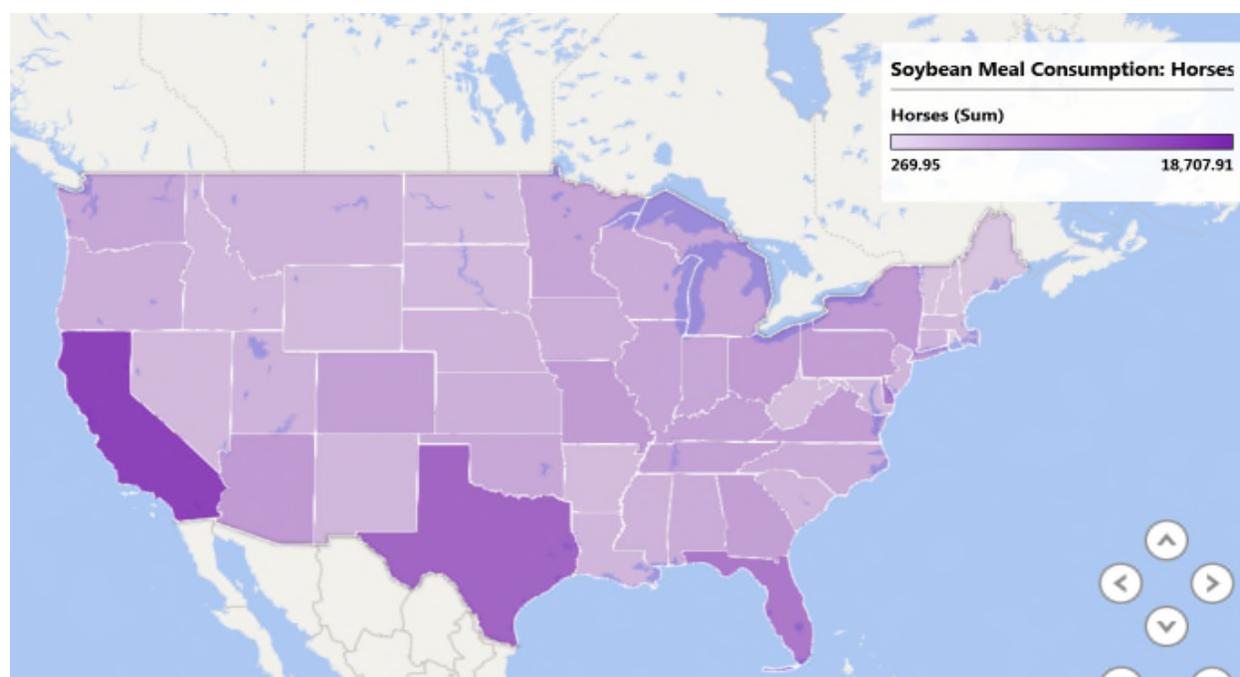
Within the cat and dog food market, the use of SBM has been relegated to use in “value” cat and dog foods, which is primarily store brands and other lower cost cat and dog food. Premium (although it may contain some SBM), super-premium, and holistic cat and dog foods are specifically marketed as not containing SBM (or other “meals”) because of the general consumer perception that SBM is not good for cat and dogs. The continuum of cat and dog food types continues to range from value cat and dog food to those cat and dog foods keeping up with the latest marketing trends. In reality, even though SBM is a good source of protein for cat and dogs, the pet food industry has generally marketed themselves out of options as pet food companies seek differentiation between them and their competitors.

Horses

Estimated 2017 SBM consumption by horses was about 222,000 tons, or about 0.8% of estimated 2017 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 8% of the life expectancy (25 years) of a typical horse. 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.

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. Because the majority of horses fall into the maintenance diet category, overall SBM consumption by horses is limited. 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.

Similar to cattle, much of the protein needs for horses are sourced from forage. SBM is added as part of a concentrate along with forage during the growing and performance phases. For those horses which consume SBM, it is considered the optimal protein source for horses and is typically purchased even if cheaper per unit of protein sources are available. SBM is optimal due to its well-balanced essential amino acid profile. Lysine is very important for growing and performance horses. SBM contains about 3% lysine, which is higher than most other vegetable protein sources.



Conclusion

Companion animals are not large consumers of SBM and the opportunity for increased usage is constrained by companion animal owner perceptions 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. As we have seen since about 2008, challenging economic circumstances hamper increases in horse ownership.

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 2% from the previous year² and trout sales were up 4% from the previous year³. Within the trout segment, sales of food size fish were down in numbers by 13% but the average price was up 15% resulting in the 4% increase in total sales.

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 two Minnesota operations are expected to be in product by early 2019. 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 quantity 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), Balaton, MN (pacific white shrimp) and Rockport, TX (pacific white shrimp). An additional facility will be operational in 2019 in Lucerne, MN (pacific white shrimp).

Competing Feedstuff Analysis

While there is an abundance of research on the use of SBM in aquaculture feed rations, information on actual rations used in production is generally not available. We found the

² USDA/NASS Catfish Production ISSN:1949-1948, February 26,2018

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

subject matter experts from both academia and the government to be helpful in developing inclusion rates for SBM by species. However, our discussions with producers and some feed company representatives were not as productive. Both feed companies and producers are very protective of their feed formulas.

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 following list includes some of the alternatives to SBM for aquaculture feed rations along with a brief description of characteristics as compared to SBM.

Cotton Seed Meal	<p>SBM contains anti-nutrient factors such as lectins, protease inhibitors and antigenic compounds. Cotton seed meal also contains anti-nutrient factors such as gossypol. Cotton seed meal is also lower in lysine.</p> <ul style="list-style-type: none"> • The following link refers to grass carp: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3389240/ • The following link refers to catfish: http://www.cottonseed.com/publications/cottonseed%20meal%20in%20catfish%20feeds.pdf • Depending on relative pricing, cottonseed meal can replace some of the SBM in aquaculture diets. More importantly, it appears that SBM by itself cannot replace fishmeal in a diet but a combination of cottonseed meal and SBM has that potential.
Canola Meal	<p>According to Allen D. Davis Ph.D. at Auburn University, Canola meal has a higher restriction rate due to a higher level of non-nutritional ingredients. Therefore it is not a 1 for 1 replacement for SBM. Advances in genetics have produced canola seed that provides canola meal with reduced non-nutritional ingredients. However, the protein level in canola meal is lower than SBM. Canola meal also has a high fiber content which detracts from its value in aquaculture diets.</p>
DDGS	<p>Research shows that a diet with a combination of DDGS and Soybean Meal has the potential of completely replacing fish meal in the diet. A positive side effect is a reduction of nitrogen and phosphorus in the fish farm effluent water.</p> <p>http://www.grains.org/sites/default/files/ddgs-handbook/Complete%202012%20DDGS%20Handbook.pdf</p>
Feather Meal	<p>According to Allen D. Davis Ph.D at Auburn University, feather meal is a potential replacement for fish meal. A study published in the August 2010 issue of Renderer Magazine mentions inclusion rates in the 7 to 10% range. The article also mentions that feather meal has not been widely used to due anecdotal evidence of wide swings in nutrient content.</p>
Wheat Midds	<p>Not used very much due to high fiber content.</p>

⁴ <http://www.iaffd.com>

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 15% to 50%. Given the estimated consumption of SBM represents less than 0.07% 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 22,955 tons of SBM were consumed by meat goats in 2017, which is less than 0.1% of total U.S. estimated SBM consumption in 2017. This is due to a few reasons:

1. Overall sheep slaughter is very minimal compared to other livestock and poultry. About 2.2 million sheep and lambs were commercially slaughtered in 2017.
2. 94% 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 need 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 175 tons of SBM were consumed by meat goats in 2017. This is due to a few reasons:

1. Overall goat slaughter is very minimal compared to other livestock and poultry. About 597,700 meat goats were commercially slaughtered in 2017.
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 55% slaughtered goats are young goats (up to 3 months of age), therefore, no SBM is used for this group, leaving 45% 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 use and quality matters greatly. As expected, own-price elasticities of SBM demand are all negative, and of reasonable magnitude but statistically insignificant at the 10% level. Own-price elasticities ranged from relatively inelastic for layers (-0.002) to turkeys (-0.05). As expected, an increase in the price of SBM will decrease the SBM quantity demanded in broiler, layer, turkey, and hog diets.

With respect to Broilers:

- Cross-price elasticities of SBM demand indicate that corn, DDGS and canola meal compete with SBM in aggregate.
- The SBM components elasticity analysis indicates that DDGS and canola meal can compete with the lysine component in SBM.
- Synthetic lysine poses a threat for the lysine component in SBM.
- Corn and DDGS don't compete with the metabolizable energy in the SBM, but canola meal does.
- If the level of digestible lysine in SBM were to be increased by 5 percent, broiler producers would theoretically be willing to pay up to approximately 91 percent more for SBM.

With respect to Layers:

- Synthetic lysine poses a threat for the lysine component in SBM.
- Canola meal appears to be competing with SBM with respect to the lysine component, but not DDGS.
- Canola meal competes with SBM's metabolizable energy component, but not corn and DDGS.
- Canola meal competes with SBM with respect to crude protein content.
- If the level of digestible lysine in SBM were to be increased by 5 percent, layer producers would theoretically be willing to pay approximately 196 percent more for SBM.

With respect to Turkeys:

- Synthetic lysine poses a bigger threat for the lysine component in SBM than corn and DDGS.
- Compared to corn and DDGS, synthetic lysine shows relatively high price elasticity with the lysine component demand in SBM.
- Corn is competing for metabolizable energy with the energy component in the SBM, but DDGS is not.

With respect to Hogs:

- The cross-price elasticities of SBM demand indicate that DDGS and canola meal compete with SBM in aggregate, but corn does not.
- Synthetic lysine provides greater competition than other components.
- Lysine in DDGS and canola meal do not compete with SBM on a lysine component basis.
- Corn and DDGS compete with SBM for metabolizable energy as it is a very economical source of energy, but canola meal does not.

This study brings out very important findings related to the competitive position of SBM in livestock and poultry diets in the United States. The results help examine the potential for SBM to compete on component levels. With respect to the lysine component in SBM, synthetic lysine has become very competitive in the livestock and poultry industry. Both canola meal and DDGS have become more utilized in the crude protein market and can compete with SBM. In addition to corn being the cheapest energy source, DDGS has started to play a competitive role in replacing energy sources in addition to other components in SBM market.

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.

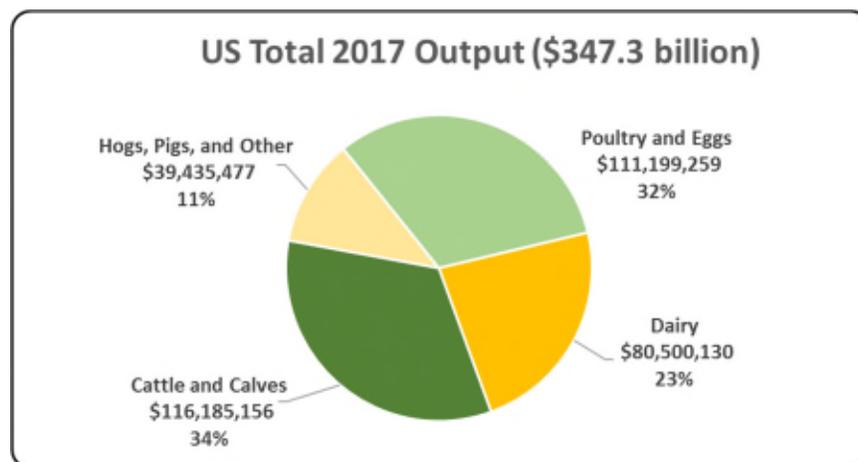
U.S. Economic Impact of Animal Agriculture

This section details the impact of animal agriculture for the U.S. during 2007-2017. 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 17 (at the end of this section) shows state-by-state estimated 2017 economic impacts of animal agriculture. During the last decade in the U.S., animal agriculture has contributed to the following measures of economic activity:

- \$32.6 billion increase in economic output
- \$6.8 billion expansion in household earnings
- 159,786 more jobs
- \$1.6 billion more income taxes paid

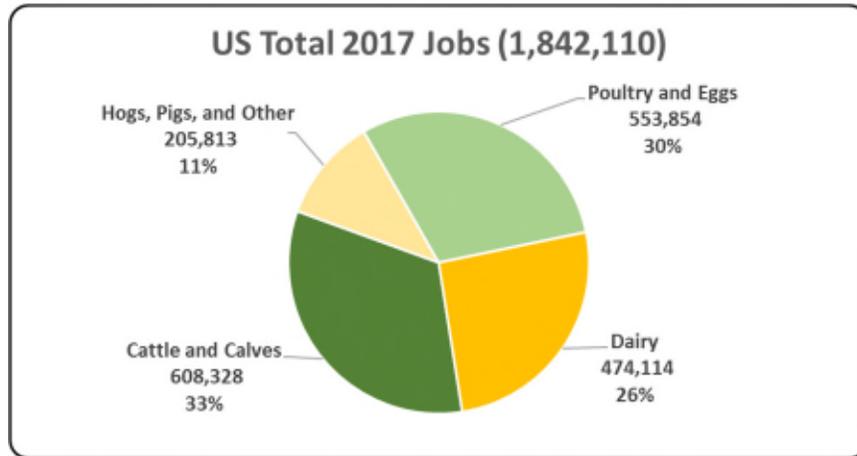
U.S. Output

“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 \$347.3 billion in output within and related to animal agriculture.



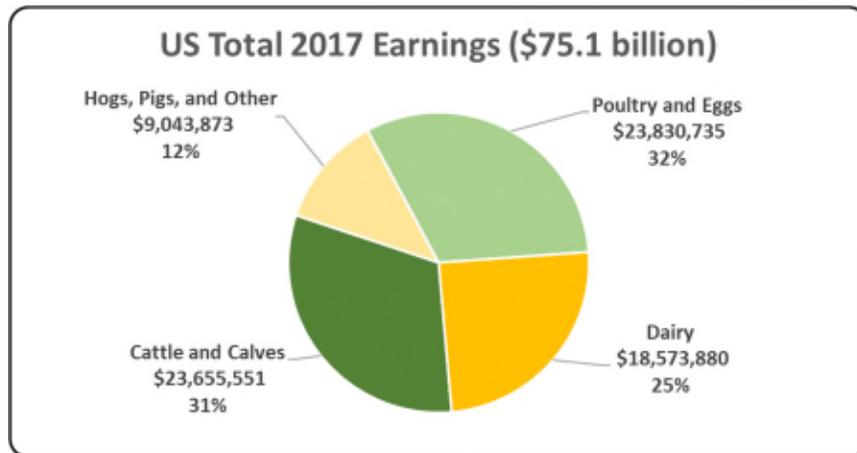
U.S. Jobs

“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 1,842,110 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 \$75.1 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 \$347.3 billion of output in 2017. The top 5 leading states for animal agriculture in terms of output include Texas (\$31.9 billion), Iowa (\$24.2 billion), California (\$18.6 billion), North Carolina (\$18.2 billion), and Wisconsin (\$17.6 billion). Table 17 on page 18 lists the total output, earnings, employment, and income taxes paid in 2017 for each state.

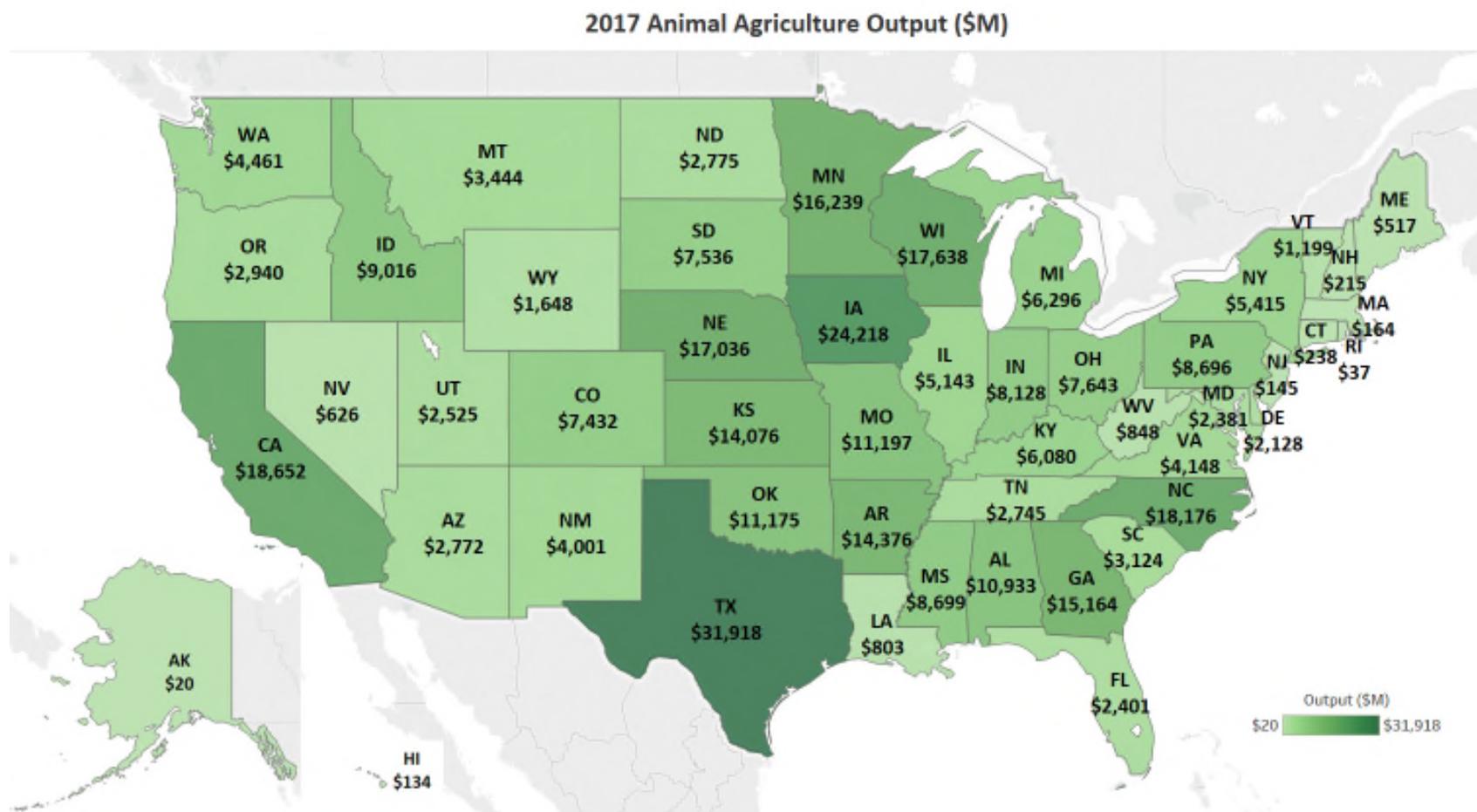


Figure 24, U.S. Animal Agriculture Output (\$M)

The majority of states across the U.S. saw an increase from 2007 to 2017 in the amount of output supported by animal agriculture. Iowa, Texas, Nebraska, North Carolina, and Missouri were the leading states for total increases in animal agriculture output. Although not as large of an increase in total output, Wyoming, Utah, North Dakota, and South Dakota also saw sizeable growth on a percent basis within their state.

Table 18 on page 19 lists the changes in output, earnings, employment, and income taxes paid from 2007 to 2017 for each state.

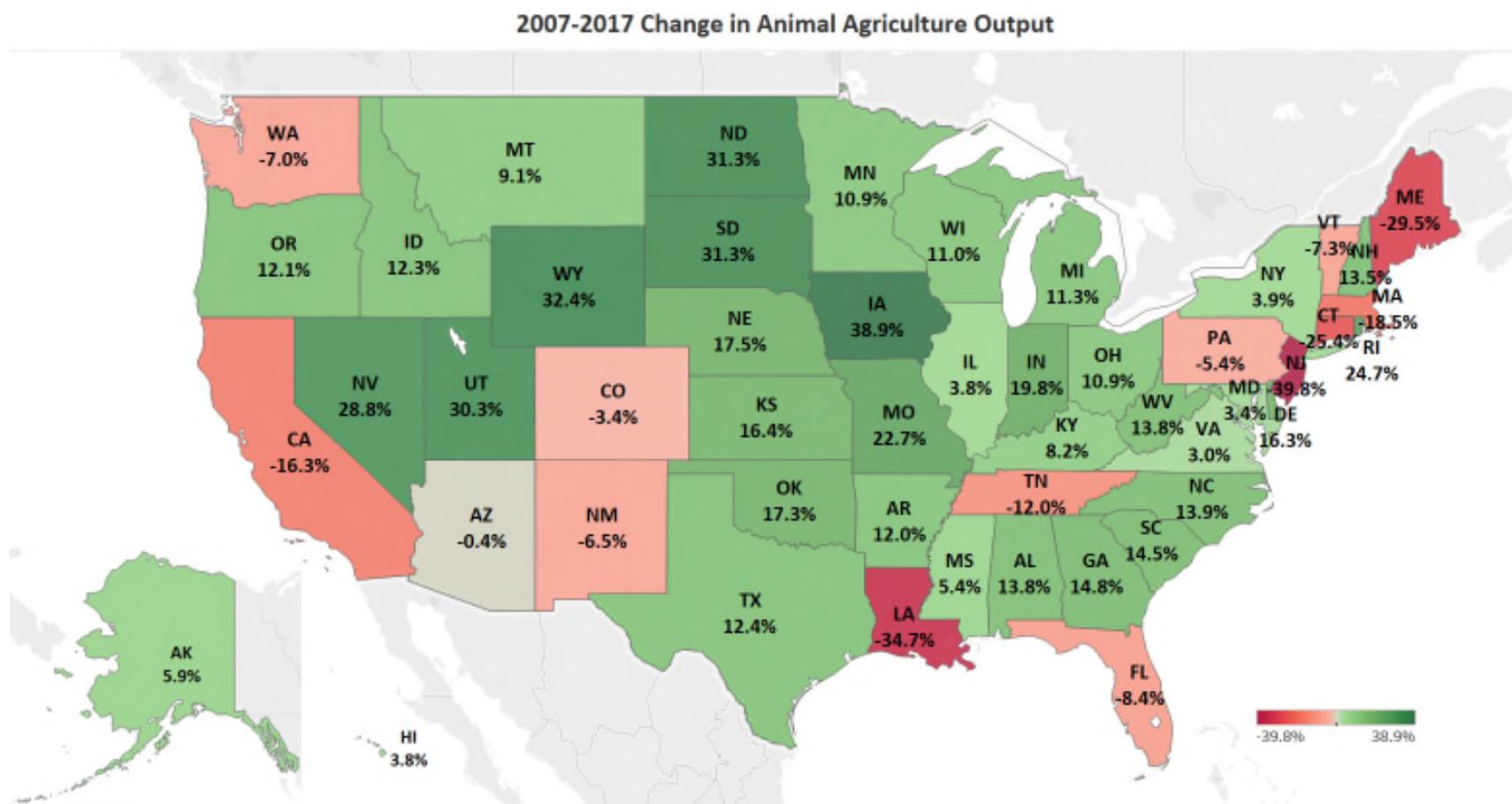


Figure 25, 2007-2017 % Change in Animal Agriculture Output

In 2017, animal agriculture supported 1,842,110 jobs in the United States. There are six states where this sector is especially robust and supports almost 75,000 jobs: Texas (208,791), Iowa (109,822), Wisconsin (106,251), North Carolina (88,838), California (85,995), and Nebraska (74,844).

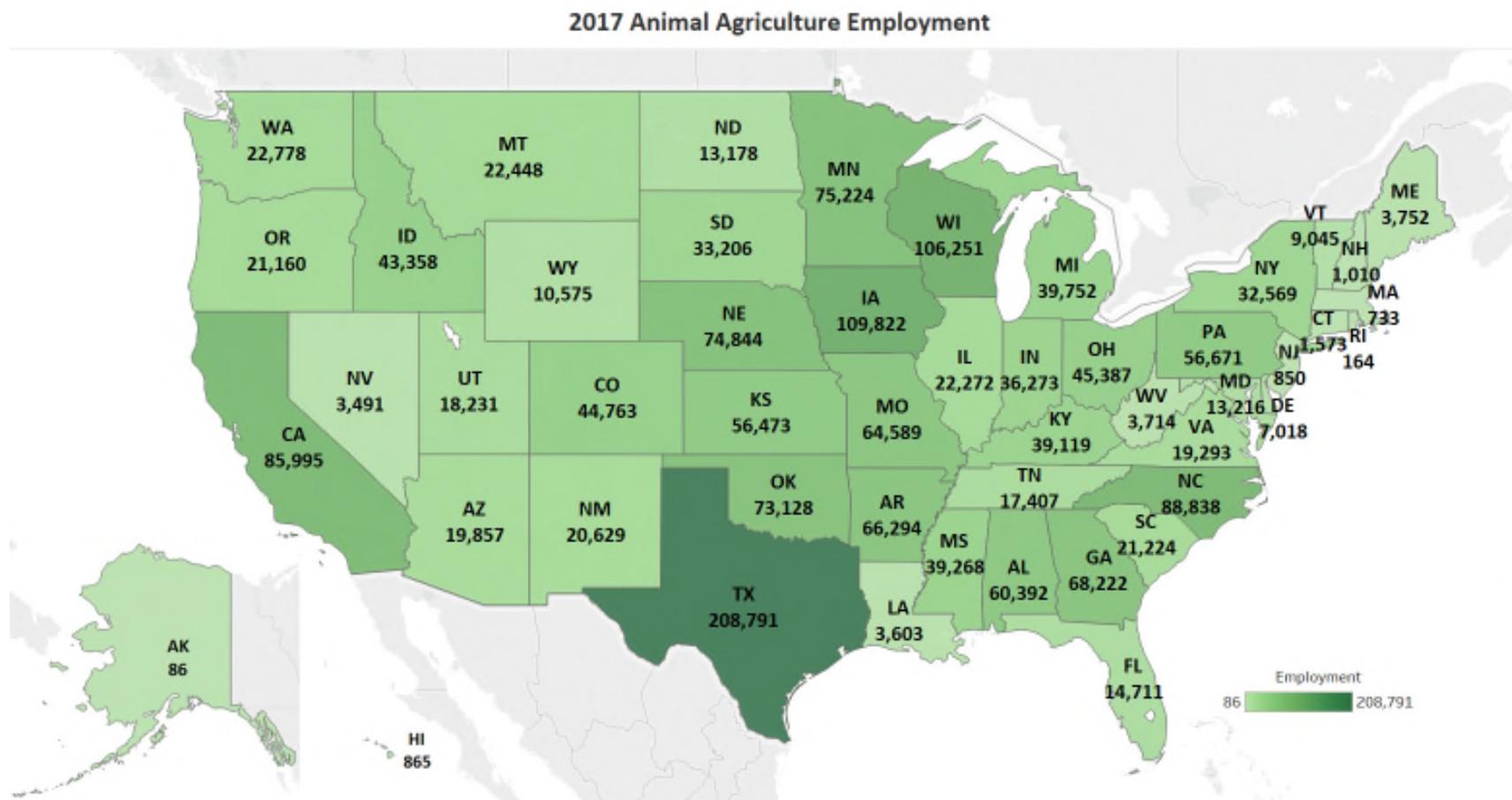


Figure 26, U.S. Animal Agriculture - Employment (Jobs)

Animal agriculture supported increases in jobs in many states over the past decade. More specifically, 13 of the states saw animal agriculture generate jobs gains greater than 15% from 2007 to 2017, and half of the states saw at least a 10% increase.

2007-2017 Change in Animal Agriculture Employment

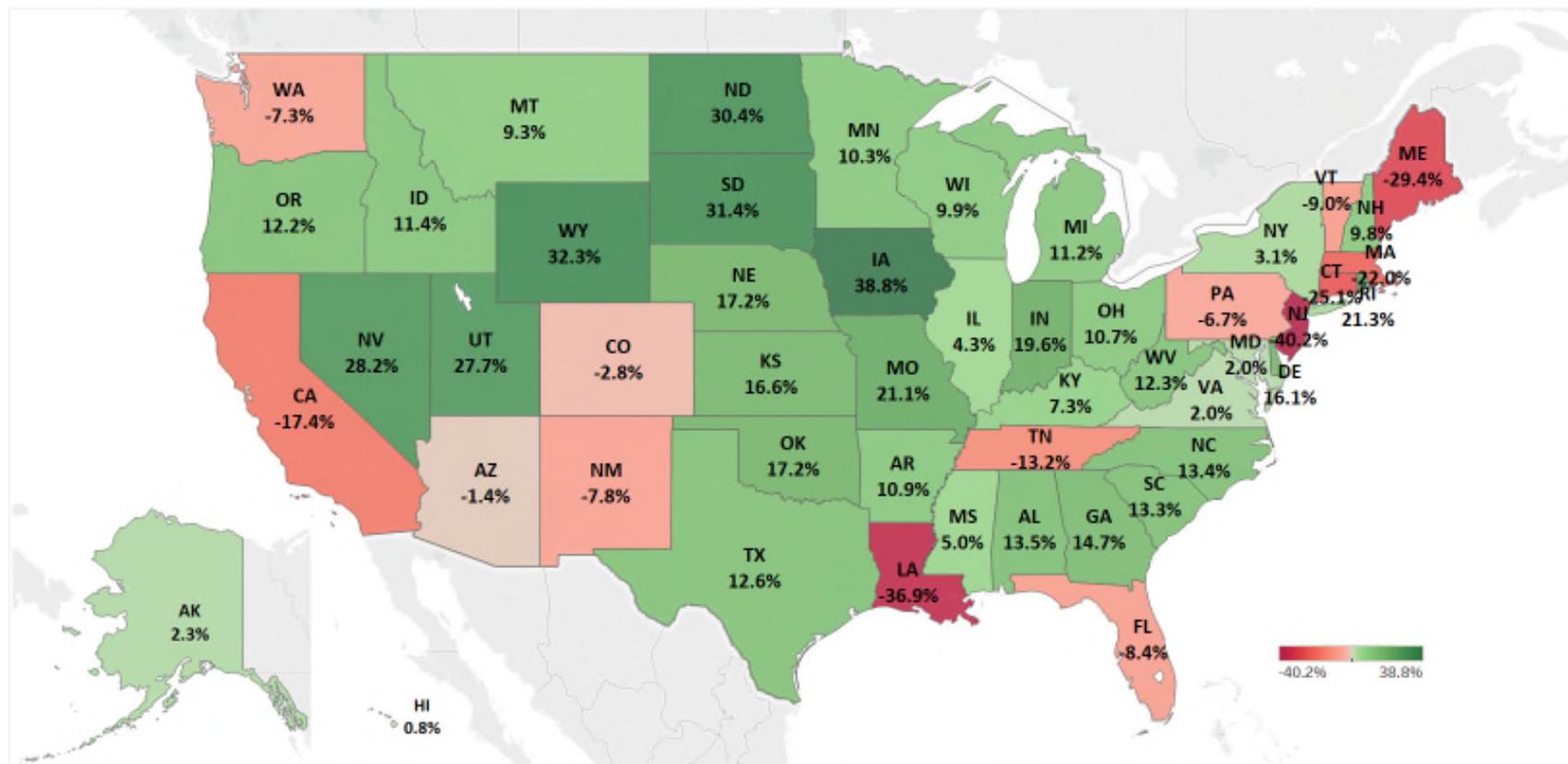


Figure 27, 2007-2017 % Change in Animal Agriculture Employment

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 \$75.1 billion in household earnings in the U.S. in 2017 and contributes heavily to earnings in many states such as Texas (\$6.9 billion), Iowa (\$5.2 billion), California (\$4.3 billion), North Carolina (\$4.1 billion), Wisconsin (\$3.9 billion), and many more.

2017 Animal Agriculture Earnings (\$M)

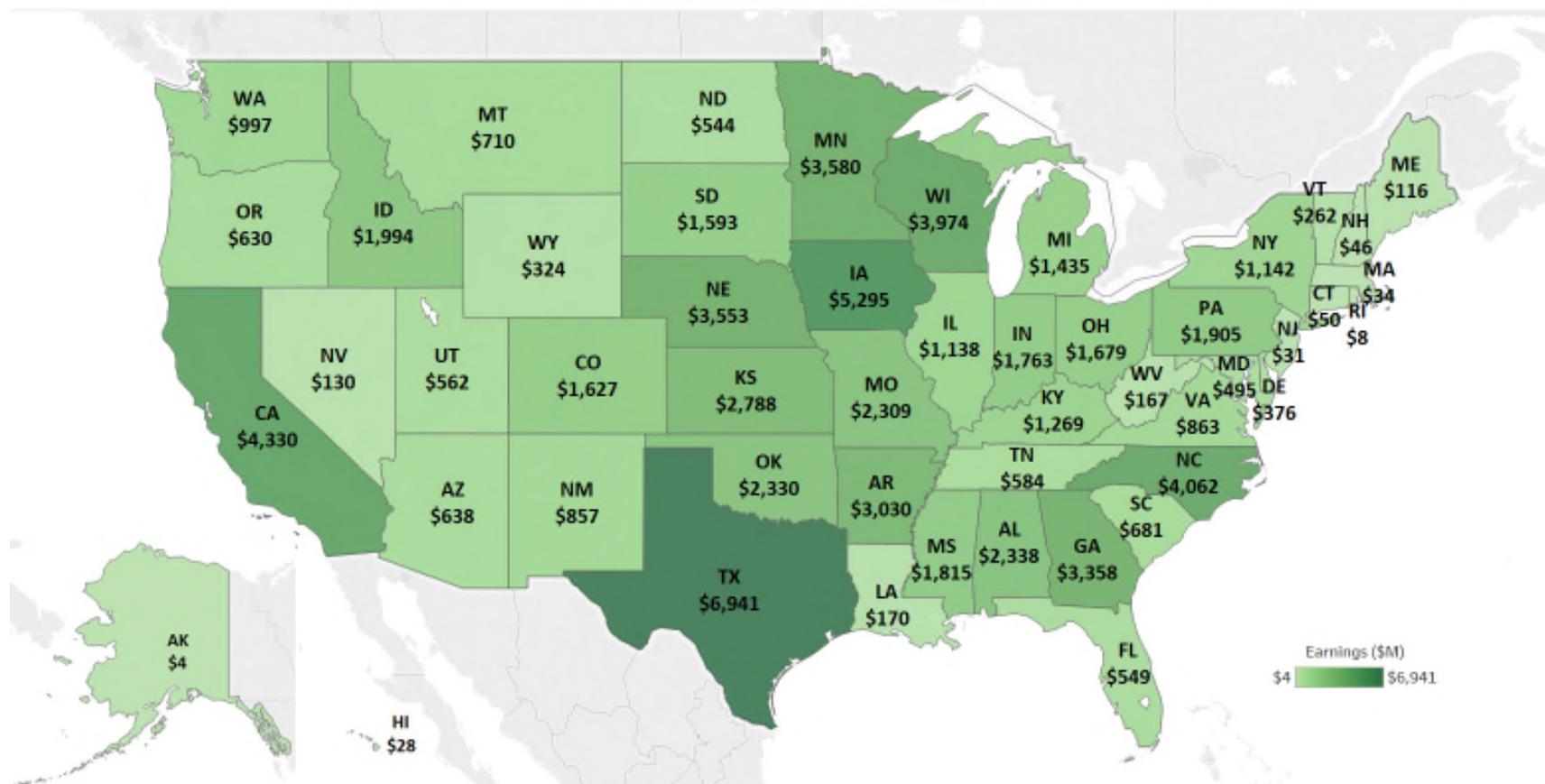


Figure 28, U.S. Animal Agriculture - Earnings (\$M)

Most states across the U.S. have seen increased earnings generated from the animal agriculture sector from 2007 to 2017. The animal agriculture sector increased earnings by greater than 15% in 13 states over the past decade. However, California saw a 17.2% decline in earnings from animal agriculture due to decreasing animal unit numbers across all species. Dairy was the main contributor to the large decline in California with a 9% lower average milk price received compared to 2007, in addition to a reduction of dairy animal units over the last decade.

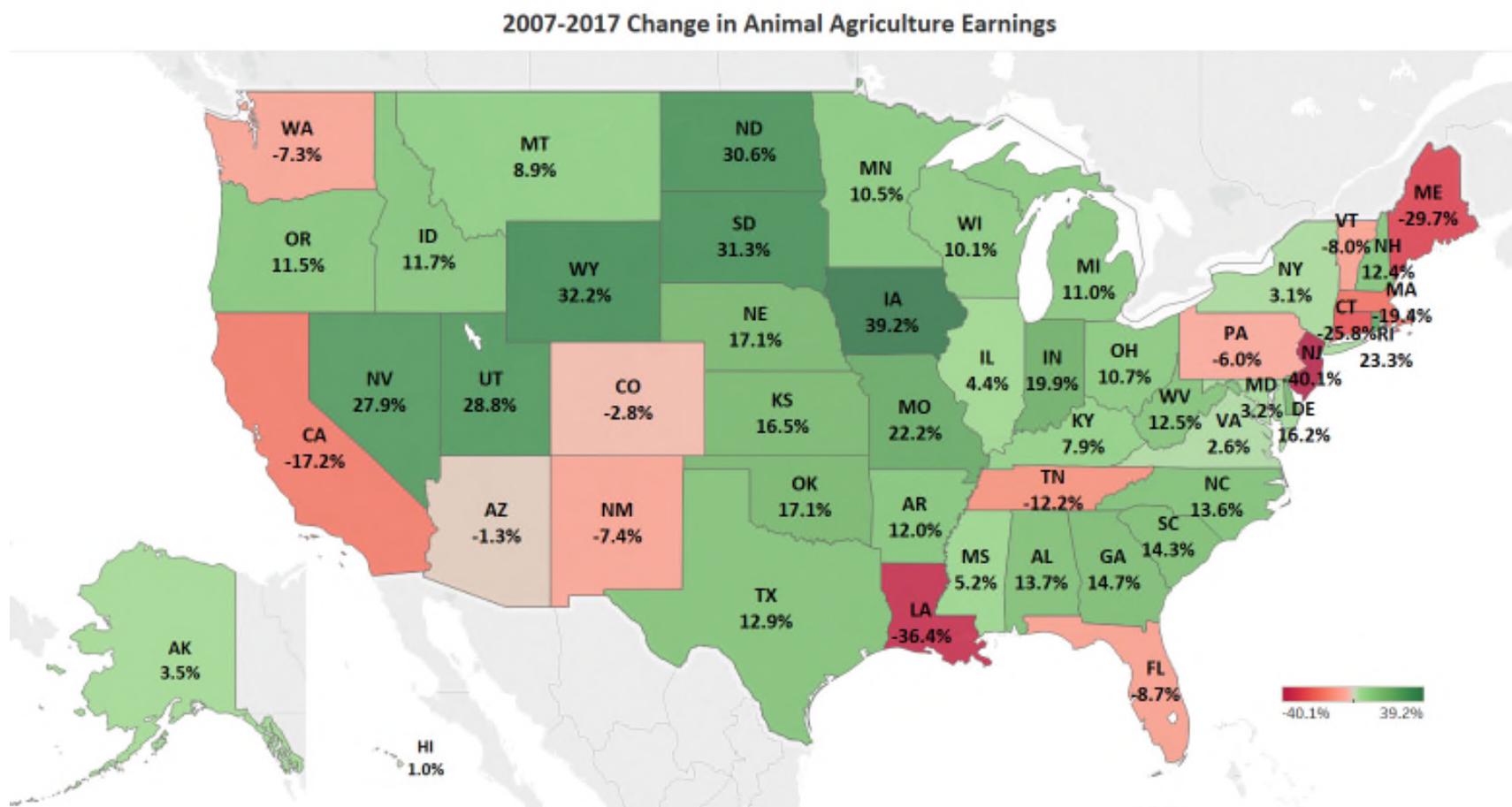


Figure 29, 2007-2017 % Change in Animal Agriculture Earnings

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, Wisconsin, Minnesota and Nebraska. In seventeen states, animal agriculture paid taxes estimated at \$400 million or more in 2017.

2017 Animal Agriculture Income Taxes Paid (\$M)

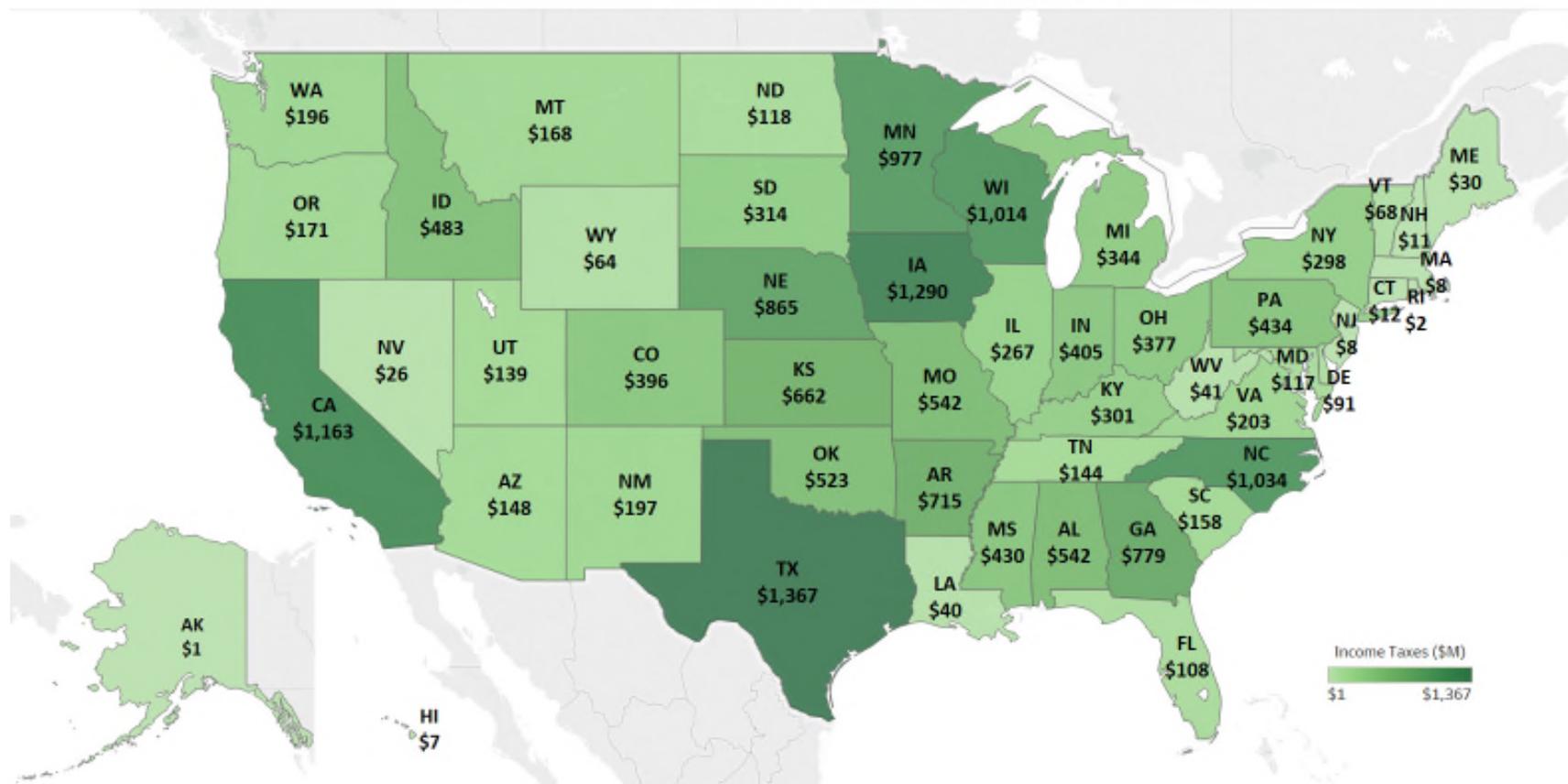


Figure 30, 2017 Animal Agriculture – Income Taxes Paid (\$M)

Income taxes paid at the local, state, and federal jurisdictions increased steadily over the last decade. States such as Iowa, Wyoming, South Dakota, North Dakota, and Utah were among top states for growth in estimated income tax payments. Eight states saw growth over 20% in income taxes paid by animal agriculture from 2007 to 2017, and over half of the states saw at least a 10% increase.

2007-2017 Change in Animal Agriculture Income Taxes Paid

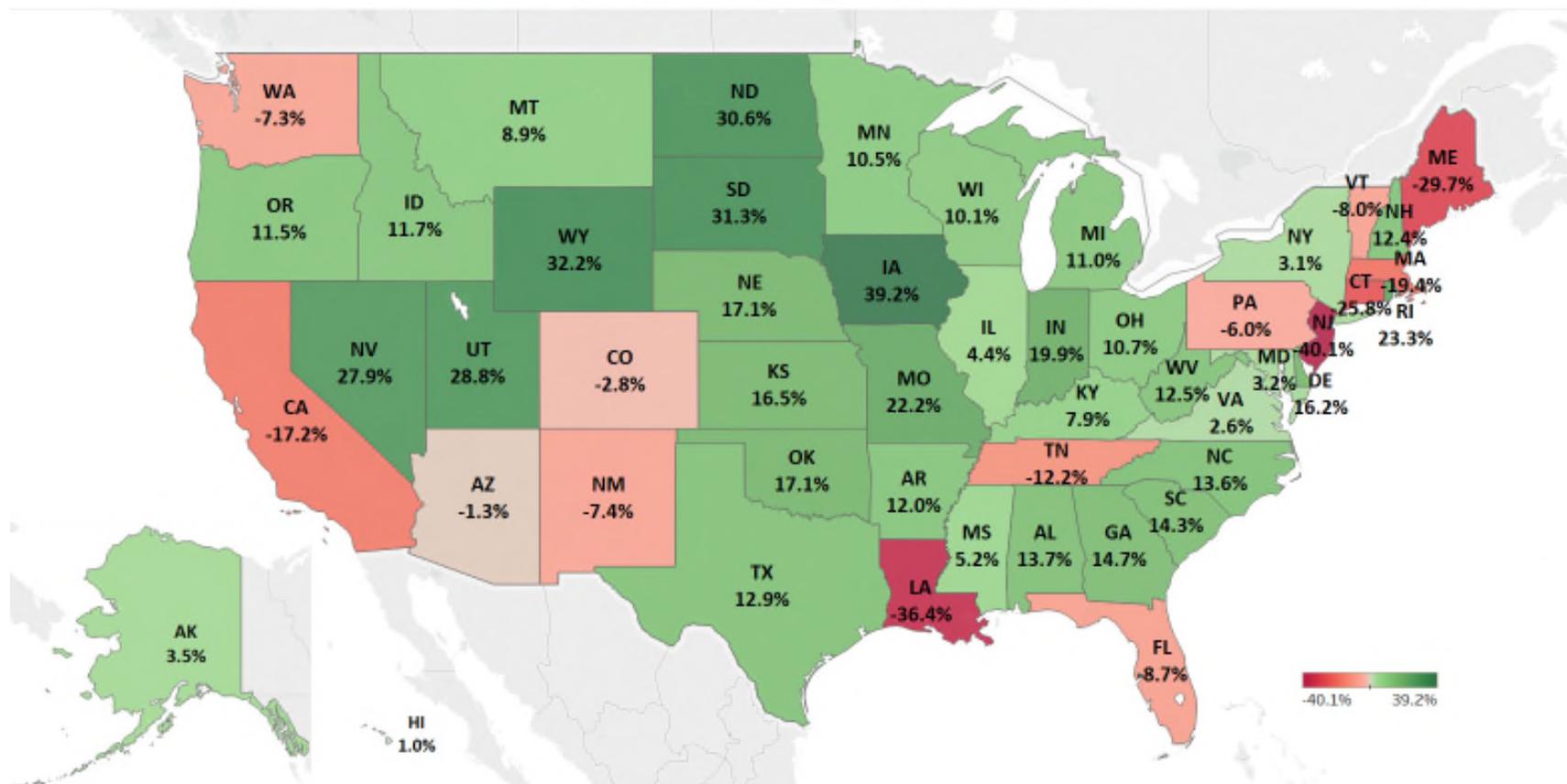


Figure 31, 2007-2017 % Change in Animal Agriculture Income Taxes Paid

Table 17, Estimated 2017 Economic Impact of Animal Agriculture

State	Output (\$M)	Earnings (\$M)	Employment	Income Taxes (\$M)	Property Taxes (\$M)
ALABAMA	\$ 10,933.0	\$ 2,338.0	60,392	\$ 542.4	\$ 47.6
ALASKA	\$ 20.4	\$ 4.0	86	\$ 0.8	\$ 1.3
ARIZONA	\$ 2,771.8	\$ 637.8	19,857	\$ 148.4	\$ 42.0
ARKANSAS	\$ 14,376.4	\$ 3,029.8	66,294	\$ 715.0	\$ 86.7
CALIFORNIA	\$ 18,652.3	\$ 4,329.8	85,995	\$ 1,162.5	\$ 827.6
COLORADO	\$ 7,431.9	\$ 1,627.0	44,763	\$ 395.8	\$ 96.2
CONNECTICUT	\$ 237.5	\$ 50.2	1,573	\$ 12.4	\$ 29.5
DELAWARE	\$ 2,127.7	\$ 375.9	7,018	\$ 90.6	\$ 6.2
FLORIDA	\$ 2,400.8	\$ 548.8	14,711	\$ 108.1	\$ 189.3
GEORGIA	\$ 15,164.2	\$ 3,357.5	68,222	\$ 778.9	\$ 131.7
HAWAII	\$ 133.6	\$ 28.2	865	\$ 6.9	\$ 11.6
IDAHO	\$ 9,015.7	\$ 1,994.2	43,358	\$ 482.6	\$ 78.9
ILLINOIS	\$ 5,143.0	\$ 1,138.0	22,272	\$ 266.9	\$ 321.3
INDIANA	\$ 8,127.6	\$ 1,762.5	36,273	\$ 405.4	\$ 260.7
IOWA	\$ 24,217.8	\$ 5,295.2	109,822	\$ 1,290.4	\$ 437.3
KANSAS	\$ 14,076.4	\$ 2,788.3	56,473	\$ 662.2	\$ 227.6
KENTUCKY	\$ 6,080.3	\$ 1,268.9	39,119	\$ 300.7	\$ 113.7
LOUISIANA	\$ 803.2	\$ 169.9	3,603	\$ 40.3	\$ 32.1
MAINE	\$ 517.3	\$ 115.5	3,752	\$ 30.2	\$ 30.7
MARYLAND	\$ 2,381.3	\$ 495.4	13,216	\$ 116.8	\$ 48.4
MASSACHUSETTS	\$ 163.6	\$ 33.8	733	\$ 8.4	\$ 38.0
MICHIGAN	\$ 6,296.4	\$ 1,435.1	39,752	\$ 343.7	\$ 217.5
MINNESOTA	\$ 16,238.8	\$ 3,579.7	75,224	\$ 977.2	\$ 340.7
MISSISSIPPI	\$ 8,698.5	\$ 1,815.4	39,268	\$ 430.2	\$ 78.3
MISSOURI	\$ 11,196.6	\$ 2,309.2	64,589	\$ 541.5	\$ 193.4
MONTANA	\$ 3,444.0	\$ 709.8	22,448	\$ 167.9	\$ 126.6
NEBRASKA	\$ 17,035.5	\$ 3,553.3	74,844	\$ 865.2	\$ 479.0
NEVADA	\$ 625.8	\$ 129.8	3,491	\$ 25.6	\$ 17.9
NEW HAMPSHIRE	\$ 214.6	\$ 46.0	1,010	\$ 11.4	\$ 23.6
NEW JERSEY	\$ 145.4	\$ 31.0	850	\$ 7.7	\$ 55.3
NEW MEXICO	\$ 4,000.6	\$ 856.6	20,629	\$ 197.0	\$ 36.2
NEW YORK	\$ 5,415.3	\$ 1,142.3	32,569	\$ 298.3	\$ 208.9
NORTH CAROLINA	\$ 18,176.0	\$ 4,062.1	88,838	\$ 1,033.8	\$ 142.4
NORTH DAKOTA	\$ 2,775.4	\$ 544.3	13,178	\$ 118.1	\$ 129.9
OHIO	\$ 7,642.5	\$ 1,679.0	45,387	\$ 376.9	\$ 235.7
OKLAHOMA	\$ 11,174.8	\$ 2,329.9	73,128	\$ 523.1	\$ 114.3
OREGON	\$ 2,940.4	\$ 630.3	21,160	\$ 171.1	\$ 112.8
PENNSYLVANIA	\$ 8,695.5	\$ 1,904.6	56,671	\$ 433.7	\$ 229.9
RHODE ISLAND	\$ 37.3	\$ 7.7	164	\$ 1.9	\$ 7.4
SOUTH CAROLINA	\$ 3,123.7	\$ 681.2	21,224	\$ 158.0	\$ 43.3
SOUTH DAKOTA	\$ 7,536.4	\$ 1,593.1	33,206	\$ 313.8	\$ 197.1
TENNESSEE	\$ 2,744.8	\$ 584.1	17,407	\$ 144.3	\$ 99.2
TEXAS	\$ 31,917.9	\$ 6,941.1	208,791	\$ 1,367.4	\$ 553.9
UTAH	\$ 2,525.2	\$ 562.3	18,231	\$ 138.9	\$ 34.0
VERMONT	\$ 1,198.7	\$ 262.4	9,045	\$ 68.1	\$ 34.0
VIRGINIA	\$ 4,148.4	\$ 863.1	19,293	\$ 203.5	\$ 110.2
WASHINGTON	\$ 4,461.4	\$ 997.0	22,778	\$ 196.4	\$ 175.1
WEST VIRGINIA	\$ 848.3	\$ 167.1	3,714	\$ 40.9	\$ 21.0
WISCONSIN	\$ 17,638.1	\$ 3,974.1	106,251	\$ 1,014.4	\$ 311.2
WYOMING	\$ 1,647.8	\$ 323.6	10,575	\$ 63.8	\$ 41.6
US Total	\$ 347,320.0	\$ 75,104.0	1,842,110	\$ 17,799.7	\$ 7,428.9

Table 18, Economic Impact of Animal Agriculture: Change from 2007-2017

State	Output (\$1,000)	Earnings (\$1,000)	Employment	Income Taxes (\$1,000)
ALABAMA	\$ 1,328,096	\$ 281,425	7,187	\$ 65,291
ALASKA	\$ 1,138	\$ 137	2	\$ 27
ARIZONA	\$ (11,705)	\$ (8,573)	(280)	\$ (1,994)
ARKANSAS	\$ 1,543,718	\$ 324,488	6,537	\$ 76,579
CALIFORNIA	\$ (3,644,457)	\$ (897,827)	(18,163)	\$ (241,067)
COLORADO	\$ (259,208)	\$ (47,594)	(1,292)	\$ (11,580)
CONNECTICUT	\$ (81,063)	\$ (17,461)	(528)	\$ (4,312)
DELAWARE	\$ 297,910	\$ 52,401	974	\$ 12,629
FLORIDA	\$ (221,469)	\$ (52,473)	(1,342)	\$ (10,337)
GEORGIA	\$ 1,954,334	\$ 431,271	8,742	\$ 100,055
HAWAII	\$ 4,889	\$ 273	7	\$ 67
IDAHO	\$ 983,960	\$ 208,505	4,454	\$ 50,458
ILLINOIS	\$ 187,127	\$ 48,472	911	\$ 11,367
INDIANA	\$ 1,340,843	\$ 292,971	5,947	\$ 67,383
IOWA	\$ 6,778,116	\$ 1,492,400	30,705	\$ 363,698
KANSAS	\$ 1,978,710	\$ 394,372	8,027	\$ 93,663
KENTUCKY	\$ 460,807	\$ 93,049	2,646	\$ 22,053
LOUISIANA	\$ (427,372)	\$ (97,294)	(2,111)	\$ (23,059)
MAINE	\$ (216,600)	\$ (48,782)	(1,562)	\$ (12,769)
MARYLAND	\$ 78,840	\$ 15,213	259	\$ 3,586
MASSACHUSETTS	\$ (37,073)	\$ (8,137)	(206)	\$ (2,018)
MICHIGAN	\$ 641,025	\$ 142,439	3,992	\$ 34,114
MINNESOTA	\$ 1,590,129	\$ 341,097	7,024	\$ 93,119
MISSISSIPPI	\$ 446,731	\$ 89,413	1,887	\$ 21,191
MISSOURI	\$ 2,070,286	\$ 418,918	11,263	\$ 98,236
MONTANA	\$ 287,446	\$ 57,968	1,902	\$ 13,709
NEBRASKA	\$ 2,539,757	\$ 518,794	11,003	\$ 126,326
NEVADA	\$ 140,038	\$ 28,276	767	\$ 5,570
NEW HAMPSHIRE	\$ 25,598	\$ 5,095	90	\$ 1,258
NEW JERSEY	\$ (96,197)	\$ (20,792)	(571)	\$ (5,174)
NEW MEXICO	\$ (277,116)	\$ (68,112)	(1,752)	\$ (15,666)
NEW YORK	\$ 202,256	\$ 34,095	972	\$ 8,902
NORTH CAROLINA	\$ 2,216,401	\$ 487,617	10,477	\$ 124,098
NORTH DAKOTA	\$ 661,415	\$ 127,480	3,071	\$ 27,663
OHIO	\$ 750,339	\$ 161,703	4,400	\$ 36,302
OKLAHOMA	\$ 1,648,117	\$ 340,313	10,758	\$ 76,400
OREGON	\$ 318,214	\$ 64,948	2,305	\$ 17,633
PENNSYLVANIA	\$ (493,315)	\$ (120,526)	(4,091)	\$ (27,444)
RHODE ISLAND	\$ 7,393	\$ 1,449	29	\$ 356
SOUTH CAROLINA	\$ 394,914	\$ 85,167	2,491	\$ 19,759
SOUTH DAKOTA	\$ 1,795,397	\$ 380,046	7,926	\$ 74,869
TENNESSEE	\$ (374,551)	\$ (81,293)	(2,647)	\$ (20,079)
TEXAS	\$ 3,531,756	\$ 791,841	23,412	\$ 155,993
UTAH	\$ 586,547	\$ 125,822	3,954	\$ 31,078
VERMONT	\$ (94,850)	\$ (22,806)	(898)	\$ (5,918)
VIRGINIA	\$ 120,146	\$ 22,113	376	\$ 5,213
WASHINGTON	\$ (338,085)	\$ (78,500)	(1,798)	\$ (15,465)
WEST VIRGINIA	\$ 102,576	\$ 18,597	406	\$ 4,547
WISCONSIN	\$ 1,750,466	\$ 363,305	9,539	\$ 92,734
WYOMING	\$ 403,104	\$ 78,811	2,584	\$ 15,526
US Total	\$ 32,595,479	\$ 6,750,111	159,786	\$ 1,554,574

U.S. Total Animal Agriculture Soybean Meal Consumption

Soybean meal consumption is highly dependent upon nutritional requirements of animals. These requirements 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. Decision Innovation Solutions (DIS) used the input from these conversations along with additional analysis to estimate the quantity of soybean meal used during the 2016-17 soybean marketing year by sixteen specific animal species.

The three segments of animal agriculture that consume the most soybean meal are: Broilers (14.9 million tons), Hogs (7.6 million tons), and Dairy Cows (2.9 million). Total soybean meal consumption in the U.S. during 2017 was estimated at 31.2 million tons.

Though this report's methodology used a "bottom up" approach, it is interesting to note that USDA's method of tracking soybean meal actually includes both soybean meal and soybean hulls. Table 4 in the USDA/Economic Research Service Oil Crops Yearbook reports, in part, the domestic disappearance of soybean meal.

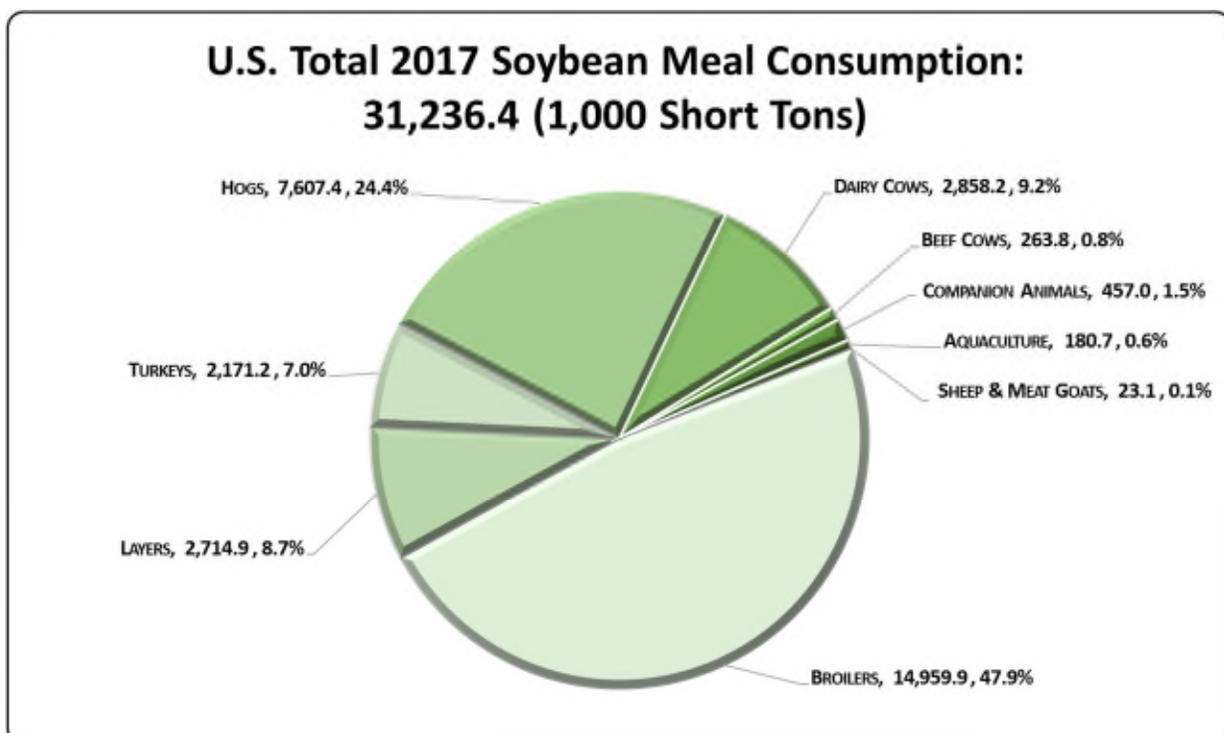


Figure 32, U.S. Total 2017 Soybean Meal Consumption

Due to the large number of hogs, layers, cattle and turkeys, Iowa is the leader in soybean meal usage for 2017. Other states that use large amounts of soybean meal include North Carolina, Georgia, Arkansas, Alabama, Texas and Minnesota. Detailed results for all species including the breakdown of companion animals and aquaculture can be found in Appendix A.

SBM Usage: State Totals (2017)

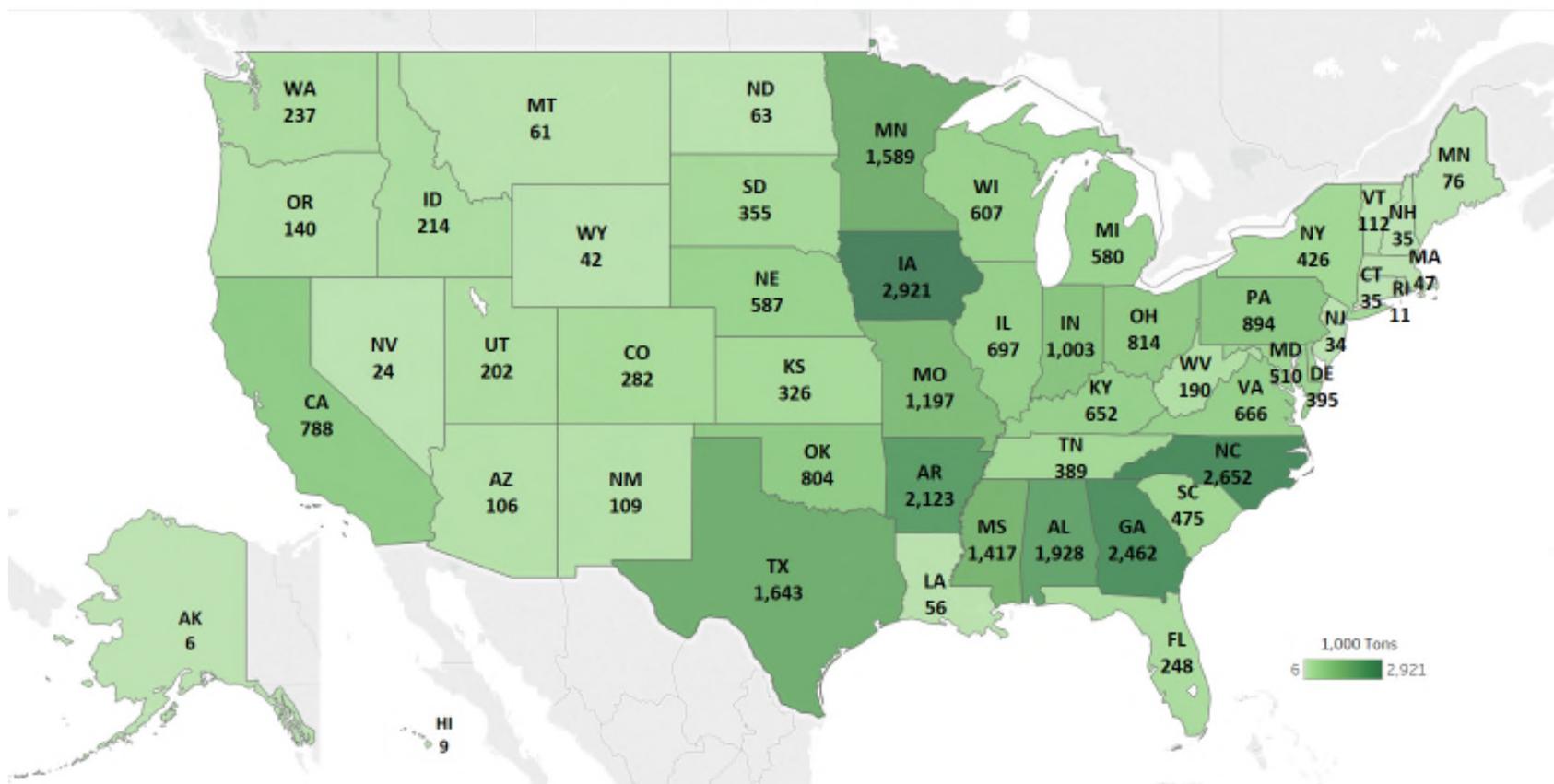


Figure 33, SBM Usage: State Totals (2017)

Wisconsin is the leading state for soy hulls usage due since it is often used in dairy cow rations with nearly 369,700 tons consumed in 2017. Animal agriculture in Nebraska and Iowa also consumed large amounts of soy hulls since it is also used in hog and beef cow rations.

Soy Hulls Usage: State Totals (2017)

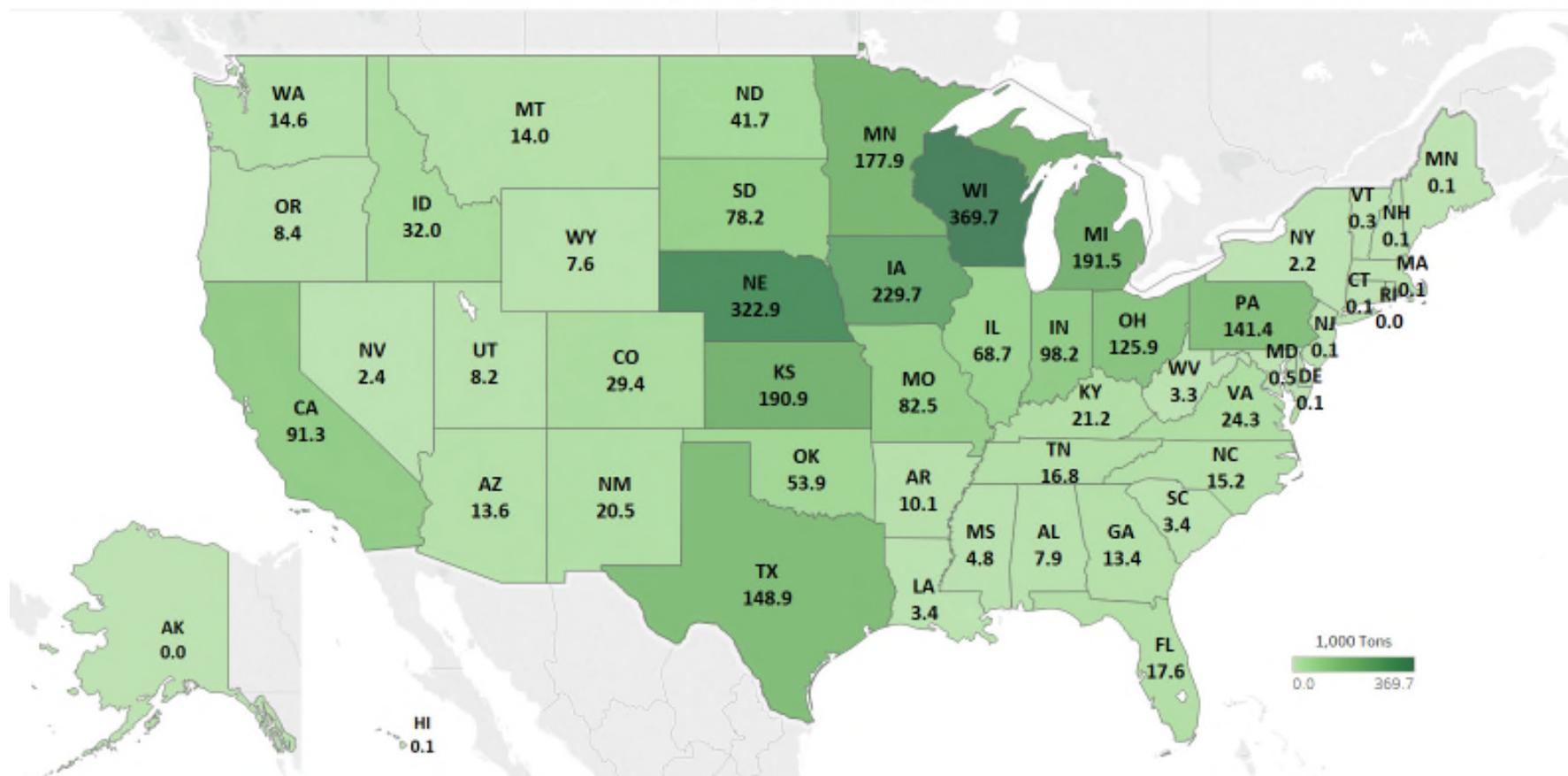


Figure 34, Soy Hulls Usage: State Totals (2017)

Georgia’s broiler chickens consumed nearly 2.3 million tons of soybean meal in 2017. Other states that use significant amounts of soybean meal in their broiler diets include Alabama, Arkansas, North Carolina, Mississippi, and Texas.

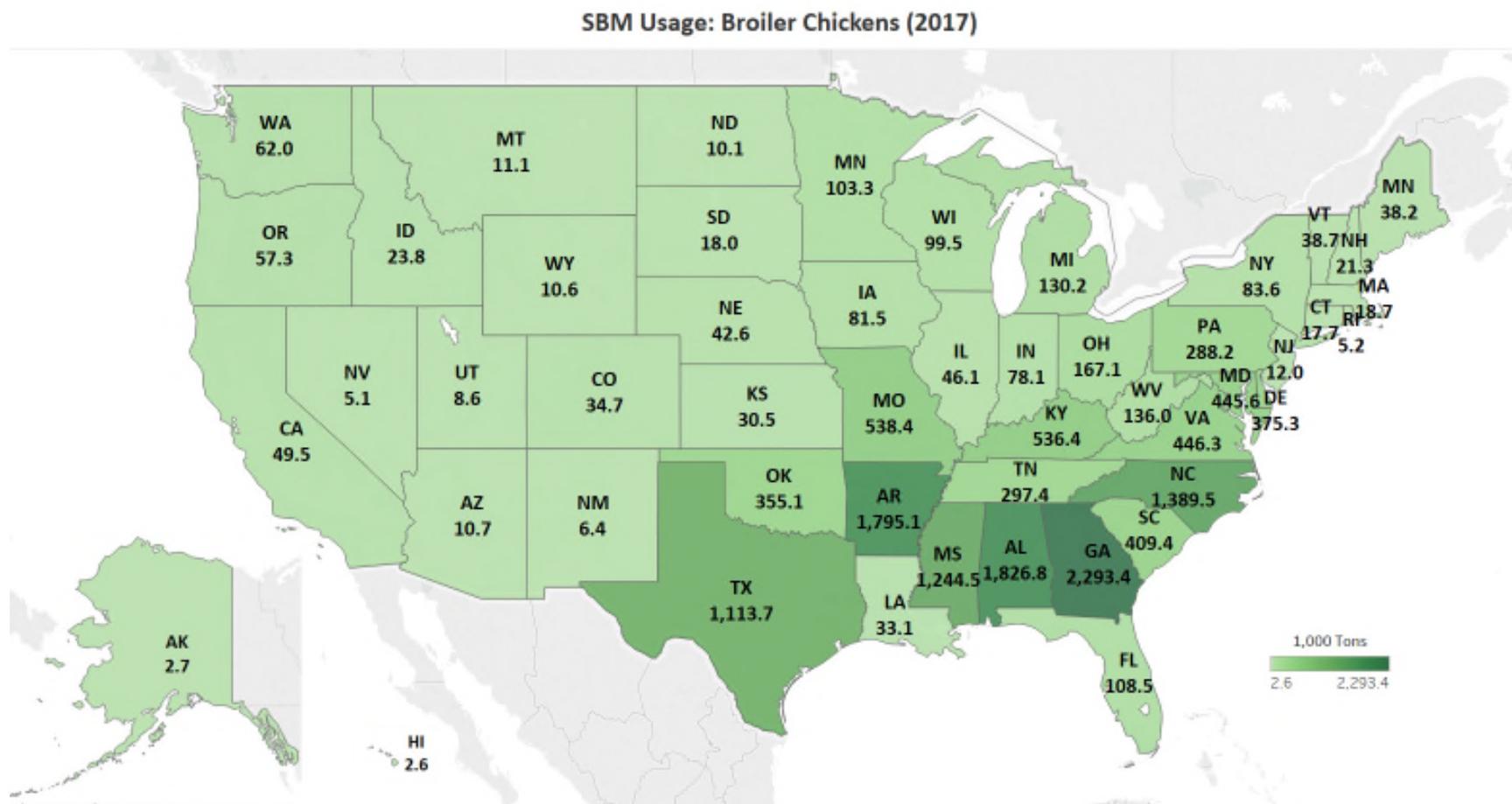


Figure 35, SBM Usage: Broiler Chickens (2017)

In 2017, Iowa's laying hens consumed about 412,200 tons of soybean meal which has improved from the 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 2017 include Ohio, Pennsylvania, and Indiana.

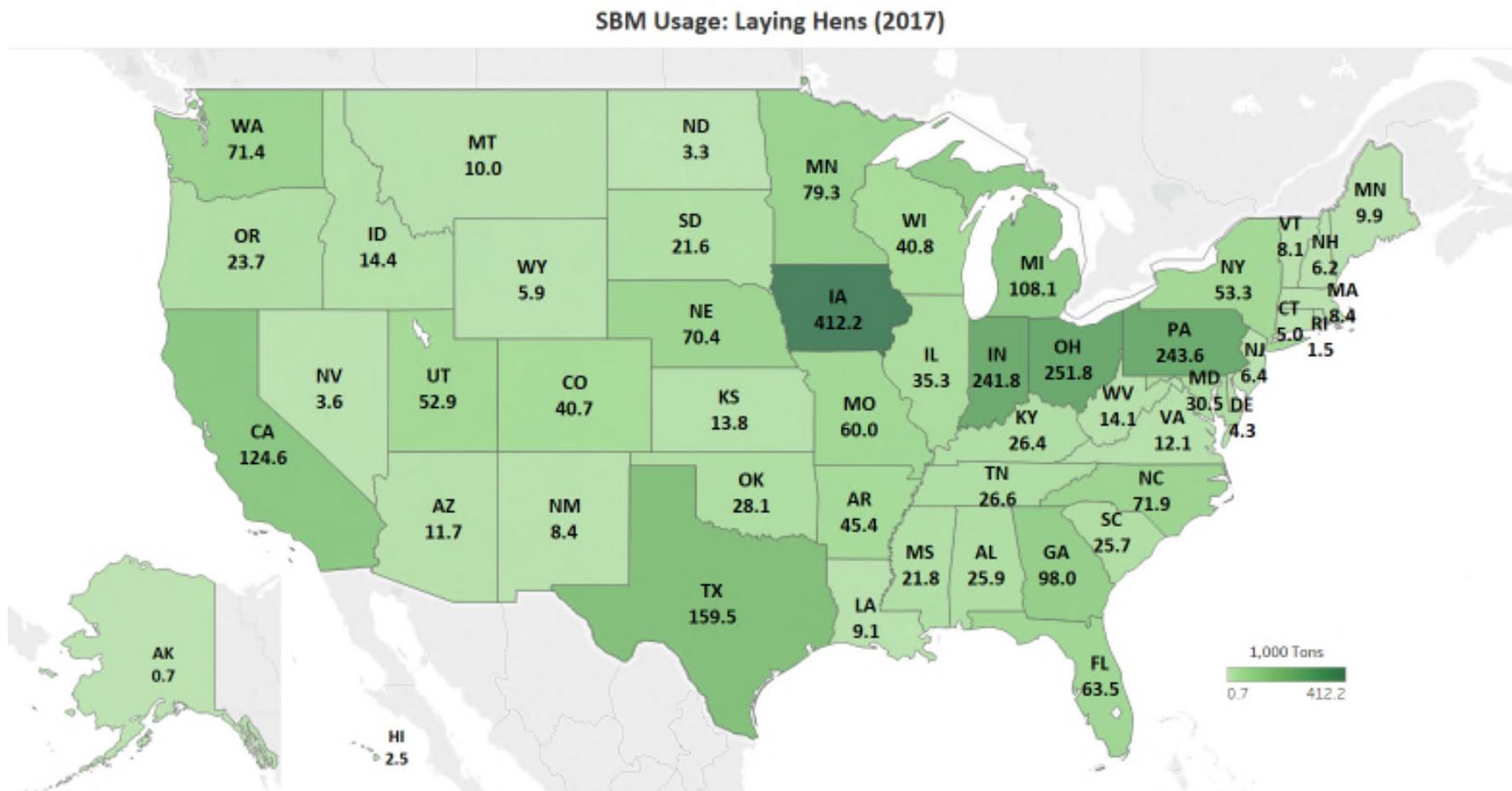


Figure 36, SBM Usage: Laying Hens (2017)

Minnesota is the leading state for turkey production and over 382,000 tons of soybean meal was consumed by the state’s turkeys in 2017. North Carolina, Arkansas, Indiana and Missouri turkeys also consumed large amounts of soybean meal.

SBM Usage: Turkeys (2017)

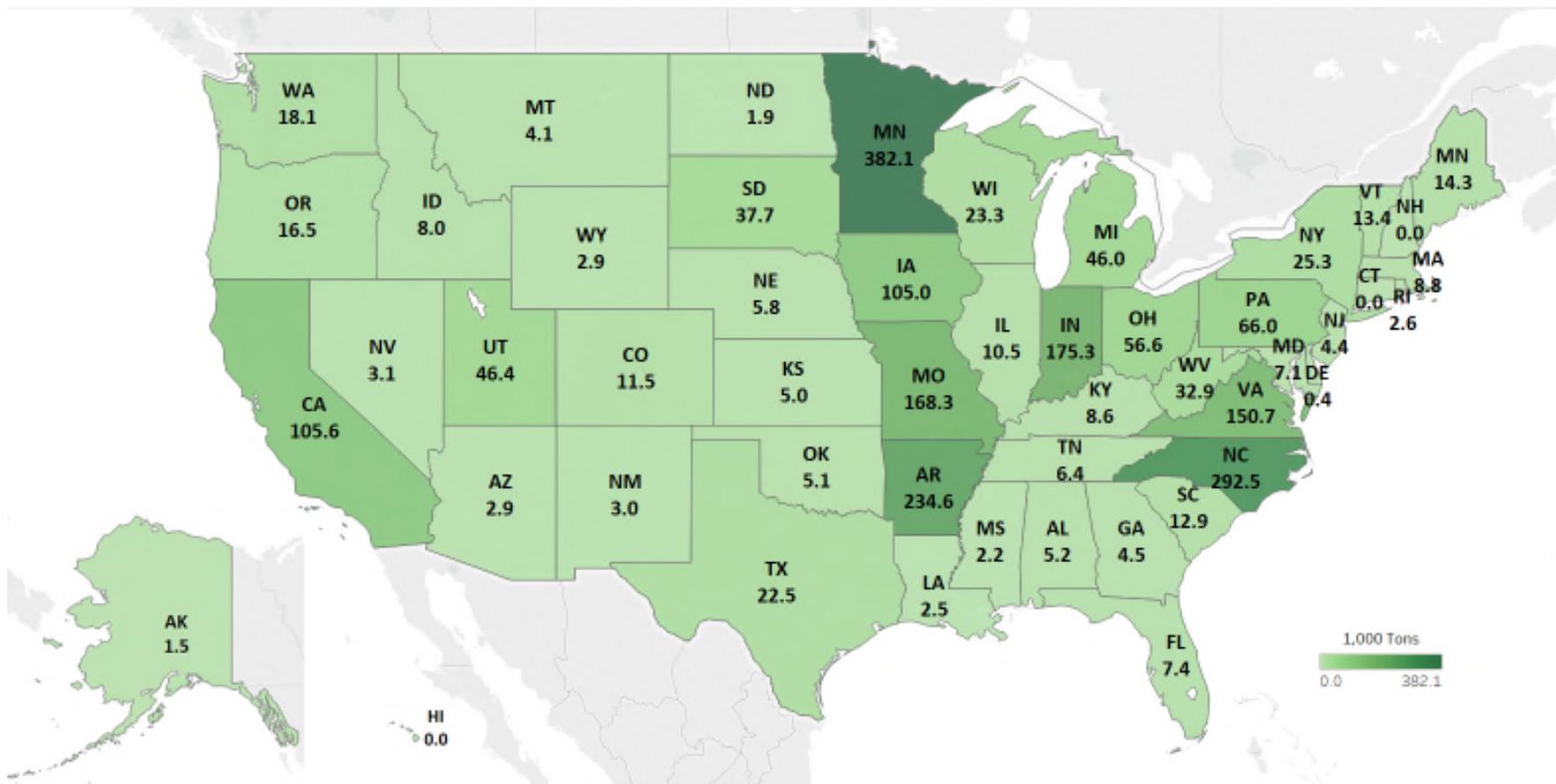


Figure 37, SBM Usage: Turkeys (2017)

Iowa leads the nation in hog production and the state’s hogs consumed nearly 2.2 million tons of soybean meal in 2017. Hogs in North Carolina, Minnesota and Illinois also consumed large amounts of soybean meal.

SBM Usage: Hogs (2017)

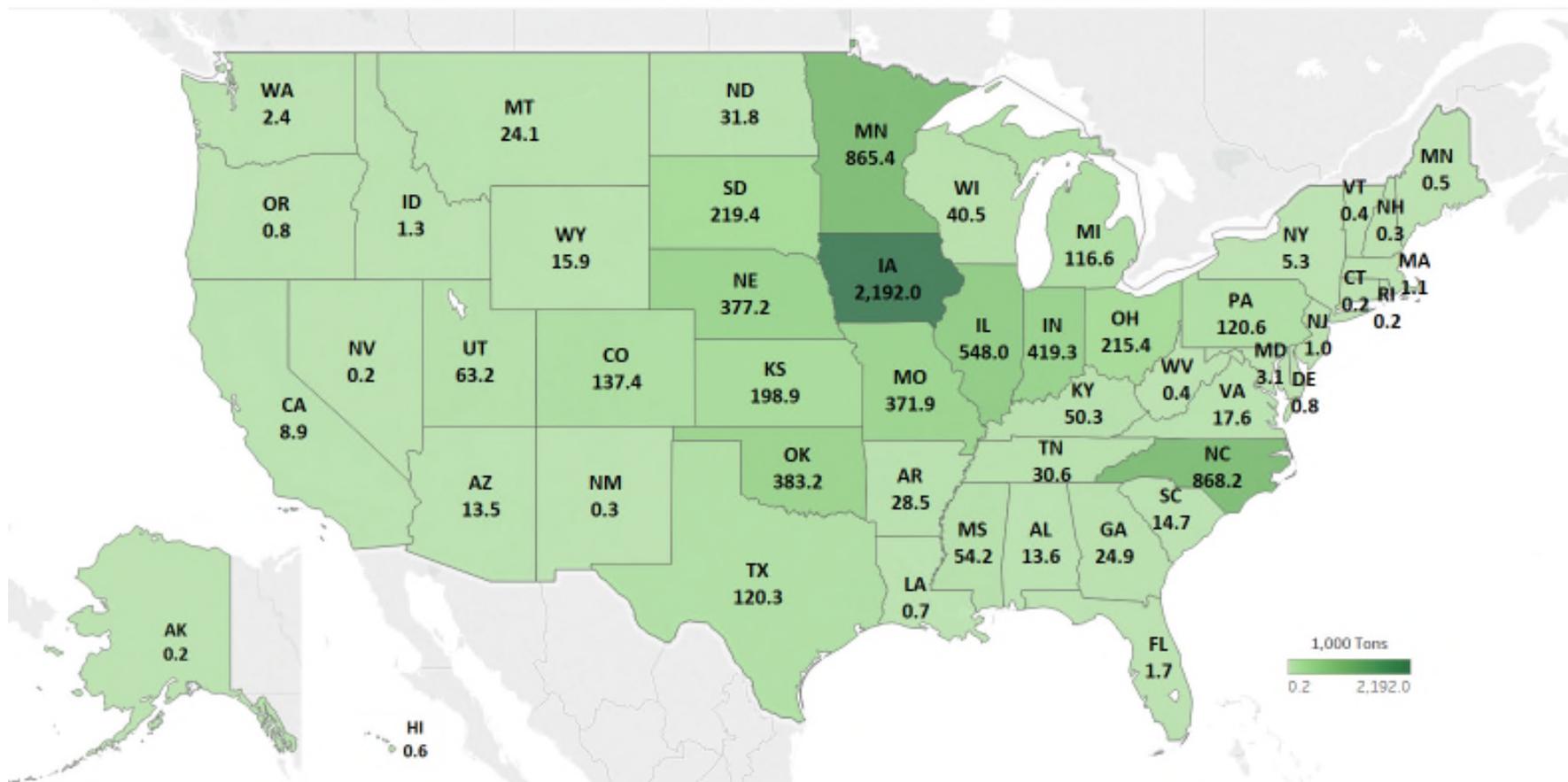


Figure 38, SBM Usage: Hogs (2017)

In 2017, hogs in Iowa and Oklahoma consumed an estimated 12,300 and 11,100 tons of soy hulls, respectively.

Soy Hulls Usage: Hogs (2017)

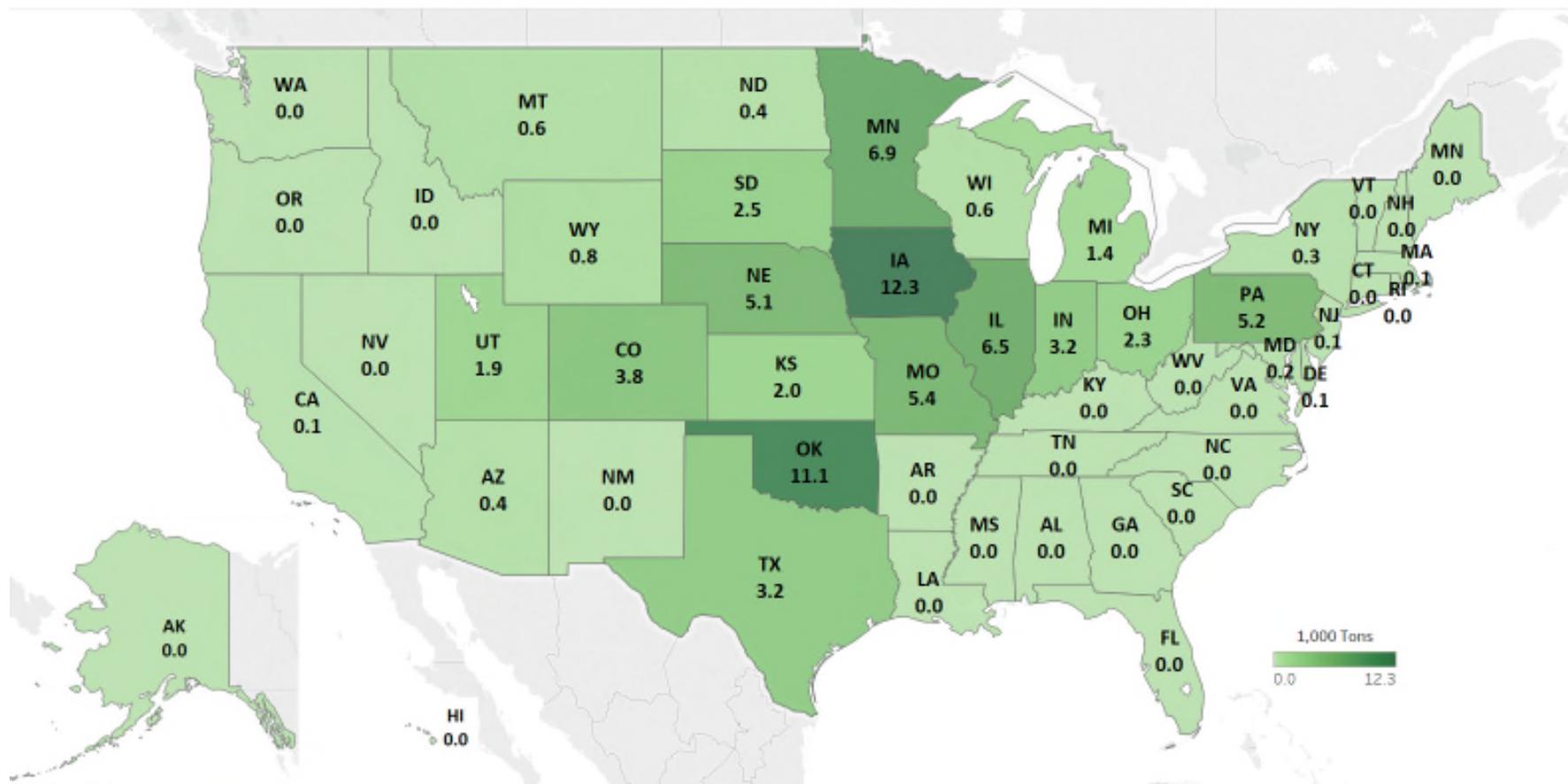


Figure 39, Soy Hulls Usage: Hogs (2017)

In 2017, California and Wisconsin’s dairy cows consumed about 451,600 and 383,700 tons of soybean meal, respectively. Dairy cows in New York, Michigan, Pennsylvania, and Idaho also consumed a large amount of soybean meal.

SBM Usage: Dairy Cows (2017)

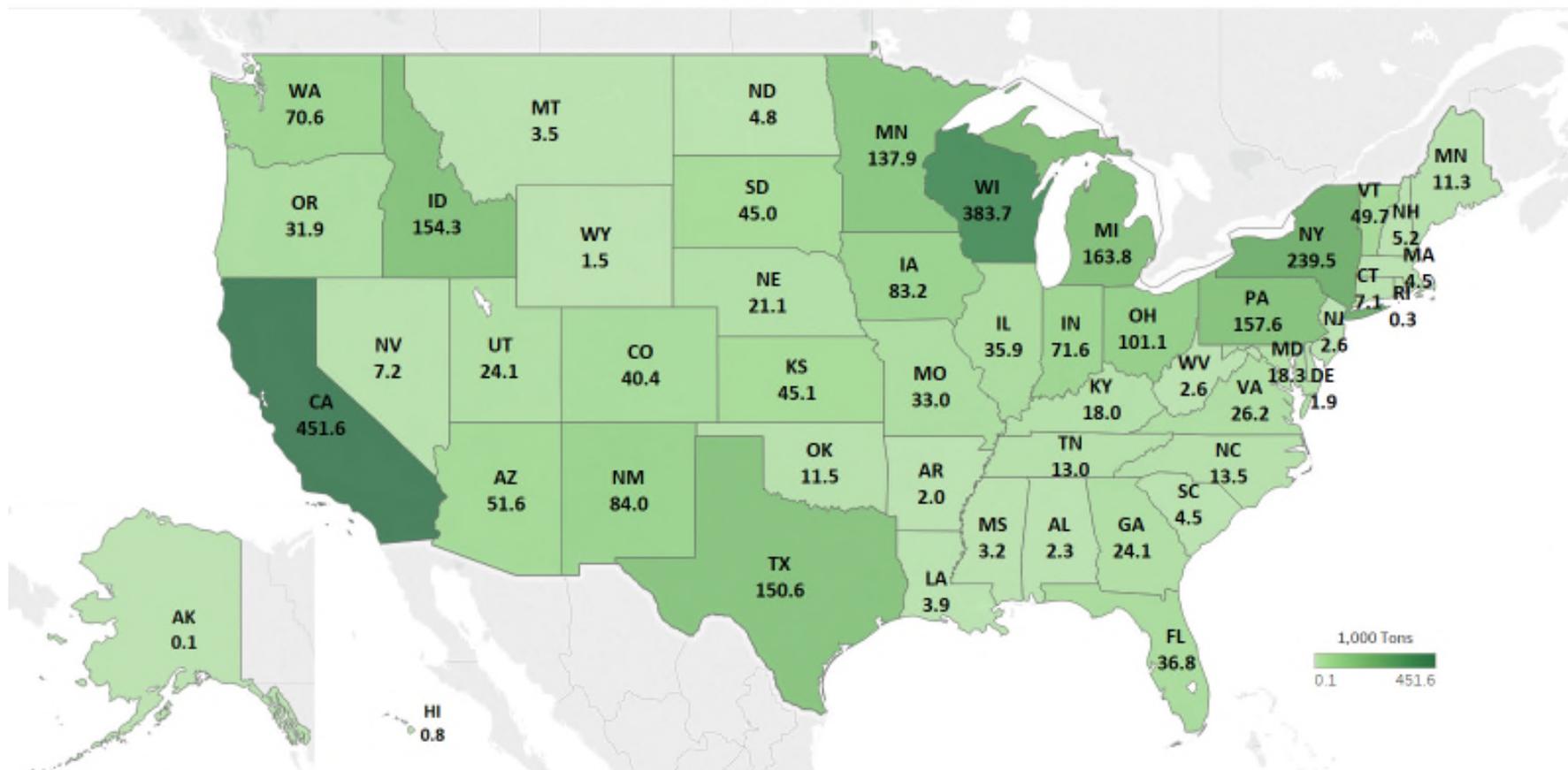


Figure 40, SBM Usage: Dairy Cows (2017)

Dairy cows in Wisconsin consumed about 323,400 tons of soy hulls in 2017. Other states that used over 100,000 tons of soy hulls for dairy cows include Michigan, Pennsylvania, Minnesota, and Ohio.

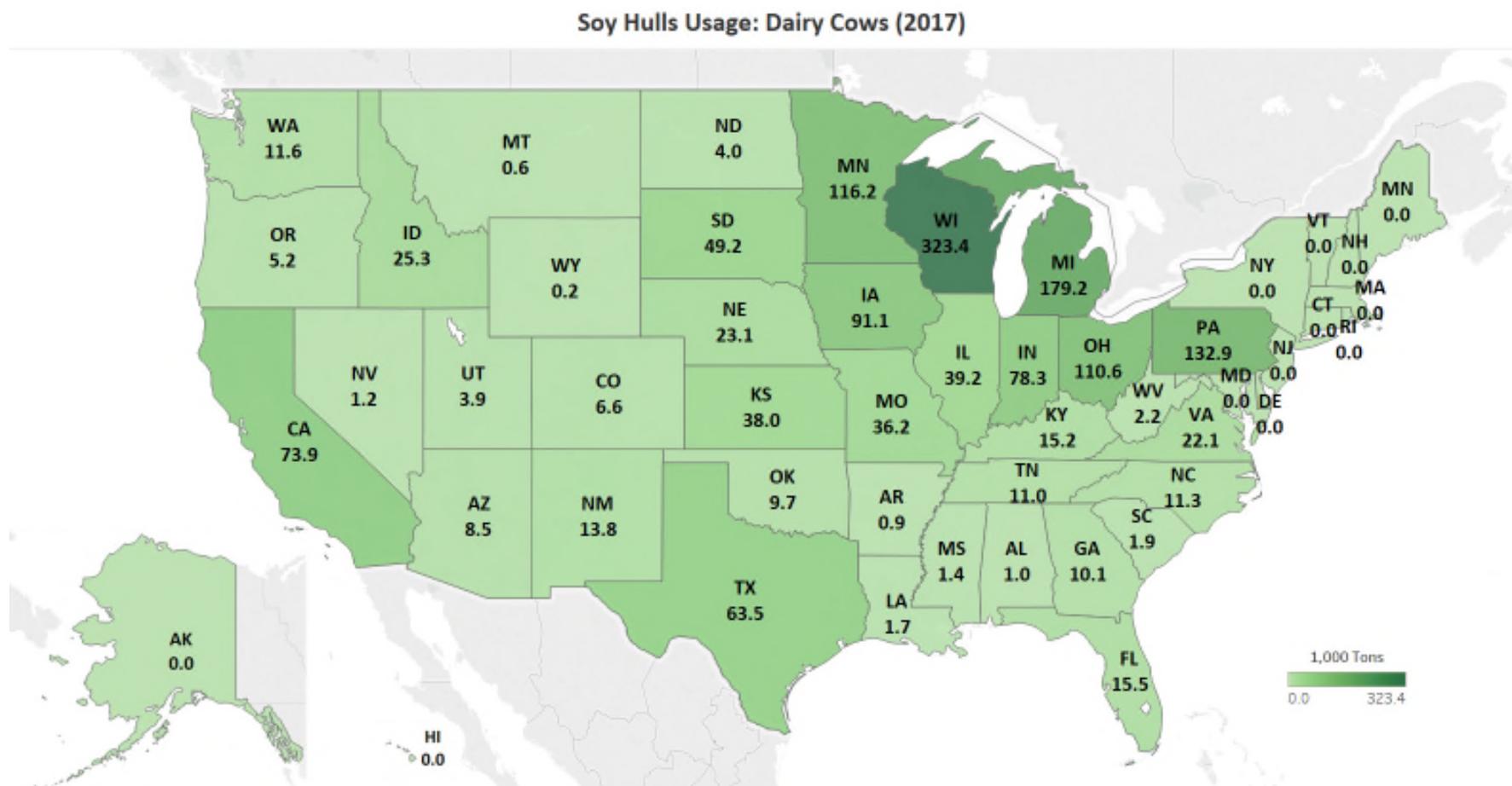


Figure 41, Soy Hulls Usage: Dairy Cows (2017)

Nebraska’s beef cows consumed 65,000 tons of soybean meal in 2017. Beef cows in Iowa, Texas and Kansas also consumed over 25,000 tons of soybean meal each.

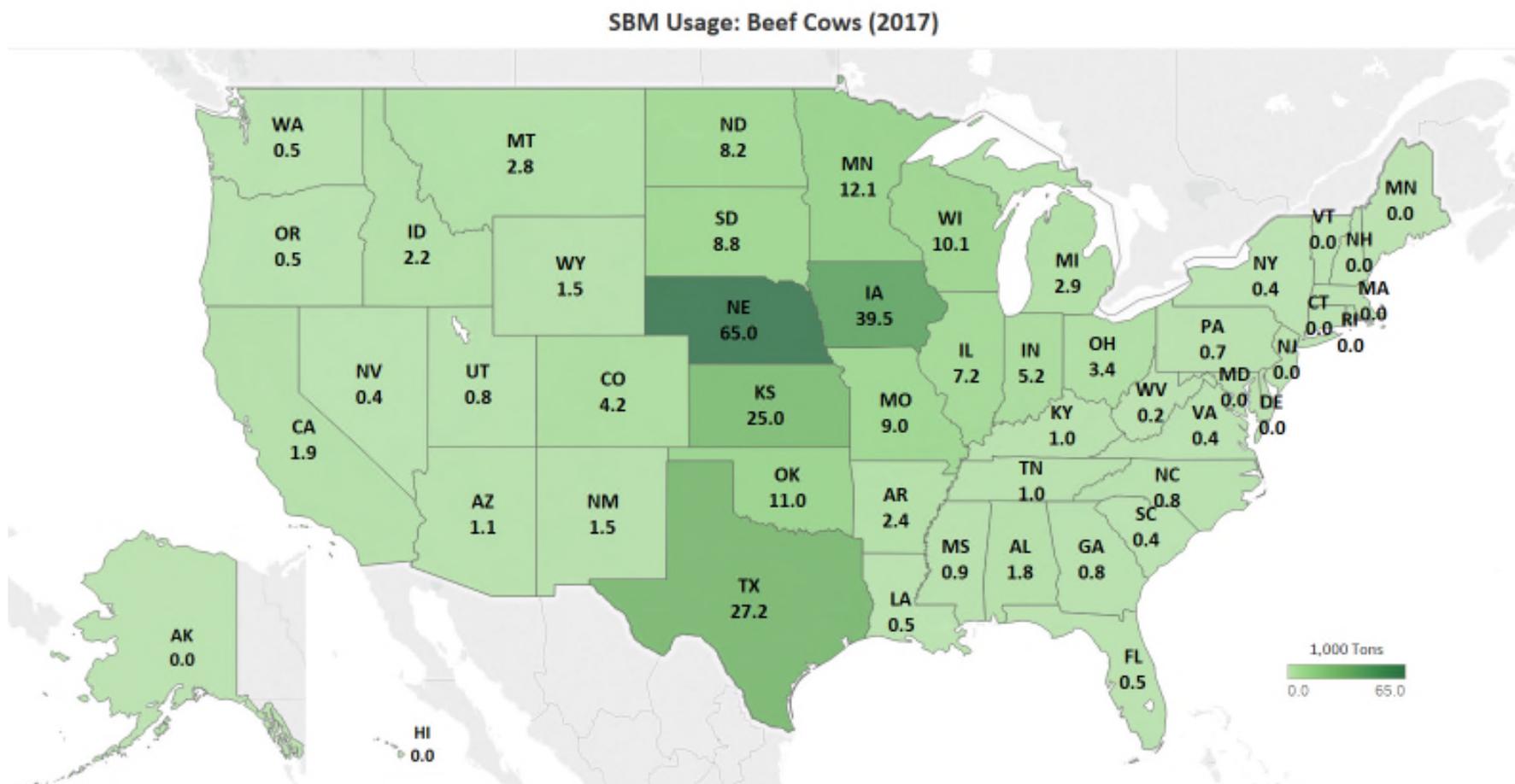


Figure 42, SBM Usage: Beef Cows (2017)

Nebraska beef cows consumed about 294,600 tons of soy hulls in 2017. Beef cows in Kansas and Iowa also consumed greater than 125,000 tons of soy hulls.

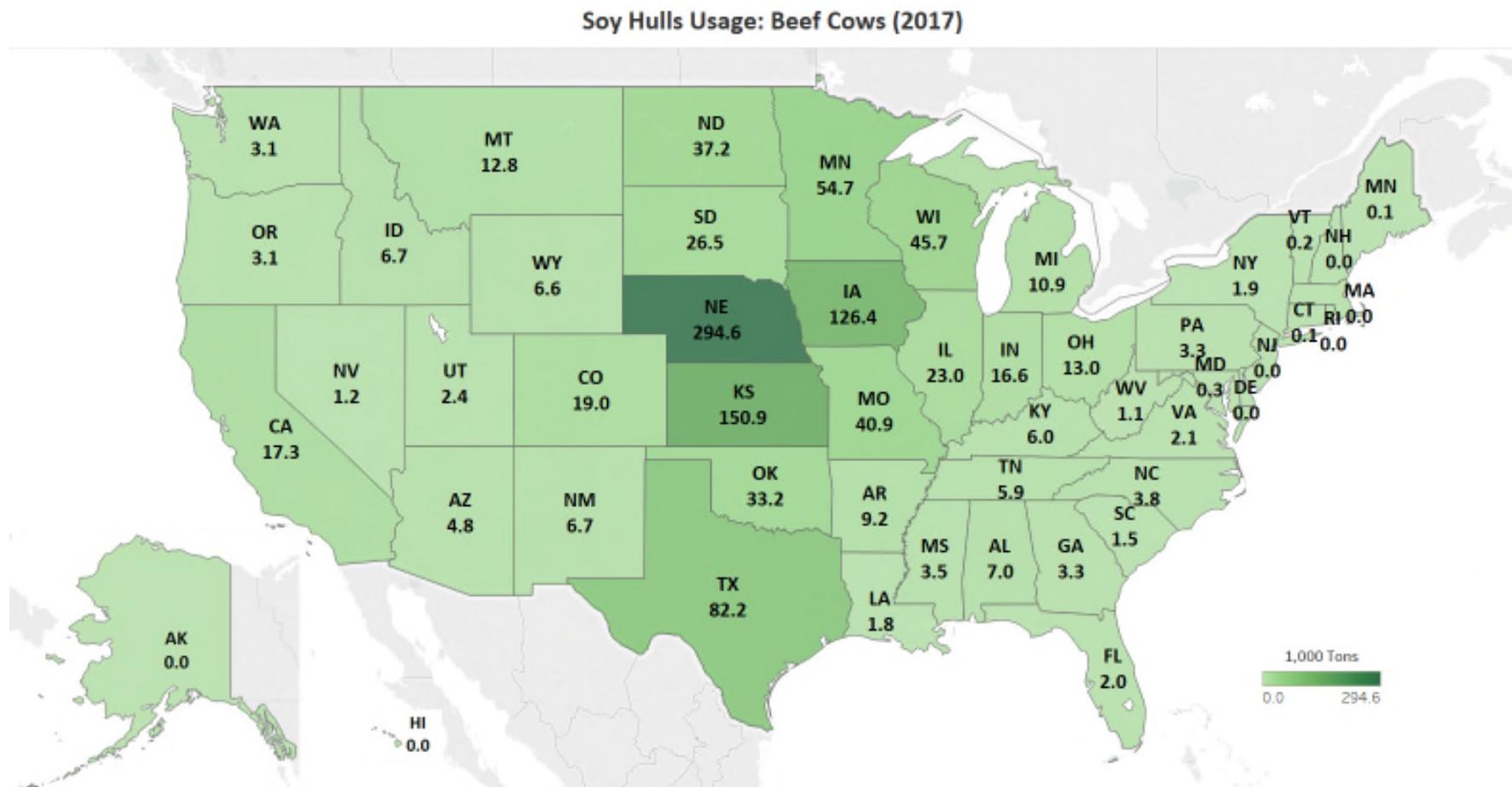


Figure 43, Soy Hulls Usage: Beef Cows (2017)

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 42,100 tons in 2017. Texas and Florida also had significant amounts of soybean meal usage by companion animals with 38,700 and 27,300 tons, respectively.

SBM Usage: Companion Animals (2017)

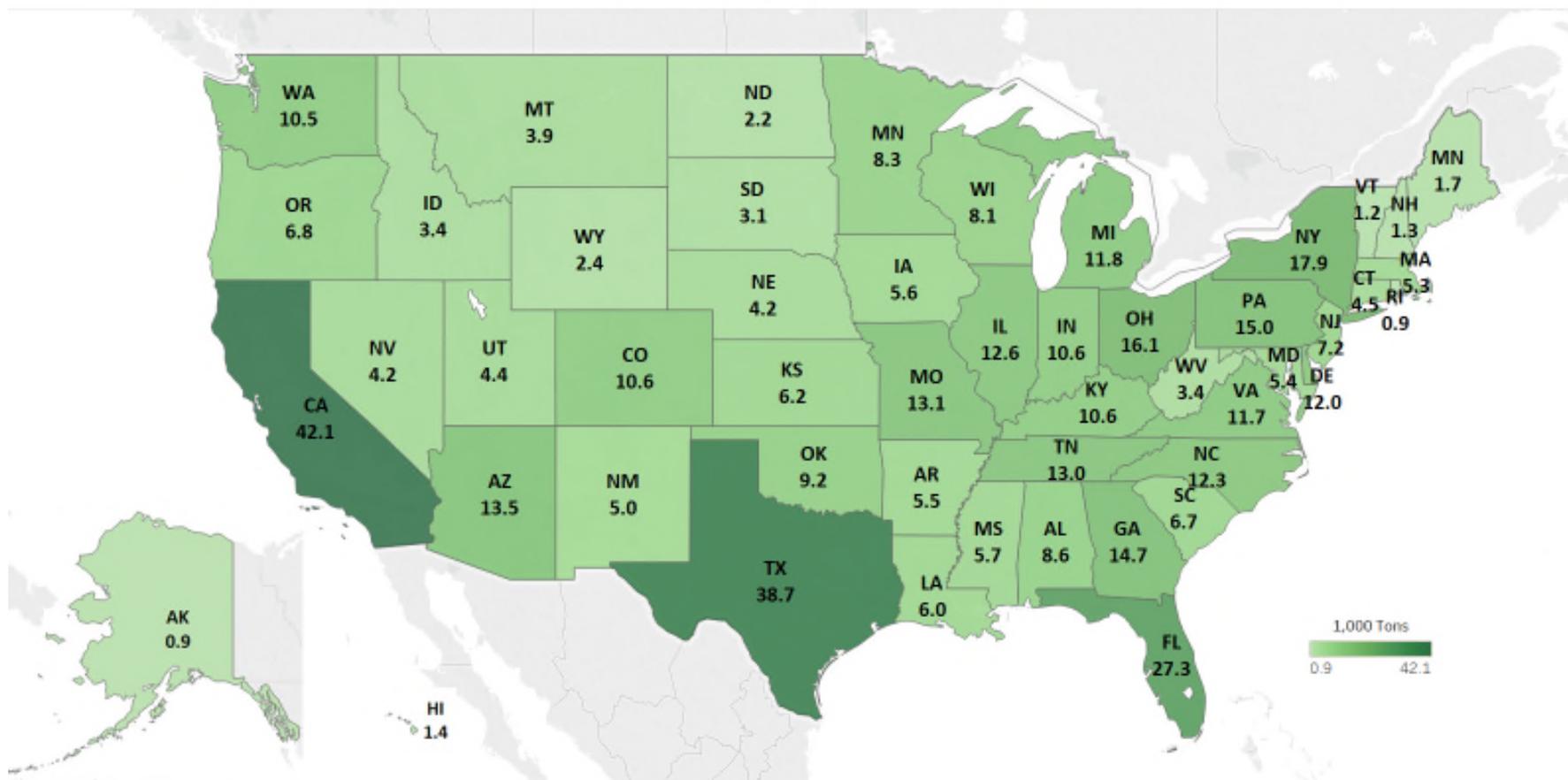


Figure 44, SBM Usage: Companion Animals (2017)

This 2017 study includes catfish, trout, tilapia, hybrid striped bass, yellow perch, shrimp, and baitfish in estimates for aquaculture consumption of soybean meal. The majority of soybean meal consumed in the aquaculture category is in Mississippi and Alabama, with 83,900 and 43,800 tons, respectively.

SBM Usage: Aquaculture (2017)

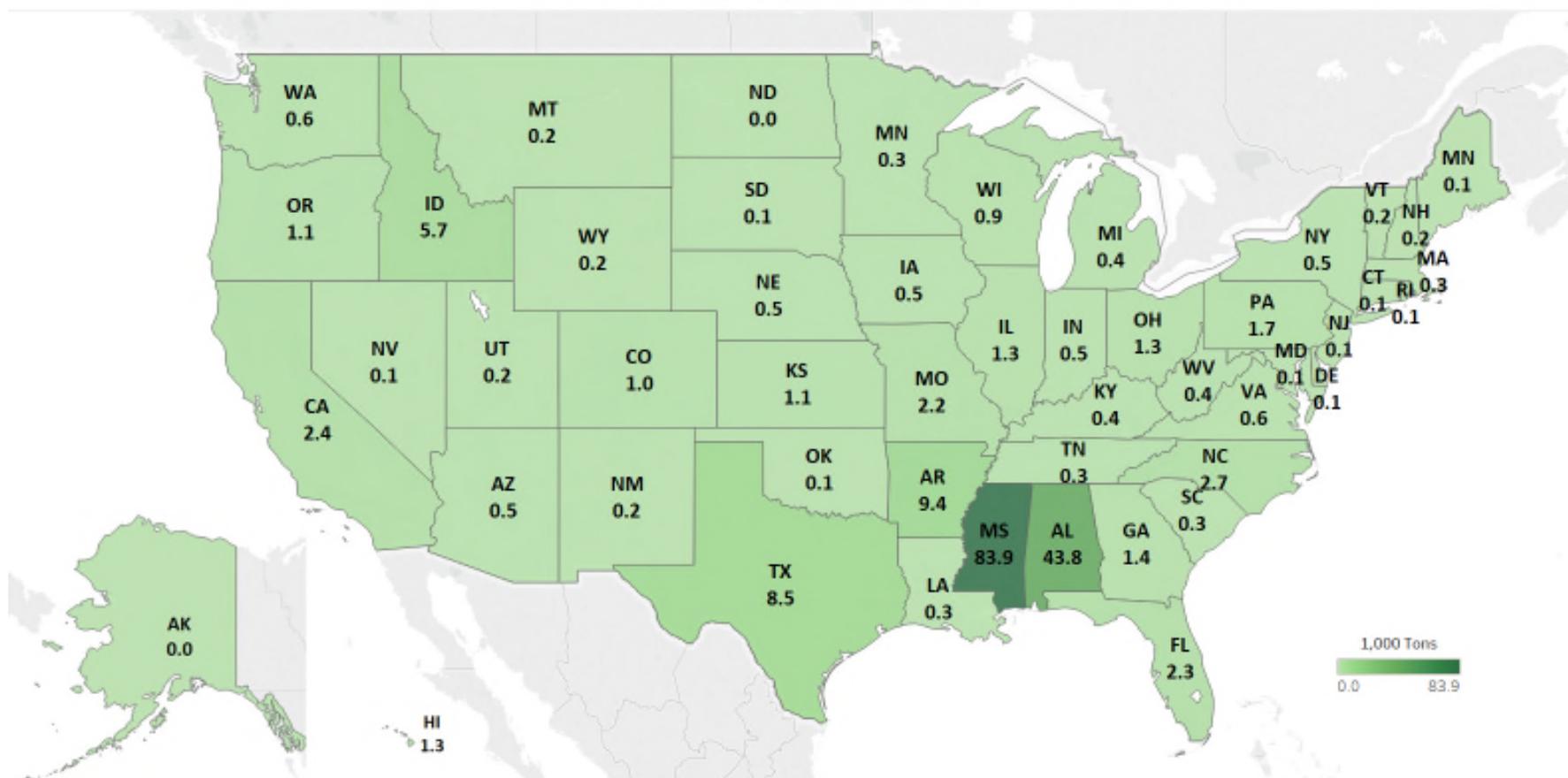


Figure 45, SBM Usage: Aquaculture (2017)

Texas was the leading state for soybean meal usage in sheep production in 2017 with about 2,200 tons. Many other states across the West also used between 1,000 and 2,000 tons of soybean meal for sheep production.

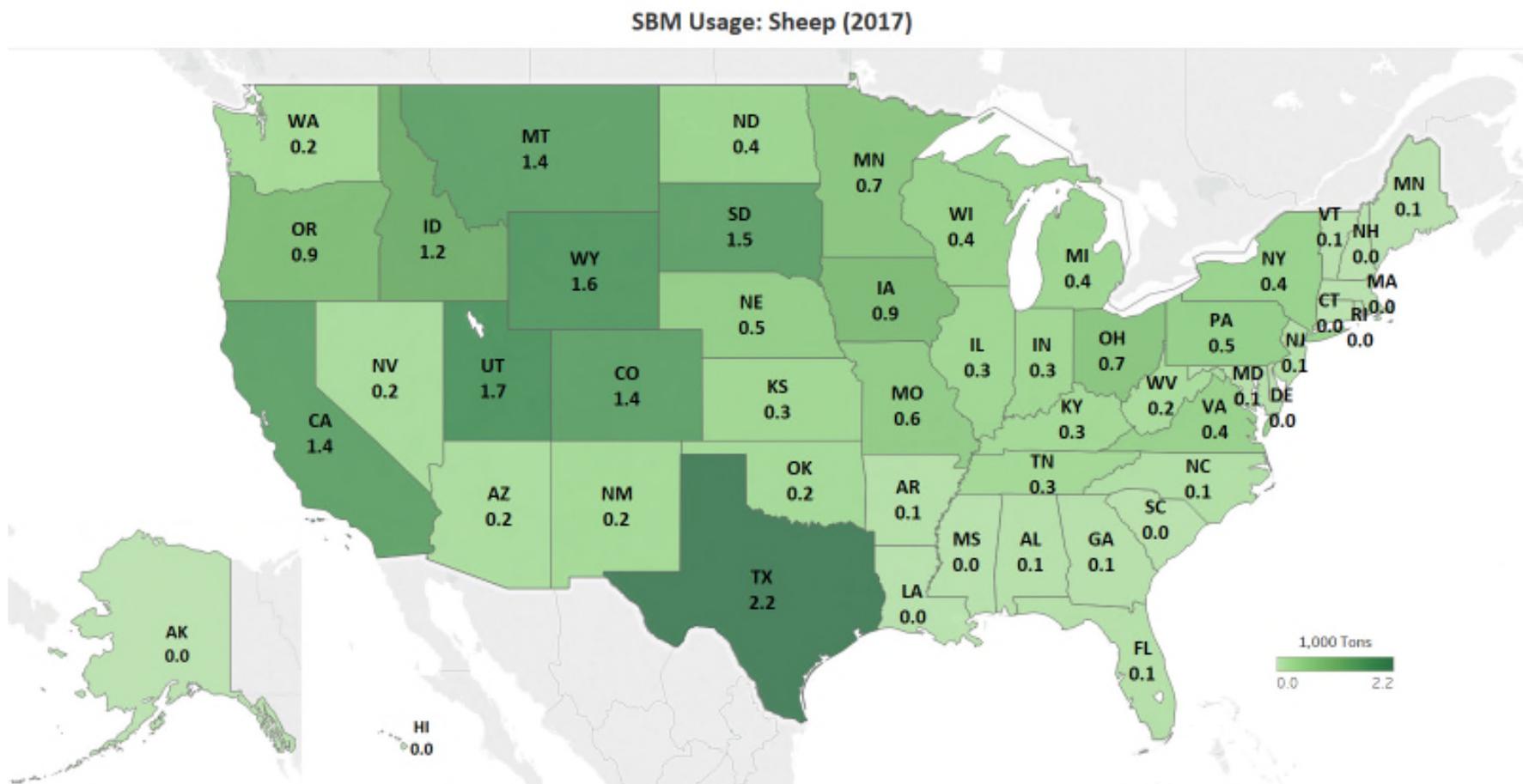


Figure 46, SBM Usage: Sheep (2017)

Texas had the most soybean meal usage in meat goats with about 65 tons in 2017. Overall, soybean meal usage for meat goats is minimal in most states across the U.S.

SBM Usage: Meat Goats (2017)

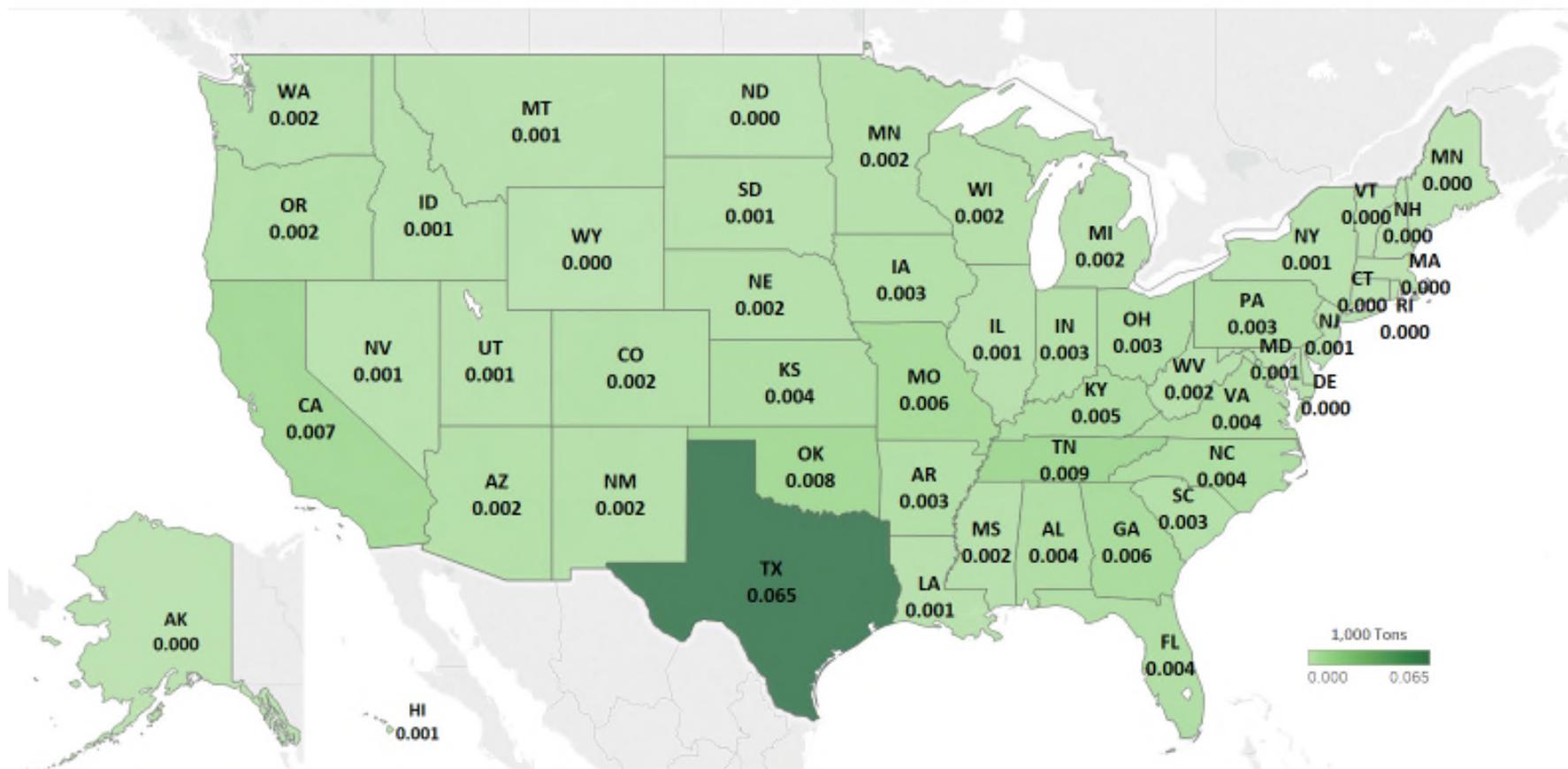


Figure 47, SBM Usage: Meat Goats (2017)

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 the U.S., the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (56.7 million AUs), Broiler Chickens (26.7 million AUs), and Hogs (25.7 million AUs). Total animal units in U.S. during 2017 were 127.4 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 11.1 million animal units in 2017. Texas and Nebraska follow with nearly 9.9 and 9.4 million AUs, respectively.

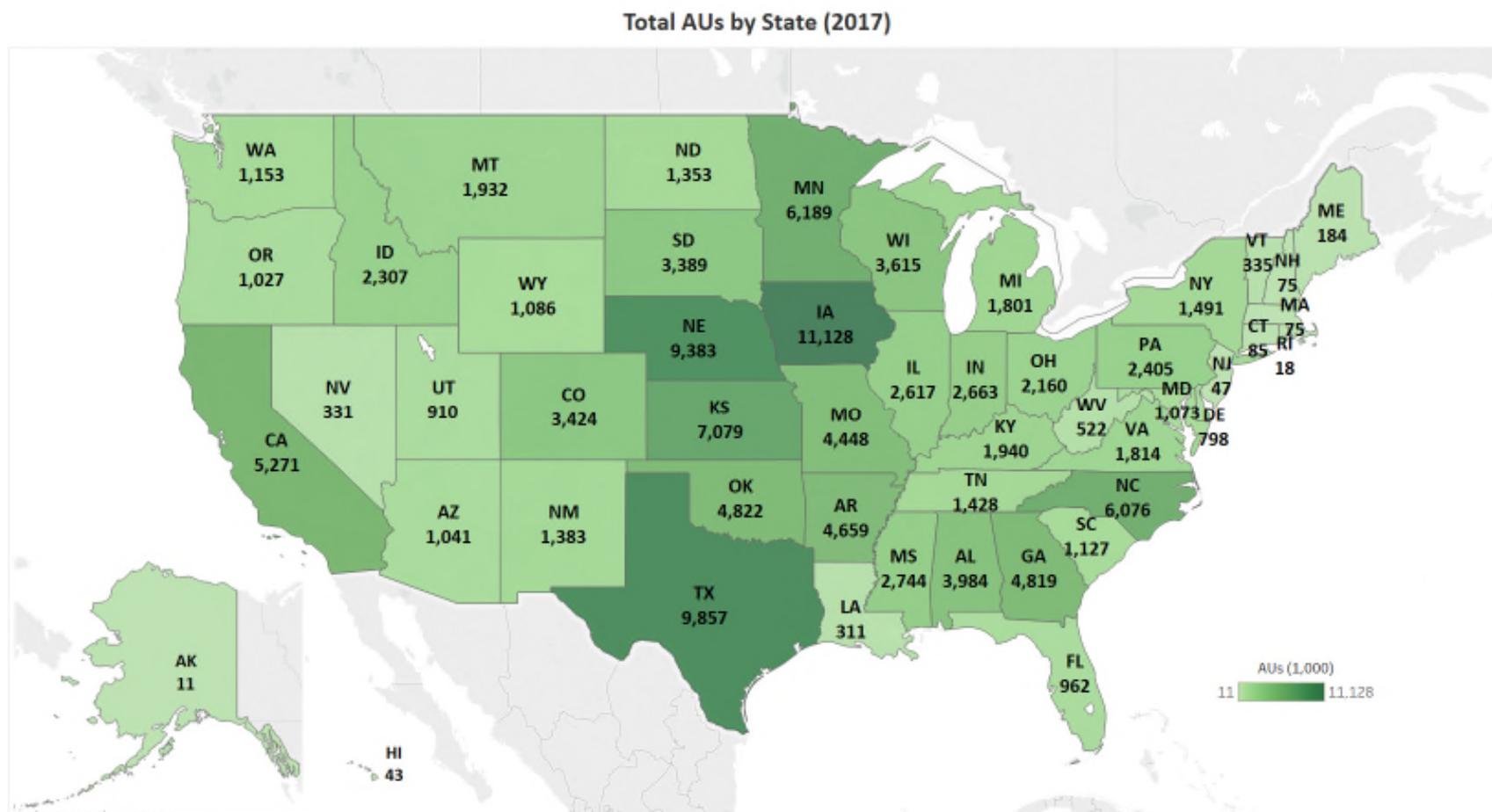


Figure 48, Total AUs by State (2017)

States across much of the southern part of the U.S. saw declines in total animal units from 2007 to 2017, while many Midwestern states saw steady increases. Cattle production has shifted further north in recent years due to drought conditions that began in 2011 in Texas and surrounding states.

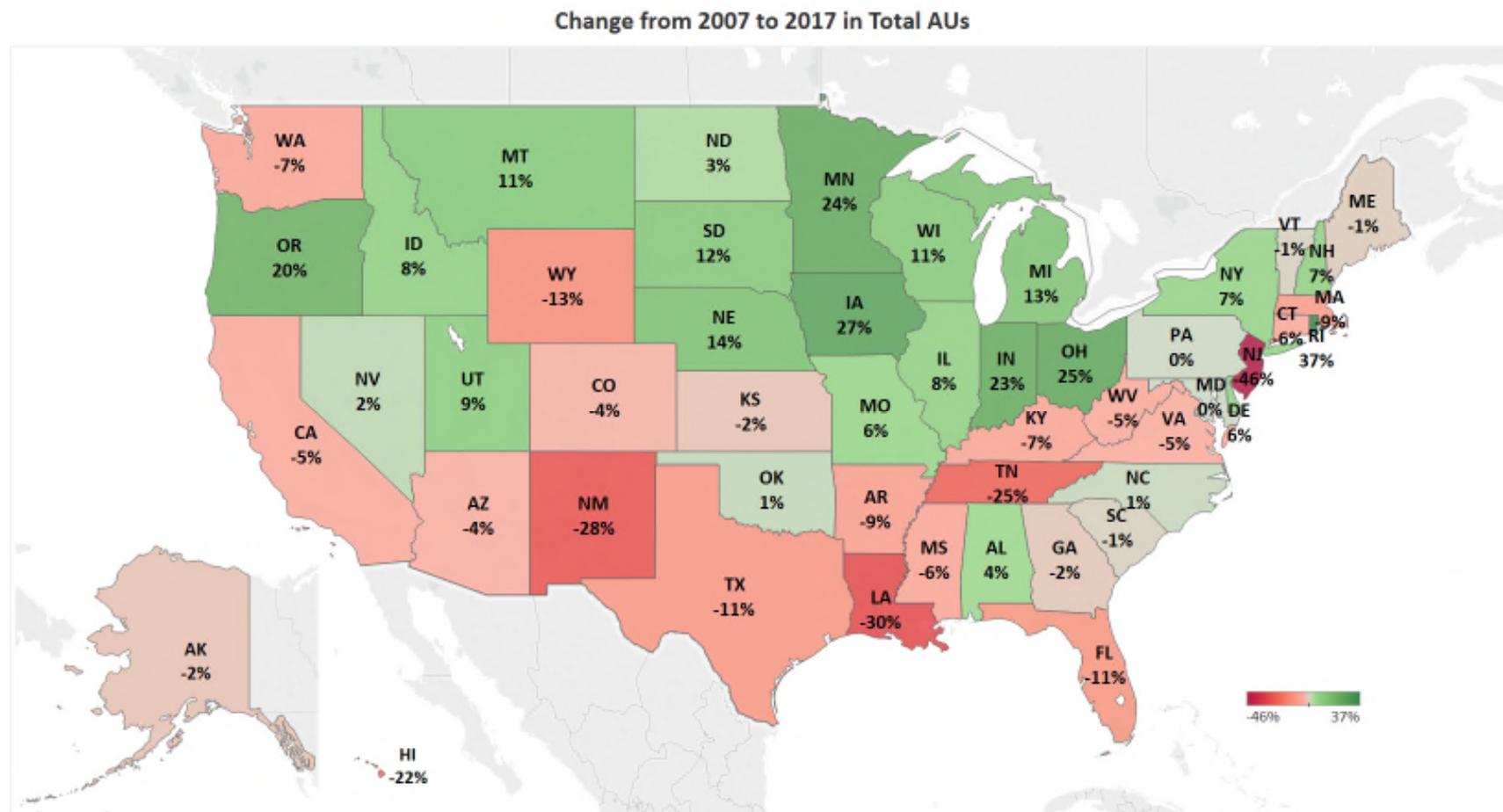


Figure 49, Change from 2007 to 2017 in Total AUs

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.

Broiler Chicken AUs by State (2017)

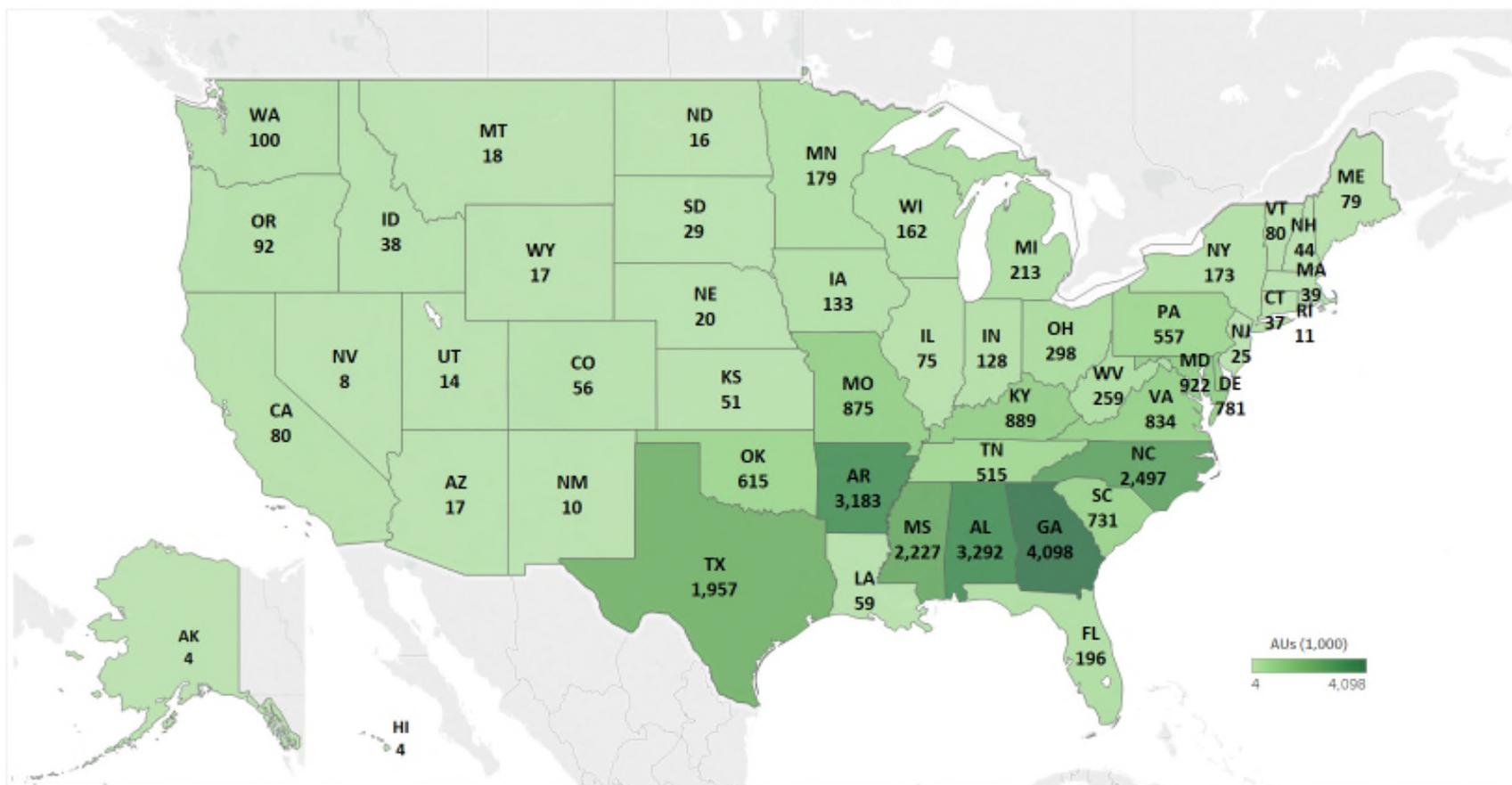


Figure 50, Broiler Chicken AUs by State (2017)

This map shows that many states across the West and Midwest saw a fairly large percent change in broiler chicken animal units from 2007 to 2017, 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 a 9% increase in animal units during the last decade, which account for a fairly large increase in total broiler AUs. However, Arkansas and Mississippi saw an 8% reduction in broiler chickens, while Georgia remained constant.

Change from 2007 to 2017 in Broiler Chicken AUs

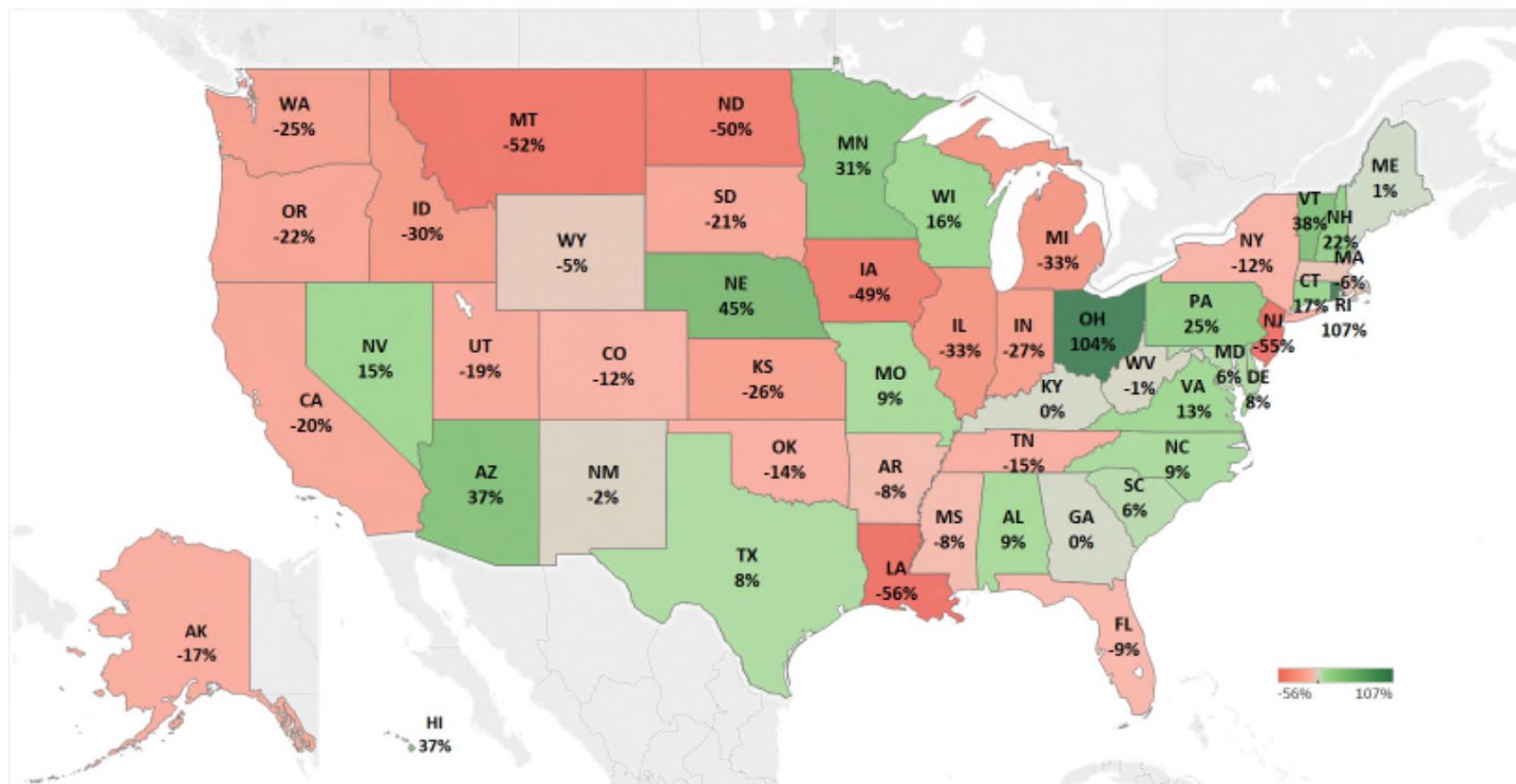


Figure 51, Change from 2007-2017 in Broiler Chicken AUs

Laying hen animal units in Iowa have increased to 222,000 AUs in 2017, 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.

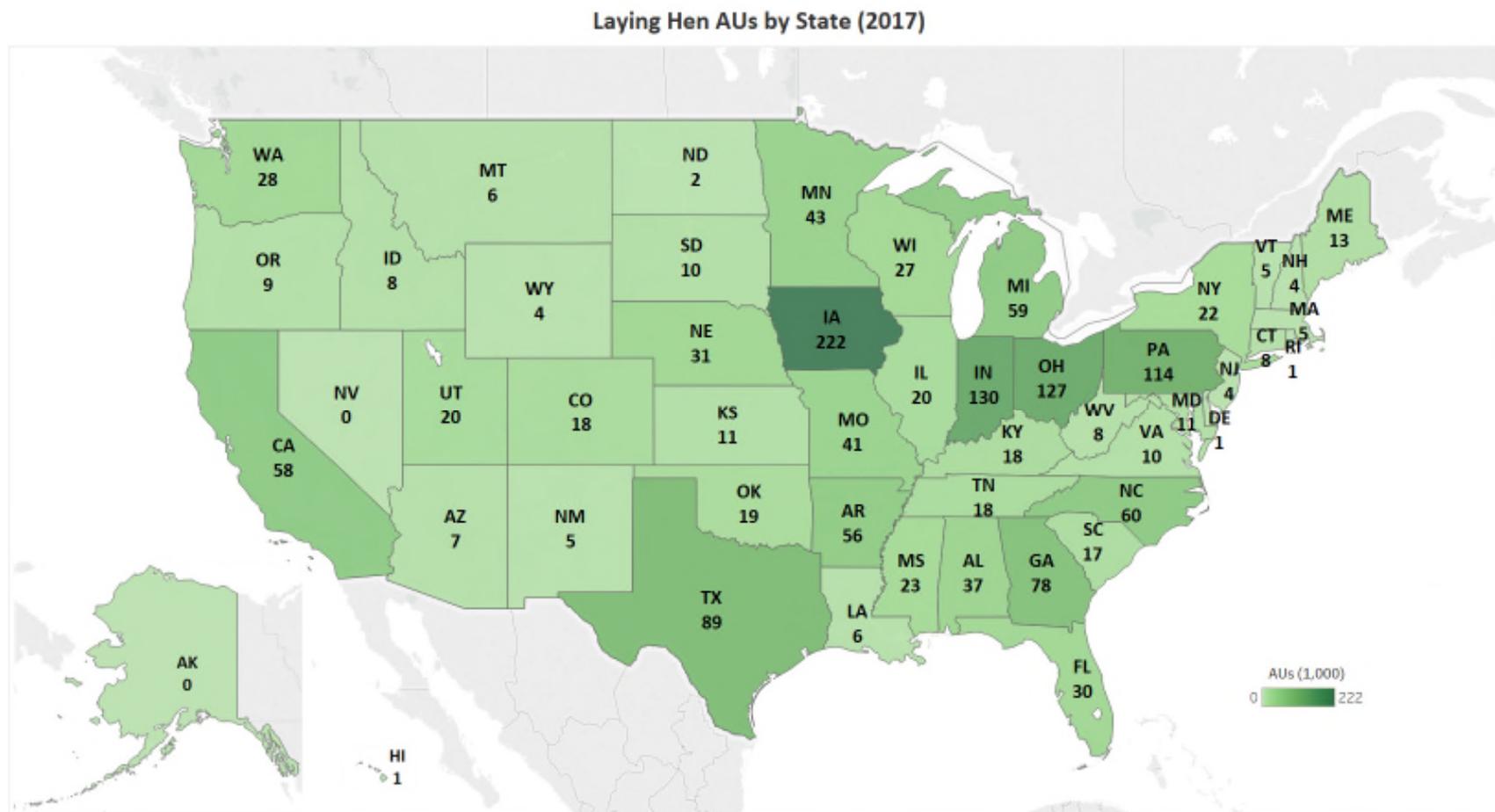


Figure 52, Laying Hen AUs by State (2017)

Iowa has recovered from the avian influence losses in 2015 and has a 3% increase in laying hen AUs over the last decade. States such as Rhode Island, Idaho, and Wyoming saw large percentage increases, but in real terms those numbers are very small.

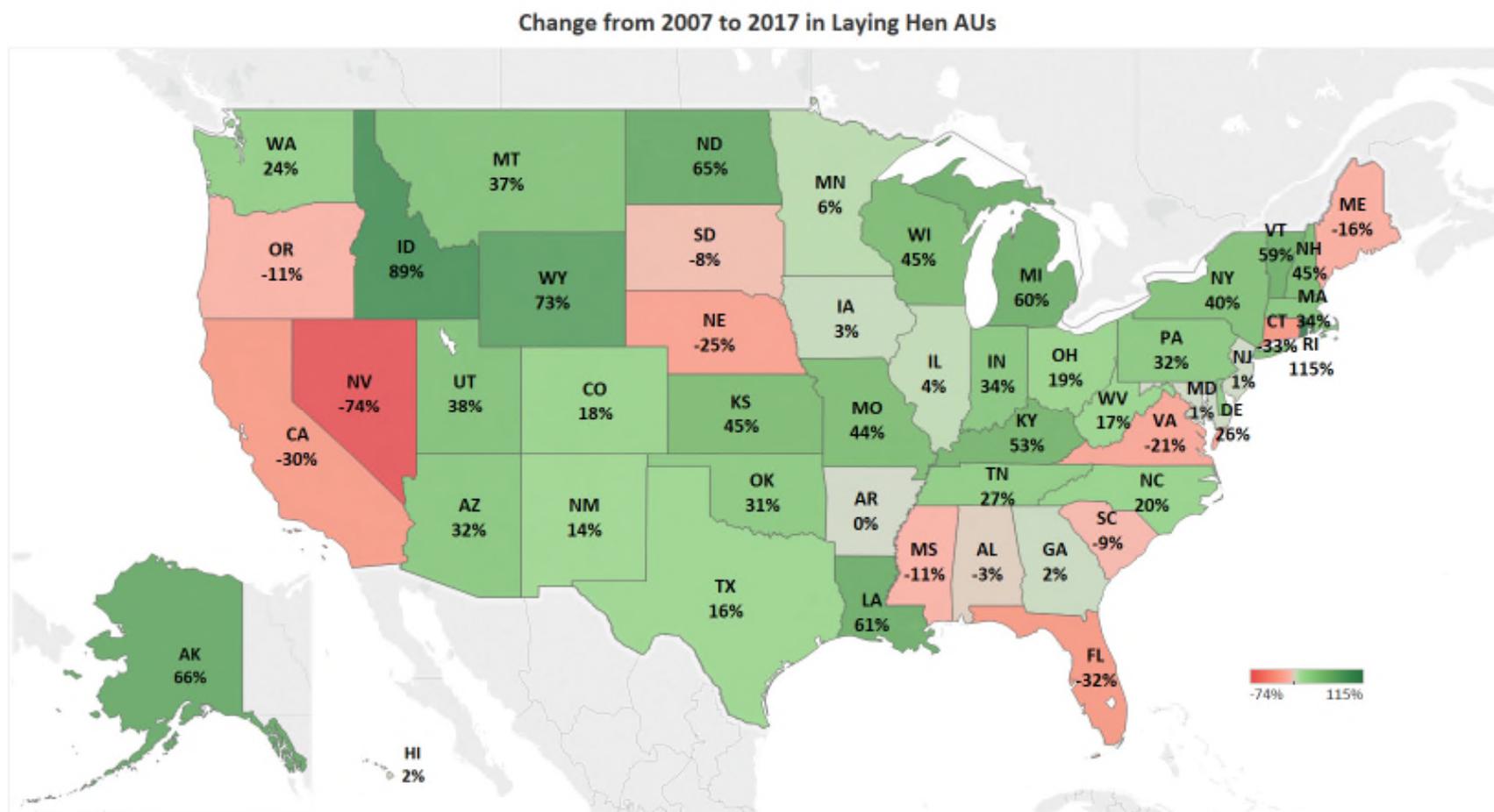


Figure 53, Change from 2007-2017 in Laying Hen AUs

Minnesota has the highest turkey animal units at 601,000, which was about 17% of the total U.S. turkey animal units. Other top states include North Carolina (13%), Arkansas (10%), Indiana (8%), Missouri (7%), and Virginia (7%).

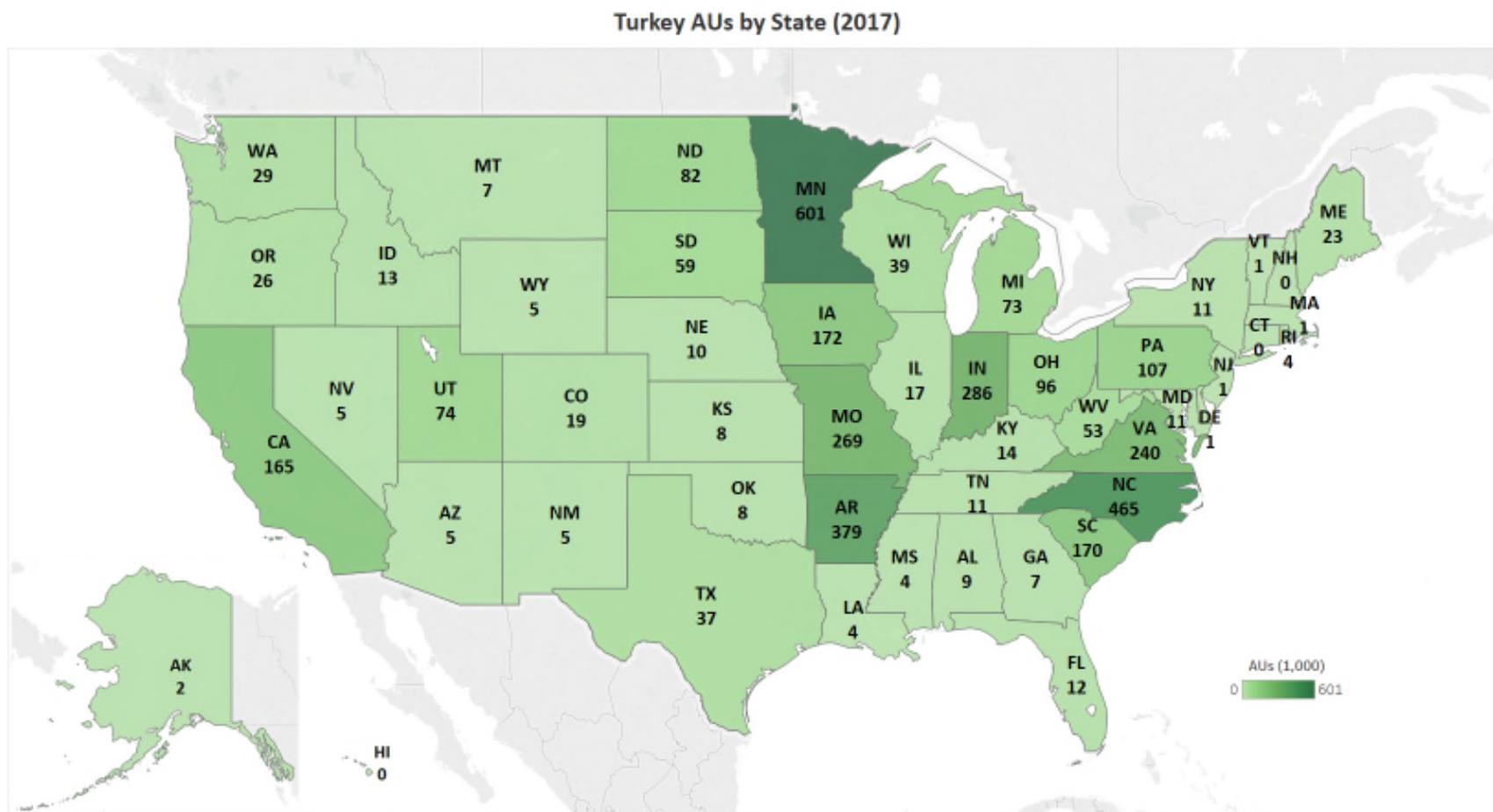


Figure 54, Turkey AUs by State (2017)

Indiana, which is the fourth highest in turkey animal units, saw a 39% increase from 2007 to 2017, while North Carolina, Arkansas and Minnesota showed declines of 20%, 15% and 14%, respectively. Utah, North Dakota, and Nevada saw very large percentage increases in turkey animal units, but those states only account for a small portion of total U.S. turkey AUs.

Change from 2007 to 2017 in Turkey AUs

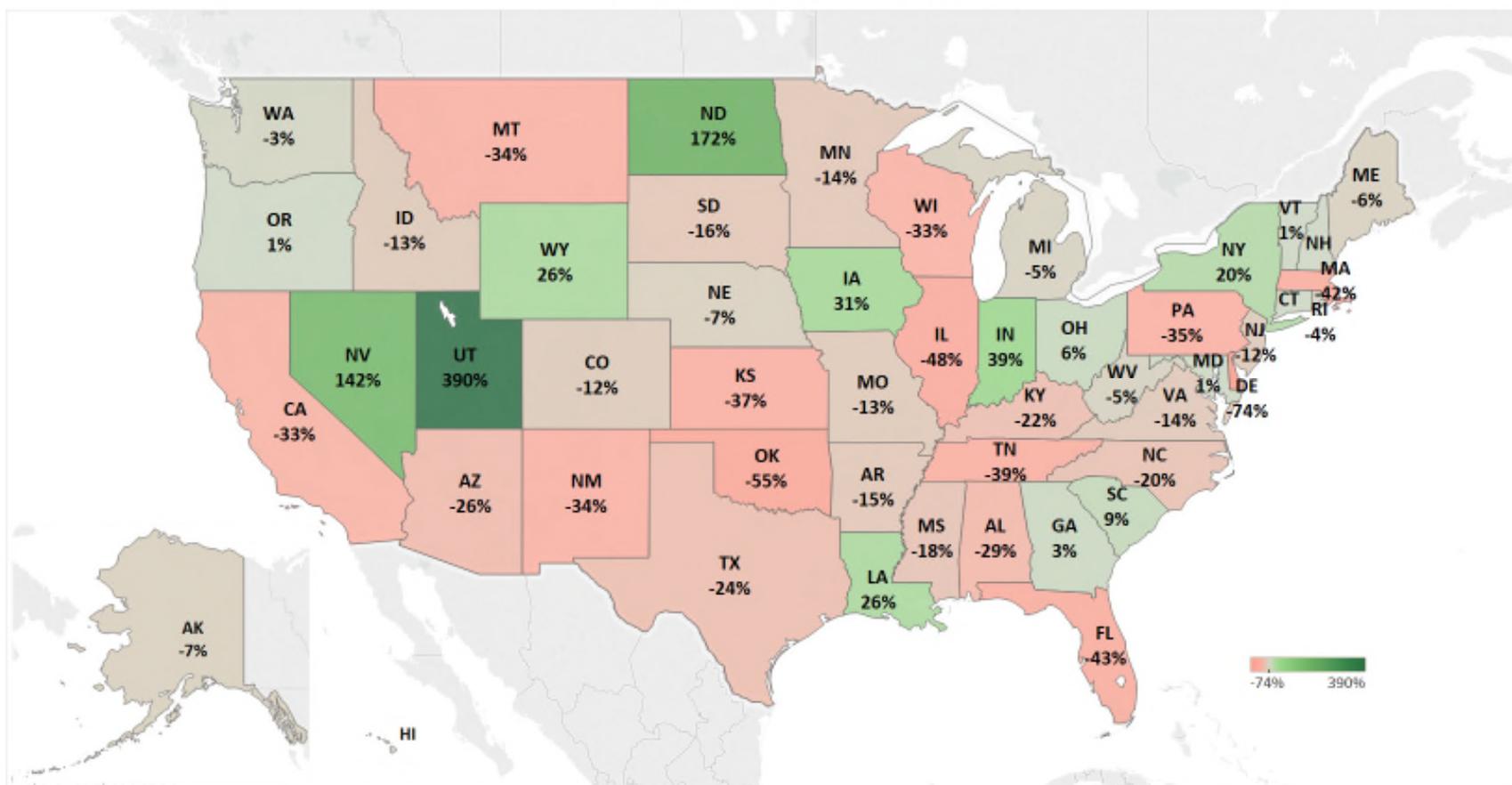


Figure 55, Change from 2007-2017 in Turkey AUs

Iowa, Minnesota and North Carolina were the states that housed the most hog animal units in 2017. Iowa accounts for about 29% of the nation’s hog animal units while Minnesota and North Carolina house 12% and 10% of total U.S. hog AUs, respectively.

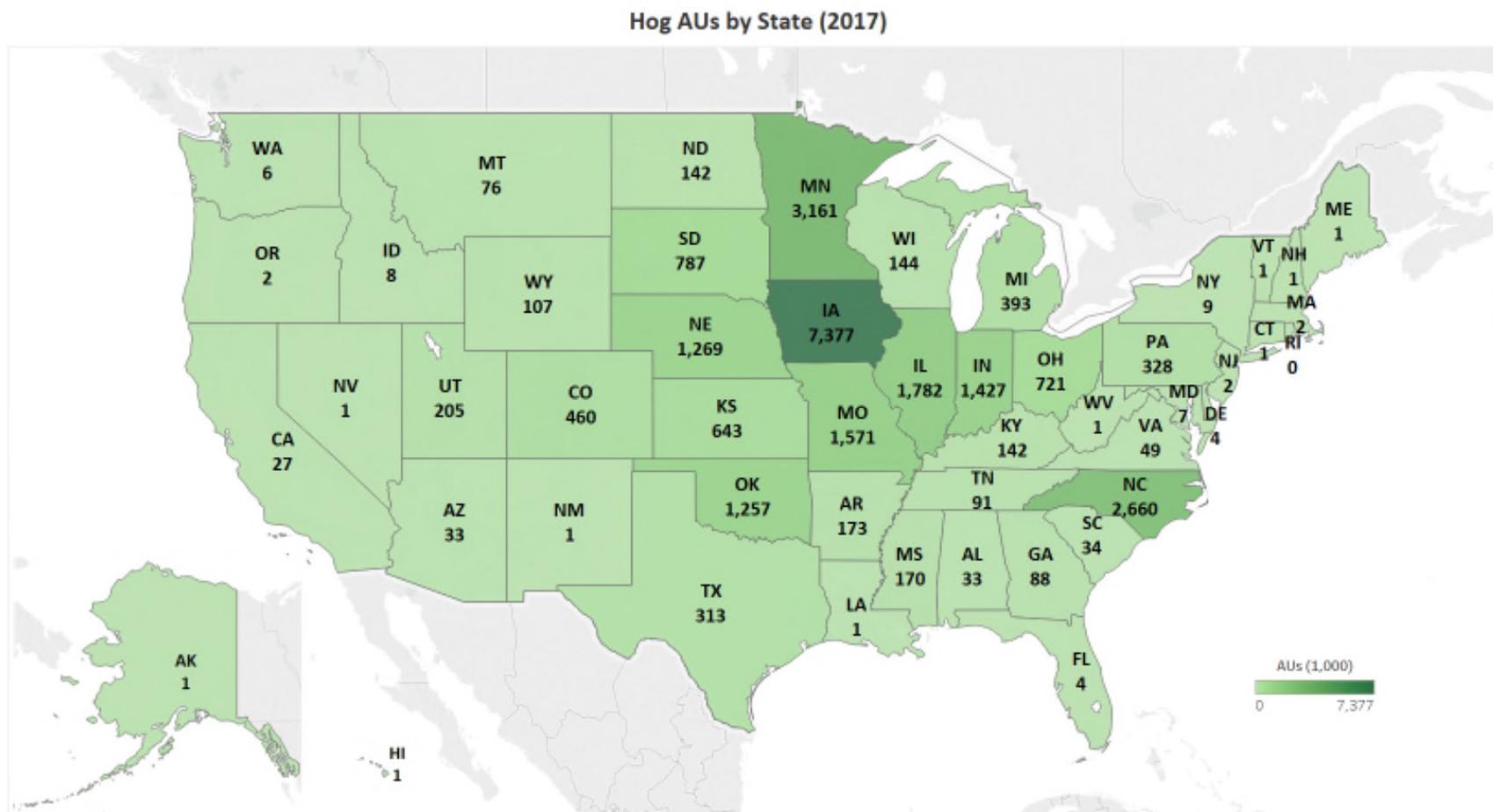


Figure 56, Hog AUs by State (2017)

Iowa, the leading state in hog production, saw a 44% increase from 2007 to 2017 in hog animal units. Minnesota, Illinois and Missouri, some of the leading states for hog animal units, saw increases of 35%, 31% and 24%, respectively. However, North Carolina hog AUs declined 1% over the last decade.

Change from 2007 to 2017 in Hog AUs

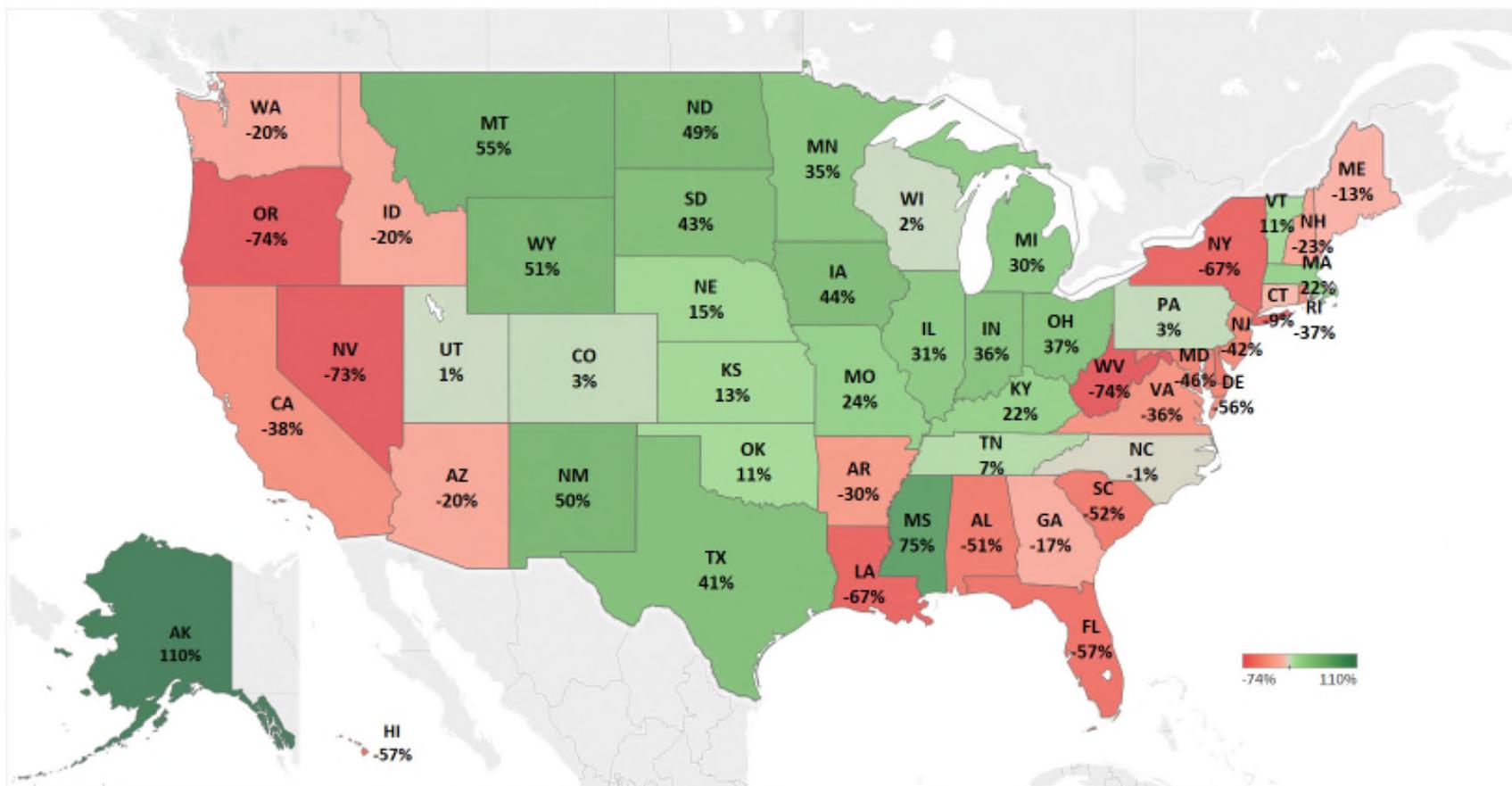


Figure 57, Change from 2007-2017 in Hog AUs

California and Wisconsin lead the way in dairy cows with nearly 2.5 and 1.8 million animal units, respectively. Dairy cows have seen some recent shifts from California to other states such as Idaho, Wisconsin, and Michigan where high quality forage supplies are more consistently available.

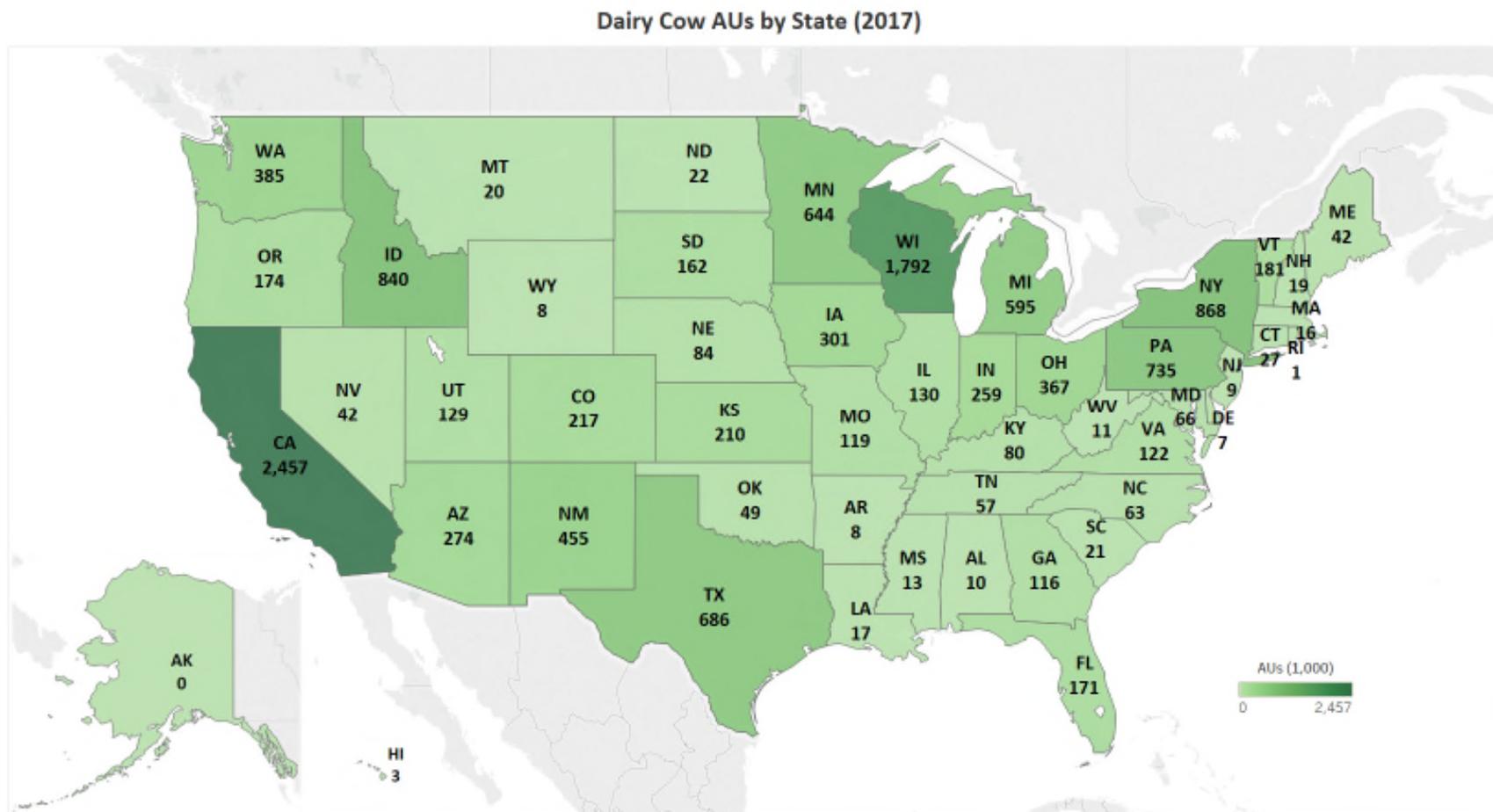


Figure 58, Dairy Cow AUs by State (2017)

Wisconsin, which is known for their large dairy cow population saw a 3% increase from 2007 to 2017, however California saw a 2% decline. During the last decade Michigan and Idaho also increased their dairy cow animal units by 30% and 20%, respectively, and are now some of the top states for dairy cows.

Change from 2007 to 2017 in Dairy Cow AUs

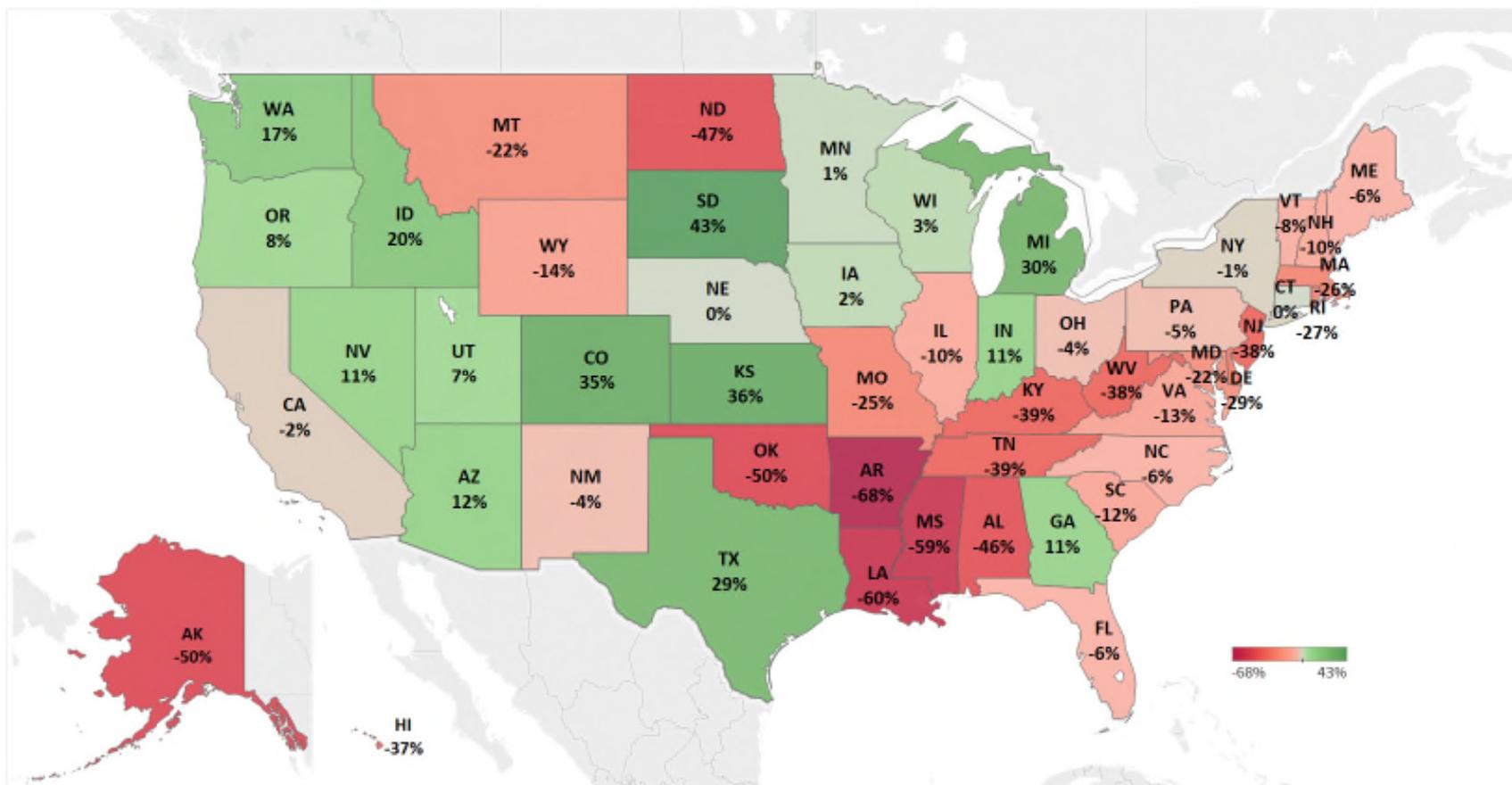


Figure 59, Change from 2007-2017 in Dairy Cow AUs

Nebraska, Texas, and Kansas are the top three states for beef cow animal units, with nearly 8.0, 6.8, and 6.2 million animal units, respectively. Iowa, Oklahoma, Colorado, California, and South Dakota also exceed 2 million animal units of beef cows.

Beef Cow AUs by State (2017)

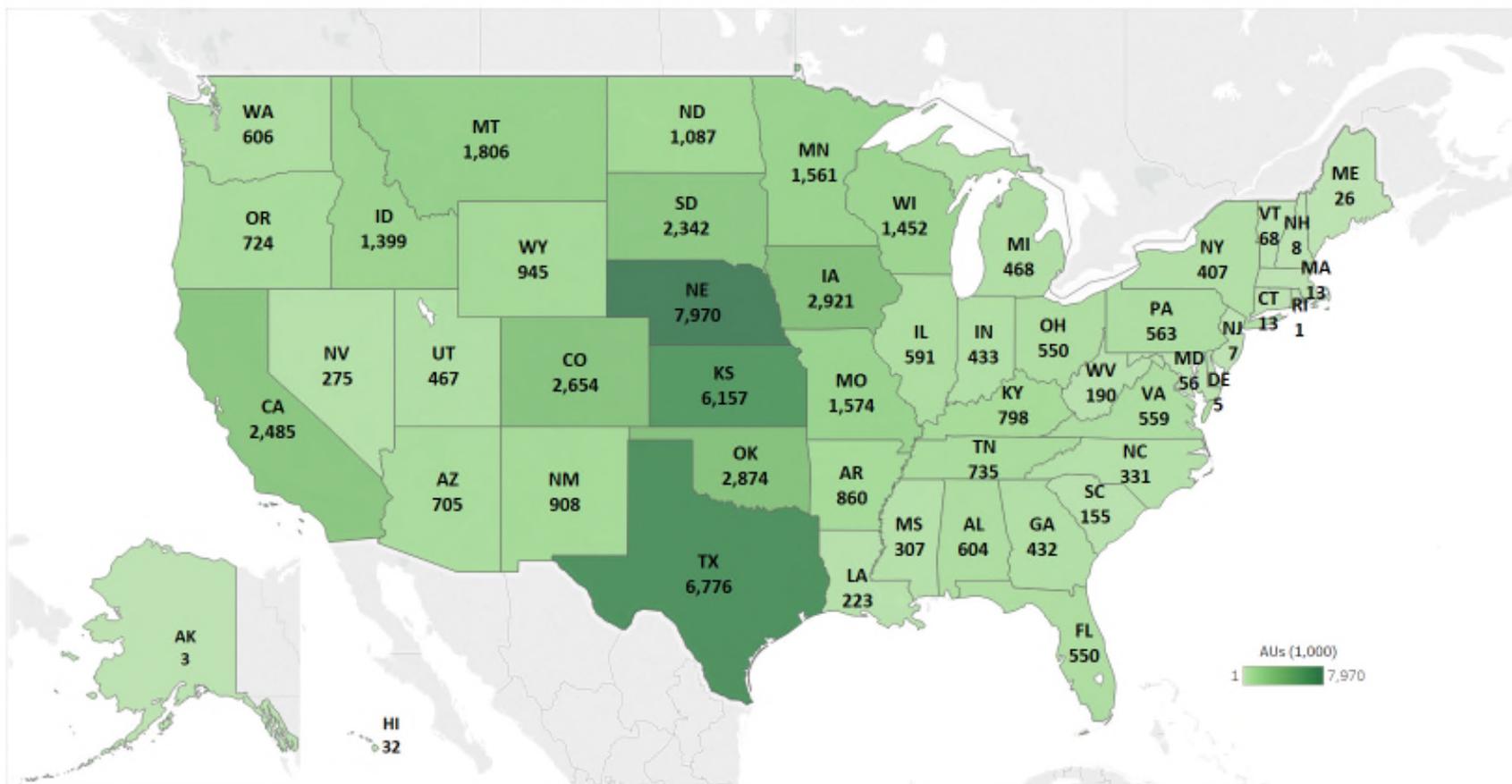


Figure 60, Beef Cow AUs by State (2017)

Nebraska saw a 14% increase in beef cow animal units from 2007 to 2017, while Texas saw a 19% 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.

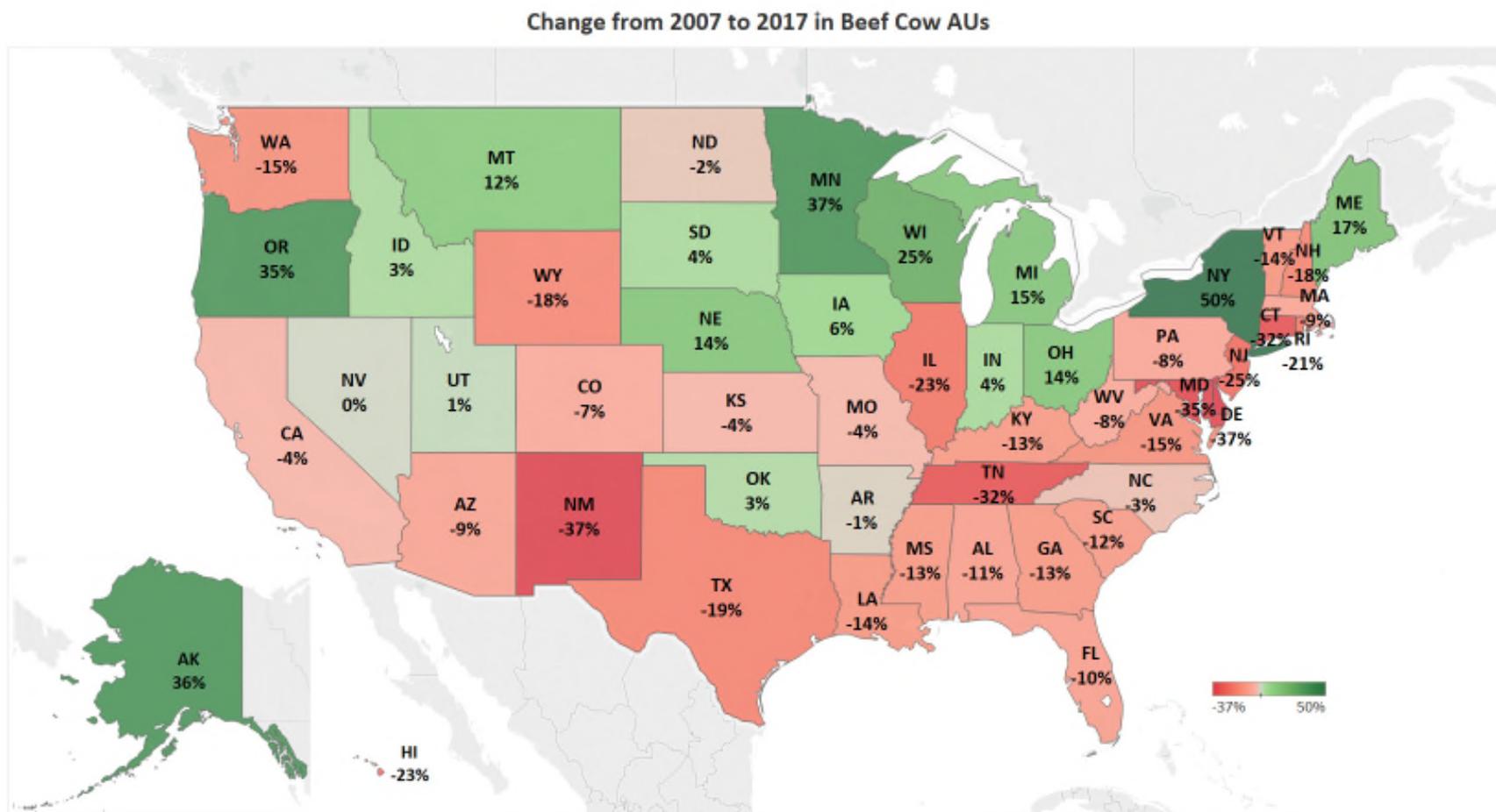
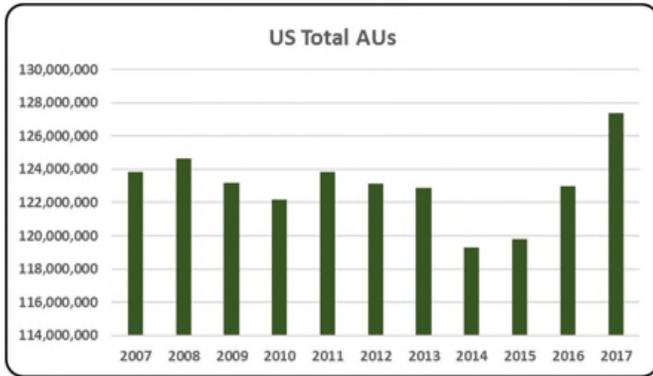
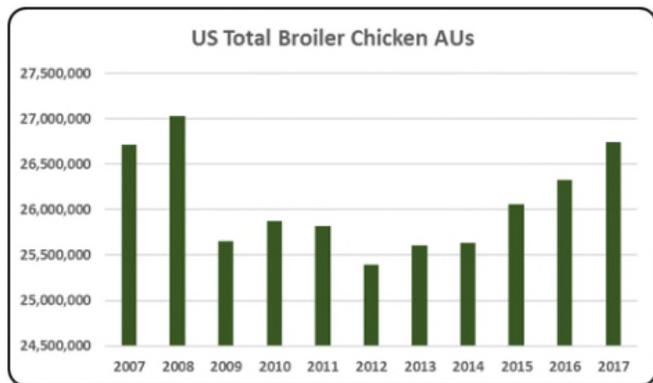


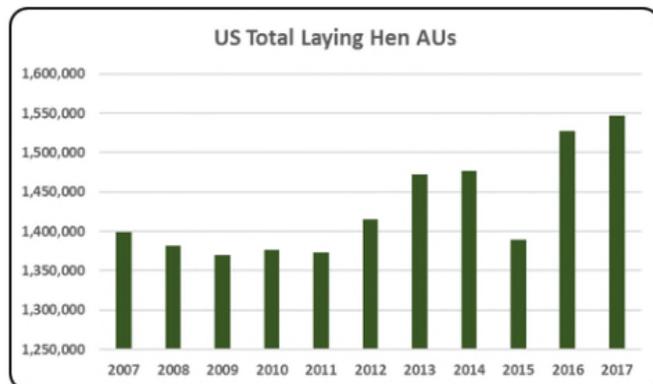
Figure 61, Change from 2007-2017 in Beef Cow AUs



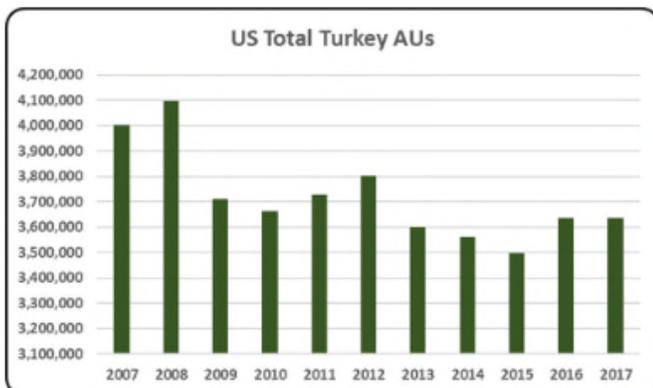
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.



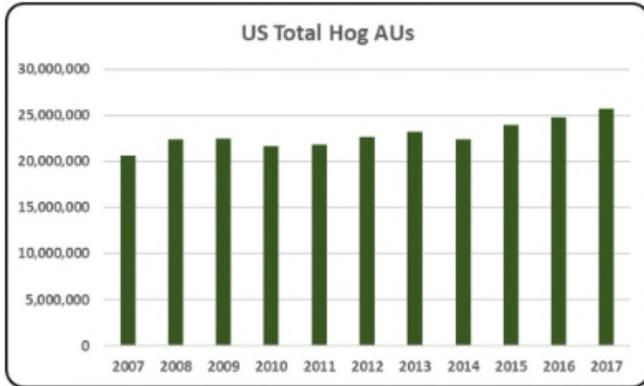
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).



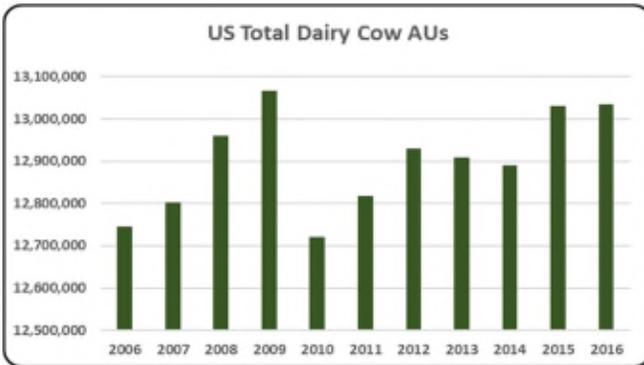
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.



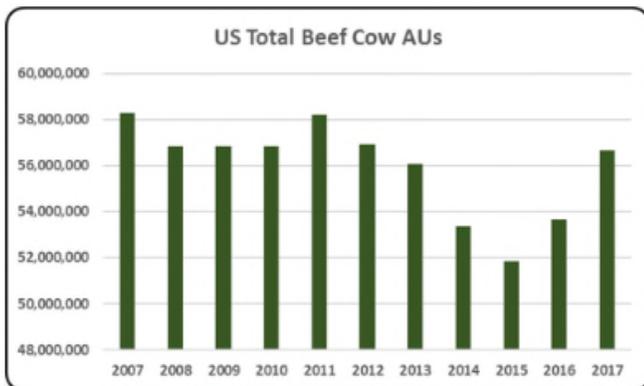
- In 2017, turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.



- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.

State Level Results

2007-2017 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 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 2017 animal agriculture contributed:

- \$10.9 billion in economic output
- 60,392 jobs
- \$2.3 billion in earnings
- \$542.4 million in income taxes paid at local, state, and federal levels
- \$47.6 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Alabama has increased economic output by over \$1.3 billion, boosted household earnings by \$281.4 million, contributed 7,187 additional jobs and paid \$65.3 million in additional tax revenues.

Alabama's animal agriculture consumed almost 1.9 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (1.8 million tons)
- Aquaculture (43.8 thousand tons)
- Egg-Laying Hens (25.9 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 2017, Alabama's animal agriculture contributed the following to the economy:

- About \$10.9 billion in economic output
- \$2.3 billion in household earnings
- 60,392 jobs
- \$542.4 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:

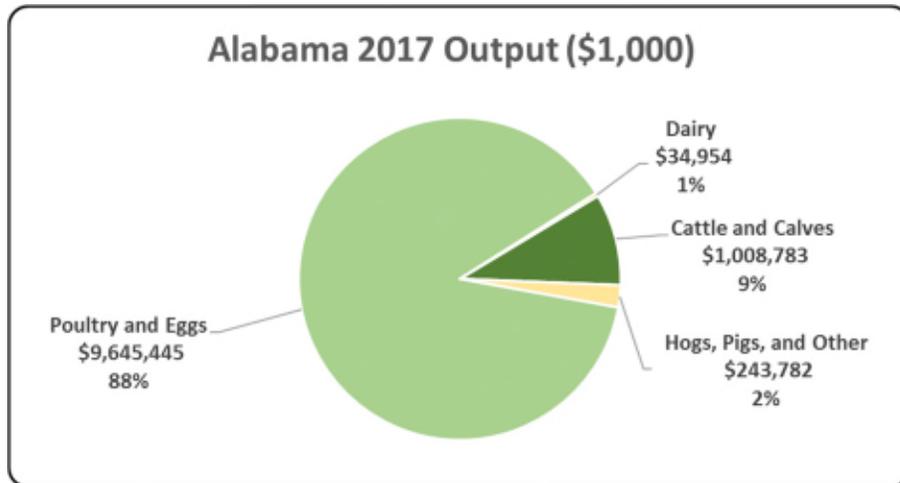
- Increased economic output by \$1.3 billion
- Boosted household earnings by \$281.4 million
- Added 7,187 jobs
- Paid an additional \$65.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 10,932,964	\$ 1,328,096	13.83%
Earnings (\$1,000)	\$ 2,337,972	\$ 281,425	13.68%
Employment (Jobs)	60,392	7,187	13.51%
Income Taxes Paid (\$1,000)	\$ 542,409	\$ 65,291	13.68%
Property Taxes Paid in 2012 (\$1,000)	\$ 47,636		

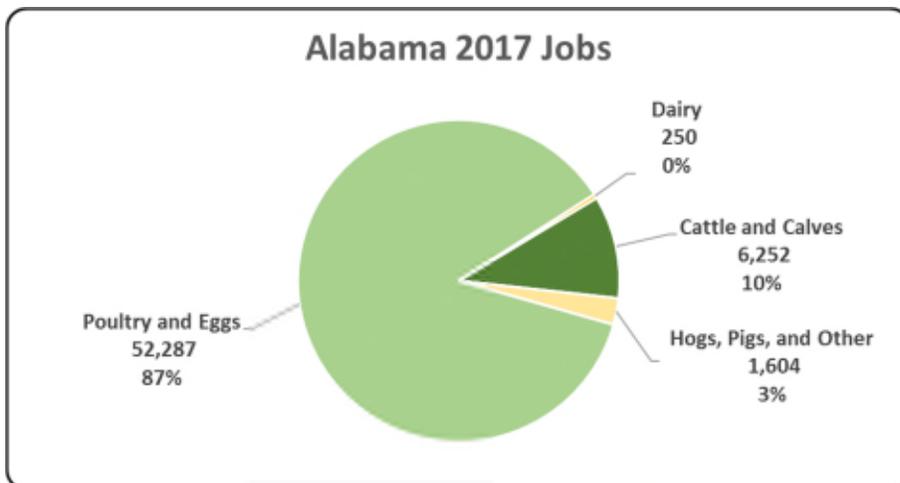
Alabama Output

“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 \$10.9 billion.



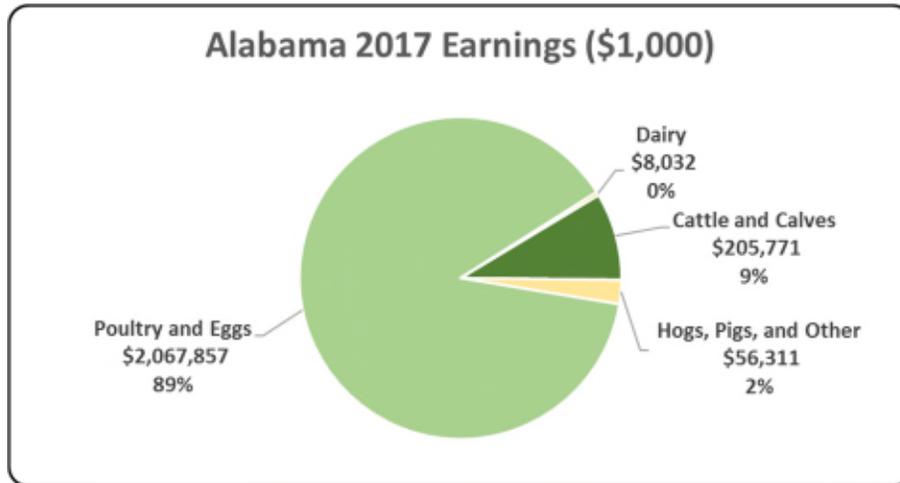
Alabama Jobs

“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 60,392 jobs within and outside of animal agriculture.



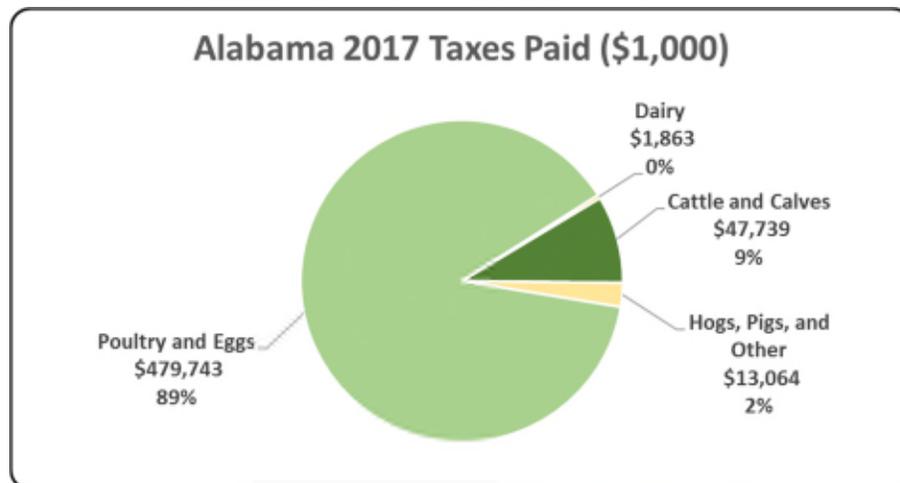
Alabama Earnings

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 \$2.3 billion to household earnings in 2017.



Alabama Taxes Paid by Animal Agriculture

Alabama’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$542.4 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$47.6 million in property taxes paid by all of Alabama agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



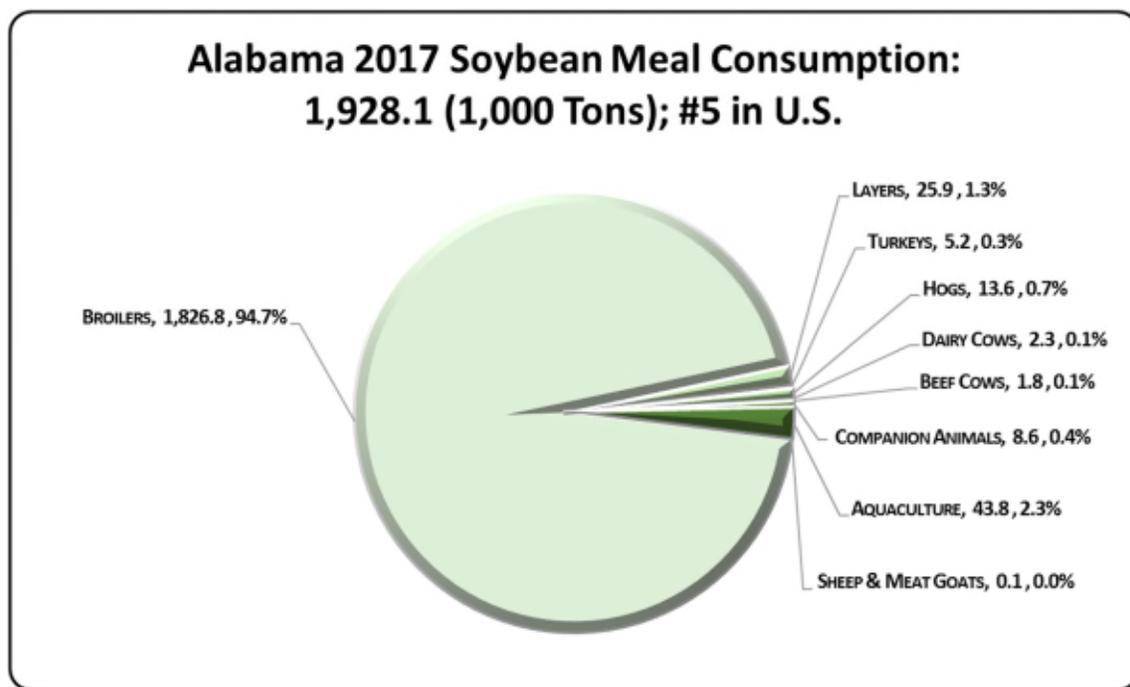
Alabama Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Alabama's animal agriculture consumed over 1.9 million tons of soybean meal in 2017, placing the state as #5 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Alabama consumed 7,918.5 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (1.8 million tons)
- Aquaculture (43.8 thousand tons)
- Egg-Laying Hens (25.9 thousand tons)

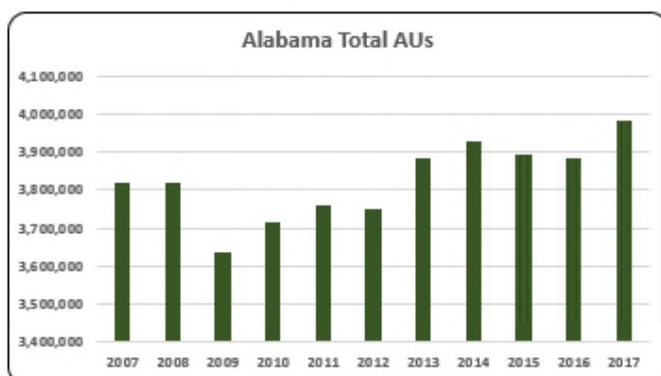
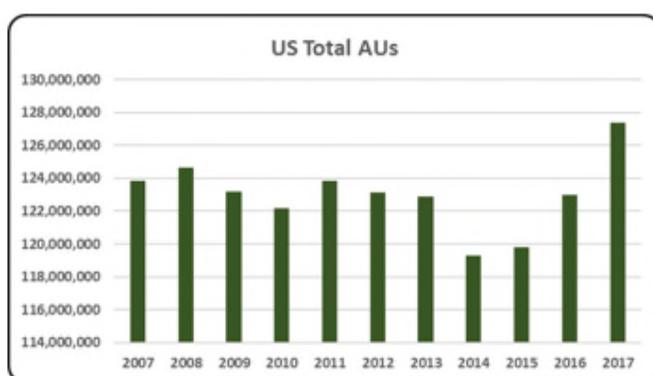


Alabama Animal Unit (AU) Trends

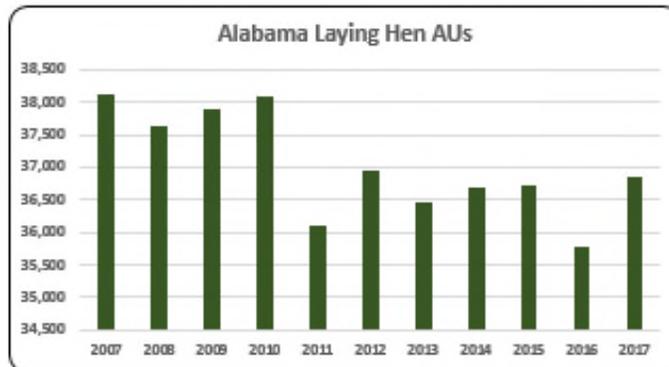
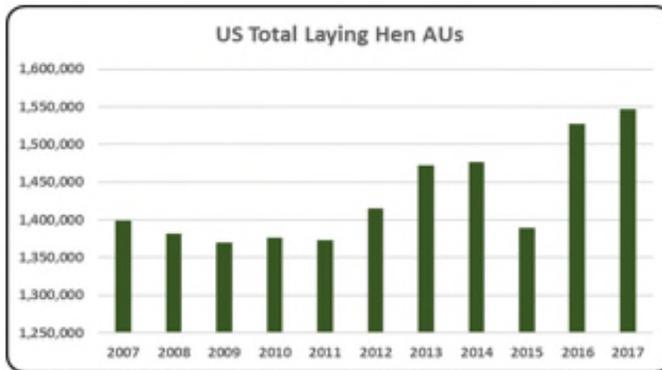
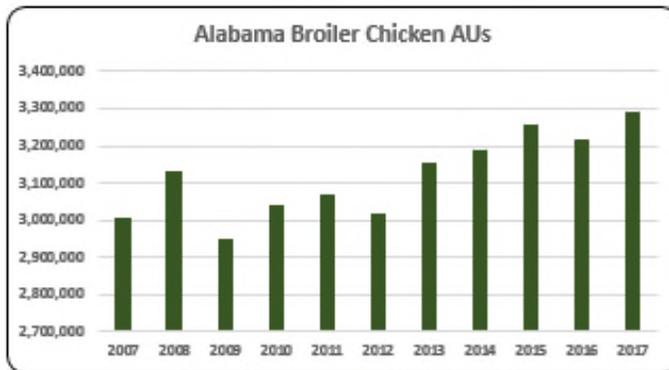
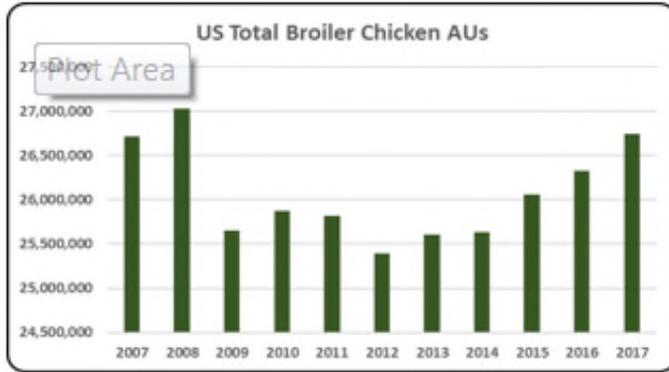
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Alabama. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

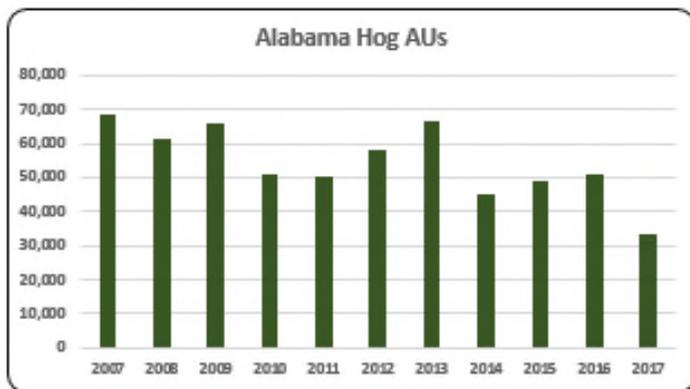
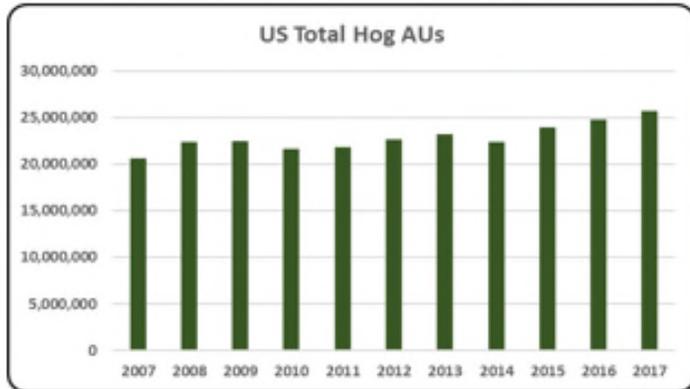
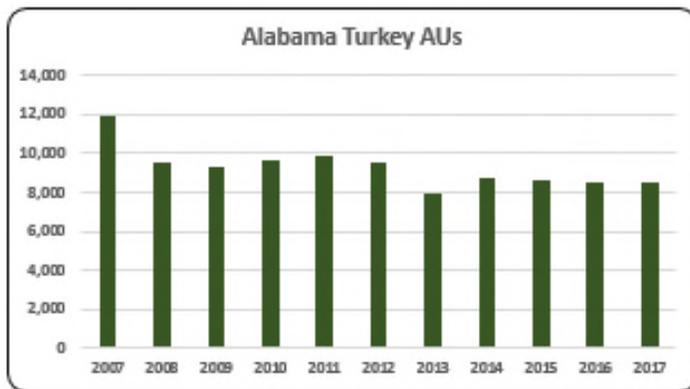
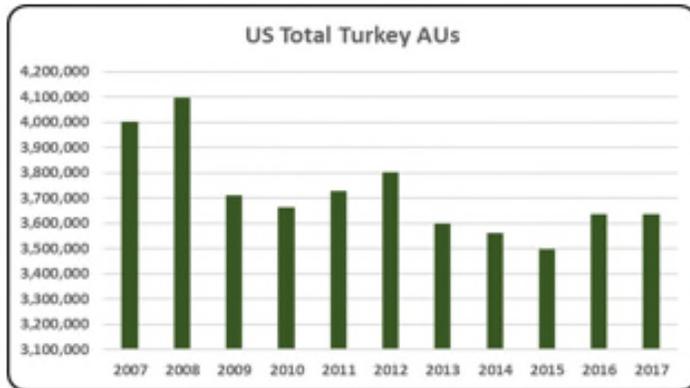
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Alabama, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (3.3 million AUs), Beef Cows (603,750 AUs), and Laying Hens (36,857 AUs). Total animal units in Alabama during 2017 were nearly 4.0 million AUs.



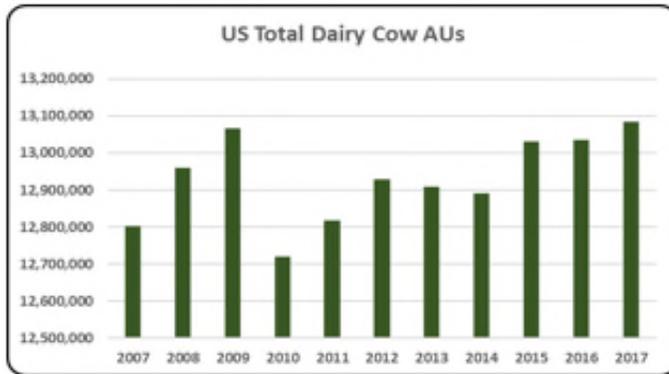
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- On average there were 3.8 million total AUs in the state of Alabama from 2007 to 2017. Total AUs in Alabama saw a 4.3% increase from 2016 to 2017 to nearly 4 million AUs.



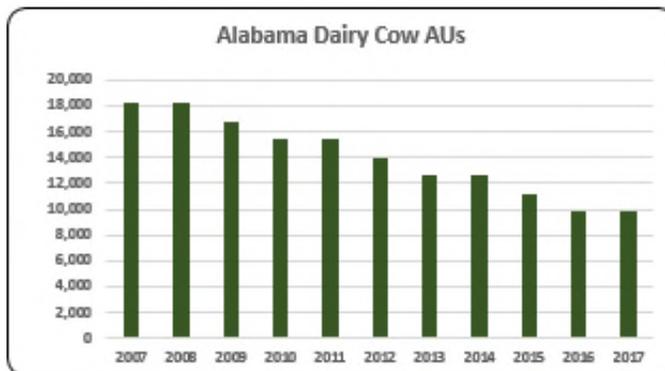
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- 82.6% of the 2017 total AUs (3.29 million) in Alabama were broilers. The average broiler AUs during 2007-2017 was 3.1 million.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In Alabama, 36,857 layer AUs were present in 2017. On average from 2007 to 2017, the number of layer AUs was 37,027.



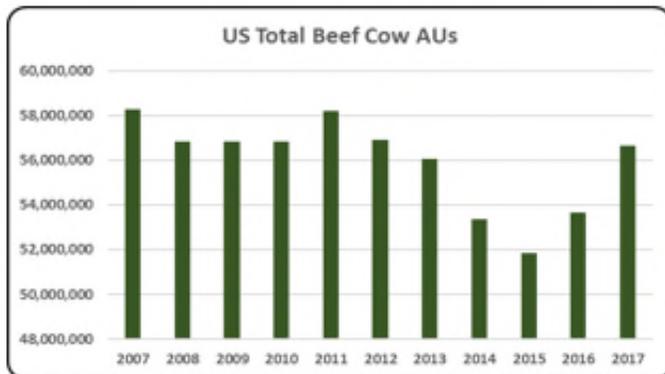
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkey AUs in Alabama are the smallest of all animal sectors in the state. Alabama has housed an average 9,299 turkey AUs per year over the past decade.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- In 2017, there were 33,375 hog AUs in Alabama. This number is a 51% decline from 2007.



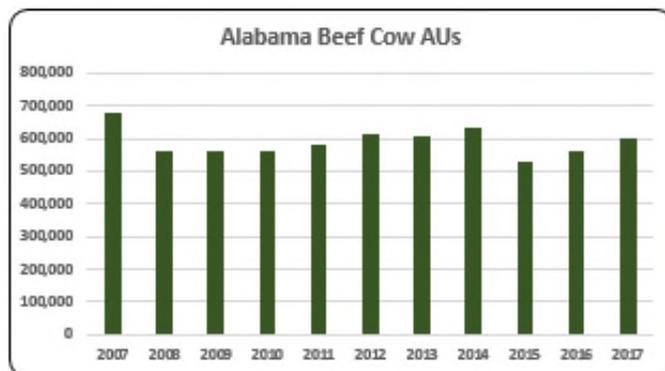
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- There were 9,800 dairy cow AUs in 2017 in the state of Alabama and there were, on average, 14,000 dairy cow AUs from 2007 to 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- After broilers, beef cows are the second largest animal sector in Alabama. The average number of beef cows was 589,750 from 2007 to 2017.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	676,200	559,650	559,650	559,650	579,600	613,425	610,125	634,800	531,150	561,150	603,750
	Hog and Pig AUs	68,400	61,350	66,150	50,850	50,100	58,200	66,300	44,850	49,050	51,000	33,375
	Broiler AUs	3,007,824	3,134,057	2,949,178	3,041,097	3,067,922	3,016,608	3,151,723	3,190,374	3,254,740	3,216,401	3,292,204
	Turkey AUs	11,907	9,517	9,322	9,710	9,884	9,539	7,957	8,785	8,595	8,566	8,510
	Egg Layer AUs	38,108	37,628	37,900	38,096	36,092	36,957	36,475	36,674	36,724	35,783	36,857
	Dairy AUs	18,200	18,200	16,800	15,400	15,400	14,000	12,600	12,600	11,200	9,800	9,800
	Total Animal Units	3,820,639	3,820,402	3,639,000	3,714,804	3,758,997	3,748,729	3,885,180	3,928,082	3,891,458	3,882,700	3,984,496
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 364,990	\$ 334,034	\$ 309,827	\$ 408,234	\$ 401,395	\$ 498,843	\$ 466,929	\$ 594,995	\$ 603,038	\$ 452,072	\$ 518,708
	Hogs and Pigs (\$1,000)	\$ 34,326	\$ 28,414	\$ 42,186	\$ 37,691	\$ 35,652	\$ 33,361	\$ 41,233	\$ 35,344	\$ 36,827	\$ 29,168	\$ 19,664
	Broilers (\$1,000)	\$ 2,418,707	\$ 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
	Turkeys (\$1,000)	\$ 7,867	\$ 9,599	\$ 9,097	\$ 19,948	\$ 15,685	\$ 16,865	\$ 12,225	\$ 8,087	\$ 8,045	\$ 9,098	\$ 6,160
	Eggs (\$1,000)	\$ 313,003	\$ 298,550	\$ 286,893	\$ 291,344	\$ 322,651	\$ 352,021	\$ 388,780	\$ 396,045	\$ 404,090	\$ 367,961	\$ 349,437
	Milk (\$1,000)	\$ 42,158	\$ 39,928	\$ 25,584	\$ 30,420	\$ 33,748	\$ 28,080	\$ 27,729	\$ 30,302	\$ 19,695	\$ 15,732	\$ 16,554
	Other	\$ 105,144	\$ 106,182	\$ 107,256	\$ 108,422	\$ 109,429	\$ 110,524	\$ 111,662	\$ 112,708	\$ 113,812	\$ 114,859	\$ 129,229
	Sheep and Lambs (\$1,000)	\$ 243	\$ 229	\$ 250	\$ 364	\$ 319	\$ 362	\$ 447	\$ 440	\$ 492	\$ 486	\$ 464
	Aquaculture (\$1,000)	\$ 104,901	\$ 105,953	\$ 107,006	\$ 108,058	\$ 109,110	\$ 110,163	\$ 111,215	\$ 112,267	\$ 113,320	\$ 114,372	\$ 128,765
Total (\$1,000)	\$ 3,286,195	\$ 3,505,867	\$ 3,300,147	\$ 3,685,392	\$ 3,590,078	\$ 3,849,794	\$ 4,612,982	\$ 5,031,713	\$ 4,506,312	\$ 3,853,352	\$ 4,376,757	

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	23,233	22,684	20,314	17,698	
	Cattle feedlots (112112)	566	161	16	-	
	Dairy cattle and milk production (11212)	196	215	116	87	
	Hog and pig farming (1122)	413	220	287	177	
	Poultry and egg production (1123)	3,233	3,450	3,818	3,815	
	Sheep and goat farming (1124)	343	697	1,626	1,904	
	Animal aquaculture and other animal production (1125,1129)	2,449	4,667	6,219	4,313	
Value of Sales (\$1,000)	Cattle and Calves	292,784	348,253	408,276	429,349	
	Hogs and Pigs	34,480	39,441	54,618	33,424	
	Poultry and Eggs	2,093,768	2,137,299	3,113,194	3,624,852	
	Milk and Other Dairy Products	52,573	46,129	38,270	28,113	
	Aquaculture	59,694	80,976	99,504	117,920	
	Other (calculated)	9,145	22,583	24,701	9,142	
	Total	2,542,444	2,674,681	3,738,563	4,242,800	
Input Purchases	Livestock and poultry purchased	(Farms)	13,213	13,420	11,619	11,777
		\$1,000	341,450	505,196	701,381	751,245
	Breeding livestock purchased	(Farms)	n/a	7,124	5,994	6,793
		\$1,000	n/a	17,300	56,499	81,263
	Other livestock and poultry purchased	(Farms)	n/a	7,830	7,022	6,491
		\$1,000	n/a	487,896	644,882	669,983
	Feed purchased	(Farms)	26,309	32,201	30,051	29,985
	\$1,000	1,140,545	927,774	1,611,020	2,195,586	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,008,783	\$ 205,771	6,252	\$ 47,739
	Hogs, Pigs, and Other	\$ 243,782	\$ 56,311	1,604	\$ 13,064
	Poultry and Eggs	\$ 9,645,445	\$ 2,067,857	52,287	\$ 479,743
	Dairy	\$ 34,954	\$ 8,032	250	\$ 1,863
	Total	\$ 10,932,964	\$ 2,337,972	60,392	\$ 542,409

Change from 2007 to 2017	Cattle and Calves	\$ 175,637	\$ 35,826	1,088	\$ 8,312
	Hogs, Pigs, and Other	\$ (24,242)	\$ (5,600)	(159)	\$ (1,299)
	Poultry and Eggs	\$ 1,246,229	\$ 267,175	6,756	\$ 61,985
	Dairy	\$ (69,527)	\$ (15,977)	(498)	\$ (3,707)
	Total	\$ 1,328,096	\$ 281,425	7,187	\$ 65,291

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.5%
	Total	23.2%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017, animal agriculture contributed:

- \$20.4 million in economic output
- 86 jobs
- \$4.0 million in earnings
- \$791,500 in income taxes paid at local, state, and federal levels
- \$1.3 million in the form of property taxes

Alaska's animal agriculture consumed almost 6,100 tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (2,700 tons)
- Turkeys (1,500 tons)
- Companion Animals (900 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 2017, Alaska's animal agriculture contributed the following to the economy:

- About \$20.4 million in economic output
- \$4.0 million in household earnings
- 86 jobs
- \$791,500 in income taxes

During the last decade Alaska's animal agriculture has:

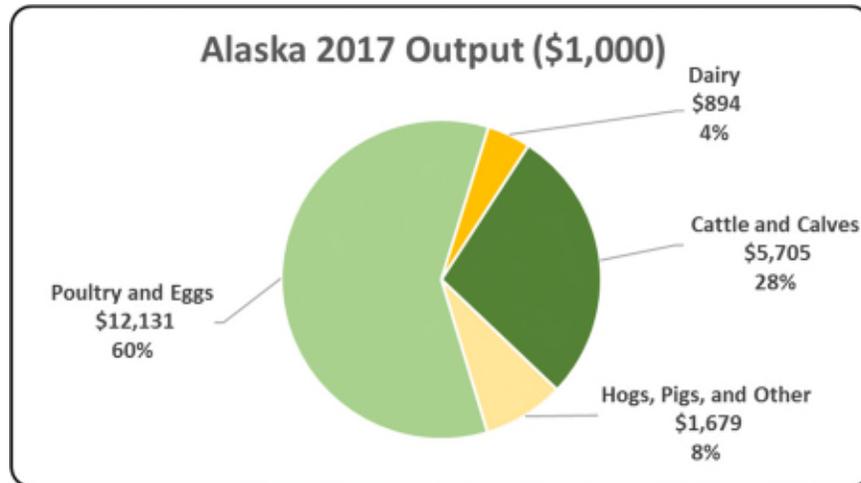
- Increased economic output by \$1.1 million
- Boosted household earnings by \$137,000
- Added 2 jobs
- Paid an additional \$27,000 in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 20,408	\$ 1,138	5.90%
Earnings (\$1,000)	\$ 4,018	\$ 137	3.53%
Employment (Jobs)	86	2	2.35%
Income Taxes Paid (\$1,000)	\$ 792	\$ 27	3.53%
Property Taxes Paid in 2012 (\$1,000)	\$ 1,345		

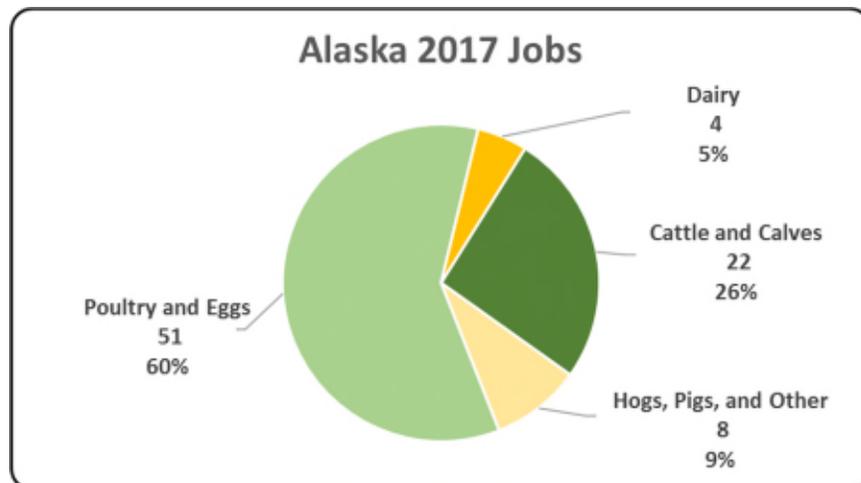
Alaska Output

“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 Alaska economy. Animal agriculture’s impact on Alaska total economic output is about \$20.4 million.



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 contributes 86 jobs within and outside of animal agriculture.



Alaska 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 Alaska economy in terms of earnings. Alaska’s animal agriculture contributed about \$4.0 million to household earnings in 2017.



Alaska Taxes Paid by Animal Agriculture

Alaska’s animal agriculture is not a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$791,500 in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$1.3 million in property taxes paid by all of Alaska agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



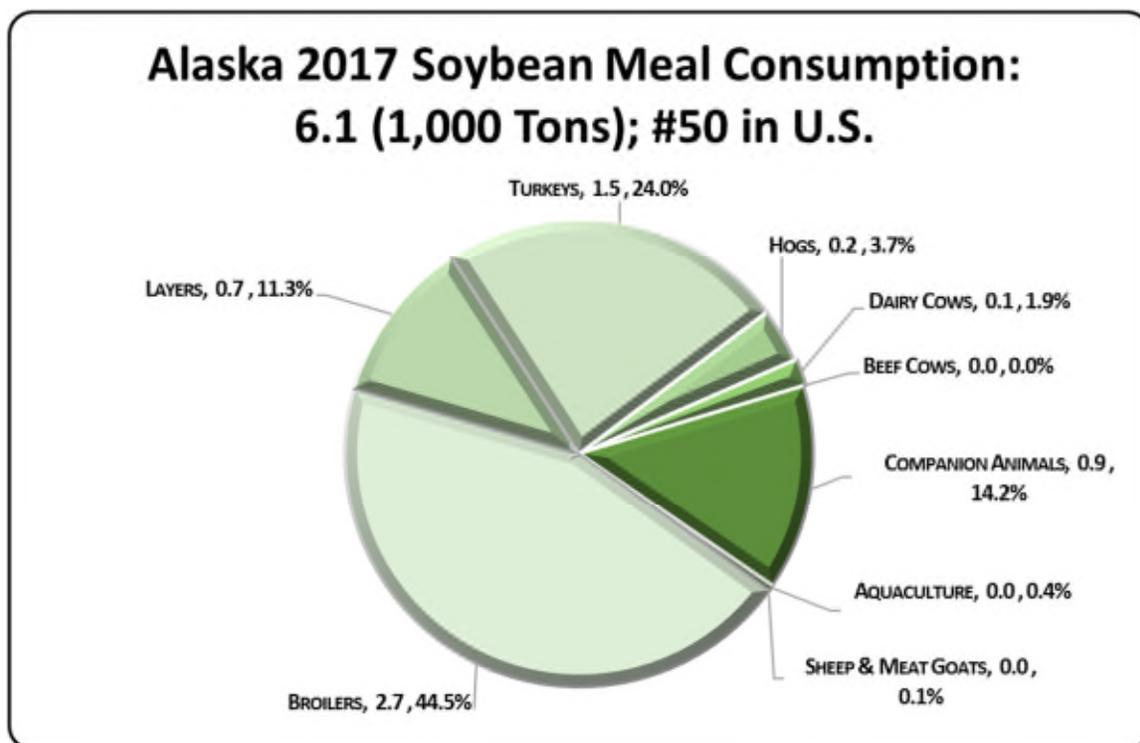
Alaska Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Alaska's animal agriculture consumed almost 6,100 tons of soybean meal in 2017, 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:

- Broilers (2,700 tons)
- Turkeys (1,500 tons)
- Companion Animals (900 tons)

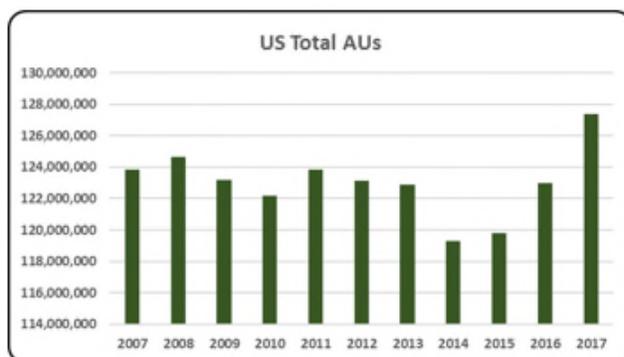


Alaska Animal Unit (AU) Trends

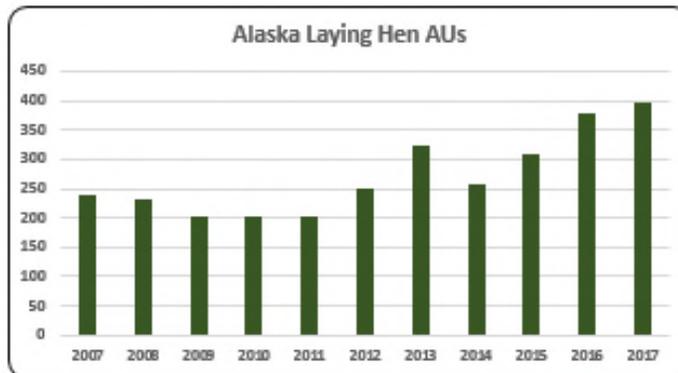
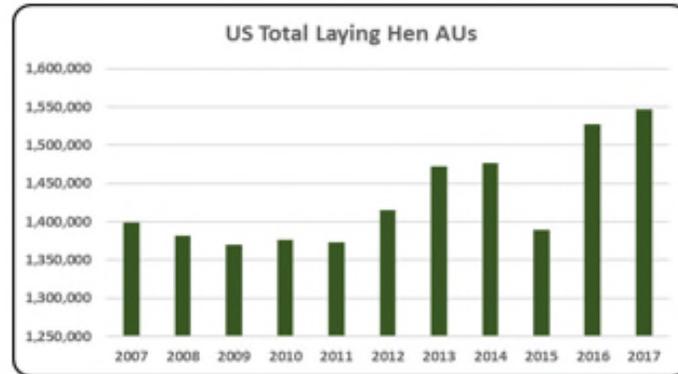
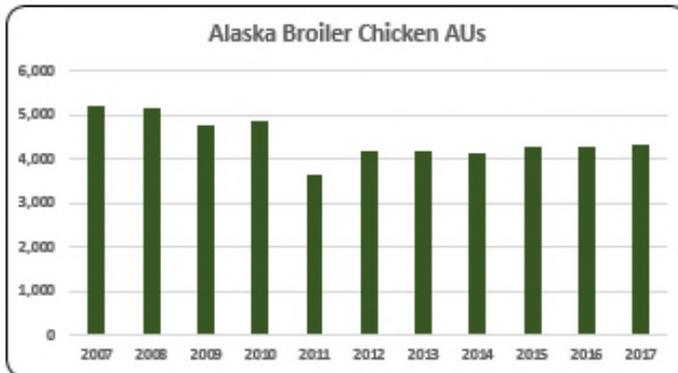
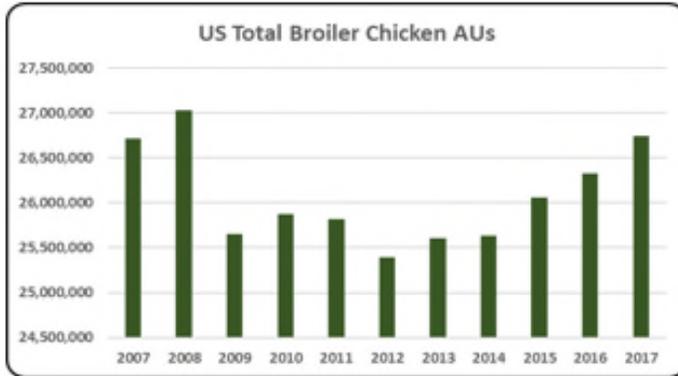
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Alaska. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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 2017 were: Broiler Chickens (4,358 AUs), Beef Cows (2,805 AUs), and Turkeys (2,321 AUs). Total animal units in Alaska during 2017 were 10,931 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Alaska is one of the few states with very low animal production. There were 10,931 AUs in 2017 for all species included in this study, and the average AUs from 2007 to 2017 was 9,988.

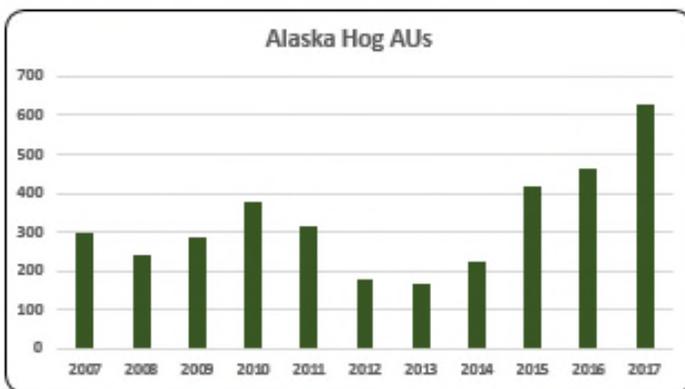
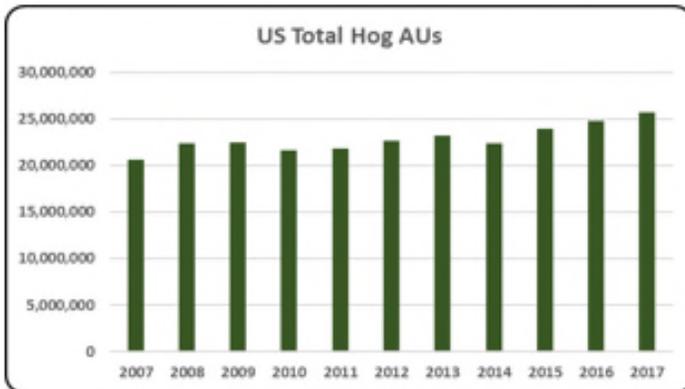
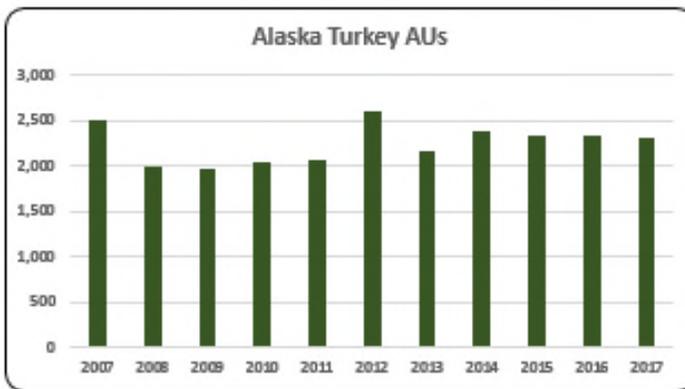
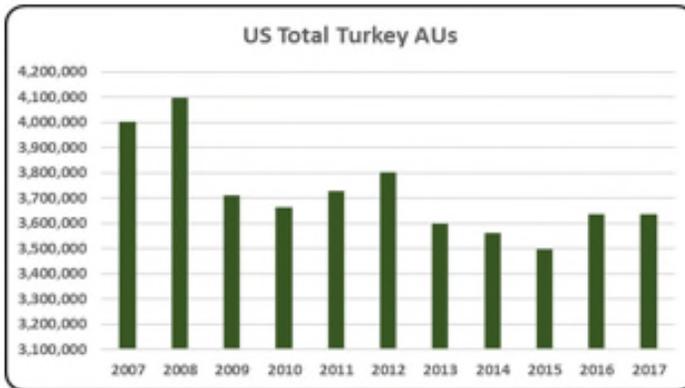


- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).

- In 2017, 39.87% (4,358) of all animal units in Alaska were in the broiler industry. The average number of broiler AUs during 2007-2017 were 4,465.

- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.

- There were 397 laying hen AUs in 2017, representing 0.03% of all layers in the U.S during that year. On average there were 272 layers from 2007 to 2017.

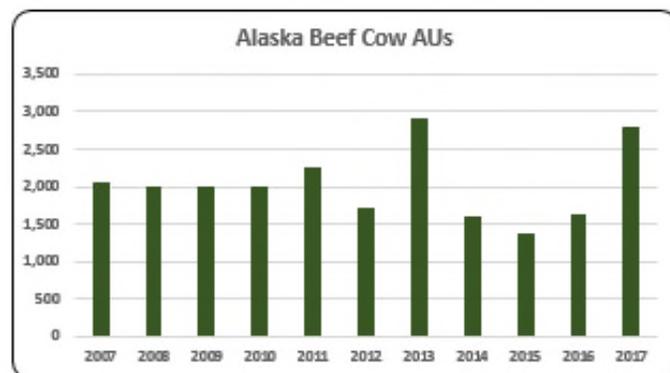
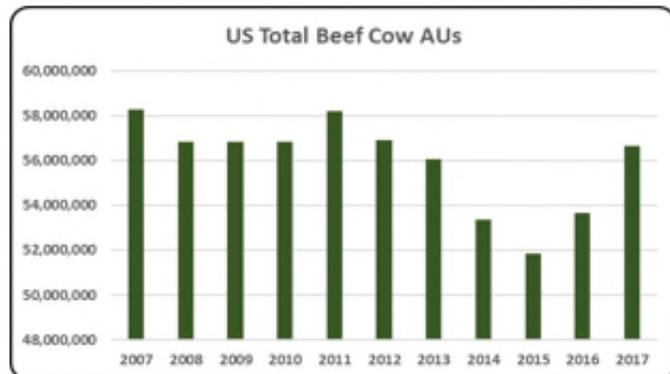
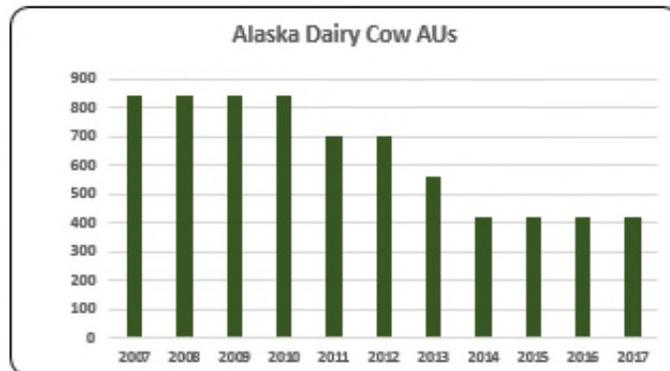
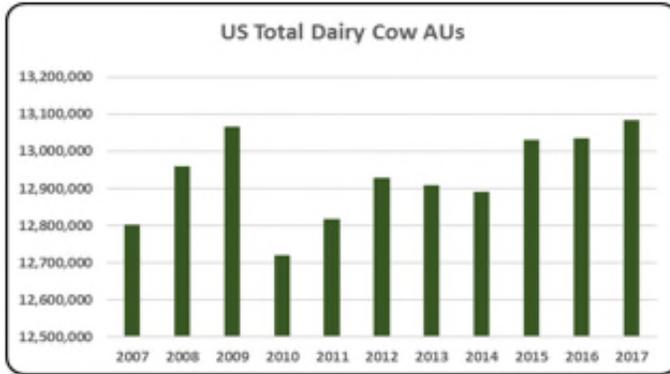


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

- There were 2,321 turkey AUs in 2017, a 7.4% decrease since 2007.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

- Hog numbers in Alaska are minimal with only 630 AUs in 2017 and an average of 327 AUs for the decade.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.

- The number of dairy cows in the state has consistently decreased since 2007. Dairy cow AUs were 840 in 2007 compared to 420 in 2017.

- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.

- Alaska beef cow AUs averaged 2,036 from 2007 to 2017. Beef cow AUs decreased 37% from 2007.

Alaska Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	2,055	2,010	2,010	2,010	2,250	1,725	2,925	1,605	1,380	1,620	2,805
	Hog and Pig AUs	300	240	285	375	315	180	165	225	420	465	630
	Broiler AUs	5,227	5,145	4,784	4,848	3,653	4,196	4,181	4,157	4,265	4,297	4,358
	Turkey AUs	2,507	2,004	1,963	2,044	2,081	2,602	2,170	2,396	2,344	2,336	2,321
	Egg Layer AUs	239	233	203	202	203	250	324	258	310	377	397
	Dairy AUs	840	840	840	840	700	700	560	420	420	420	420
	Total Animal Units	11,168	10,471	10,085	10,320	9,202	9,652	10,325	9,061	9,139	9,515	10,931
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,444	\$ 1,205	\$ 2,162	\$ 2,371	\$ 2,563	\$ 1,620	\$ 1,021	\$ 2,831	\$ 3,092	\$ 3,421	\$ 4,182
	Hogs and Pigs (\$1,000)	\$ 421	\$ 378	\$ 547	\$ 586	\$ 422	\$ 272	\$ 261	\$ 401	\$ 515	\$ 502	\$ 758
	Broilers (\$1,000)	\$ 4,034	\$ 4,121	\$ 3,556	\$ 3,716	\$ 3,253	\$ 4,181	\$ 5,094	\$ 5,344	\$ 4,662	\$ 4,145	\$ 4,868
	Turkeys (\$1,000)	\$ 2,087	\$ 2,547	\$ 2,414	\$ 4,200	\$ 3,302	\$ 3,551	\$ 2,574	\$ 1,703	\$ 2,194	\$ 2,481	\$ 1,680
	Eggs (\$1,000)	\$ 1,283	\$ 1,546	\$ 1,100	\$ 1,208	\$ 1,324	\$ 1,485	\$ 1,678	\$ 2,686	\$ 4,478	\$ 1,761	\$ 2,381
	Milk (\$1,000)	\$ 2,006	\$ 1,699	\$ 1,470	\$ 1,732	\$ 1,670	\$ 1,368	\$ 704	\$ 767	\$ 770	\$ 767	\$ 638
	Other	\$ 791	\$ 765	\$ 741	\$ 723	\$ 696	\$ 673	\$ 654	\$ 628	\$ 606	\$ 581	\$ 531
	Sheep and Lambs (\$1,000)	\$ 15	\$ 14	\$ 15	\$ 22	\$ 20	\$ 22	\$ 28	\$ 27	\$ 30	\$ 30	\$ 29
	Aquaculture (\$1,000)	\$ 776	\$ 751	\$ 726	\$ 701	\$ 676	\$ 651	\$ 626	\$ 601	\$ 576	\$ 551	\$ 502
	Total (\$1,000)	\$ 12,066	\$ 12,261	\$ 11,990	\$ 14,536	\$ 13,230	\$ 13,150	\$ 11,985	\$ 14,360	\$ 16,318	\$ 13,659	\$ 15,038

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	45	31	41	51	
	Cattle feedlots (112112)	7	8	4	1	
	Dairy cattle and milk production (11212)	12	15	6	6	
	Hog and pig farming (1122)	16	13	14	9	
	Poultry and egg production (1123)	10	14	32	26	
	Sheep and goat farming (1124)	14	11	19	27	
	Animal aquaculture and other animal production (1125,1129)	126	137	167	158	
Value of Sales (\$1,000)	Cattle and Calves	1,639	759	768	1,085	
	Hogs and Pigs	320	205	242	338	
	Poultry and Eggs	32	104	207	353	
	Milk and Other Dairy Products	2,776	3,246	1,487	withheld	
	Aquaculture	n/a	20,807	28,540	29,774	
	Other (calculated)	3,915	479	1,027	withheld	
	Total	8,682	25,600	32,271	31,550	
Input Purchases	Livestock and poultry purchased	(Farms)	127	117	118	168
		\$1,000	1,291	569	303	569
	Breeding livestock purchased	(Farms)	n/a	51	46	46
		\$1,000	n/a	432	107	250
	Other livestock and poultry purchased	(Farms)	n/a	80	86	148
		\$1,000	n/a	137	196	320
	Feed purchased	(Farms)	234	293	299	364
	\$1,000	2,532	4,078	5,096	6,386	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 5,705	\$ 1,033	22	\$ 203
	Hogs, Pigs, and Other	\$ 1,679	\$ 365	8	\$ 72
	Poultry and Eggs	\$ 12,131	\$ 2,432	51	\$ 479
	Dairy	\$ 894	\$ 188	4	\$ 37
	Total	\$ 20,408	\$ 4,018	86	\$ 792
Change from 2007 to 2017	Cattle and Calves	\$ 3,393	\$ 614	13	\$ 121
	Hogs, Pigs, and Other	\$ (174)	\$ (38)	(1)	\$ (7)
	Poultry and Eggs	\$ 324	\$ 65	1	\$ 13
	Dairy	\$ (2,405)	\$ (504)	(12)	\$ (99)
	Total	\$ 1,138	\$ 137	2	\$ 27
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	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	
Tax Rates	Federal effective income tax rate			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			0.0%	
	Total			19.7%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$2.8 billion in economic output
- 19,857 jobs
- \$637.8 million in earnings
- \$148.4 million in income taxes paid at local, state, and federal levels
- \$42.0 million in the form of property taxes

Arizona's animal agriculture consumed almost 105.6 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (51.6 thousand tons)
- Hogs (13.5 thousand tons)
- Companion Animals (13.5 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 2017, Arizona's animal agriculture contributed the following to the economy:

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- \$637.8 million in household earnings
- 19,857 jobs
- \$148.4 million in income taxes

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

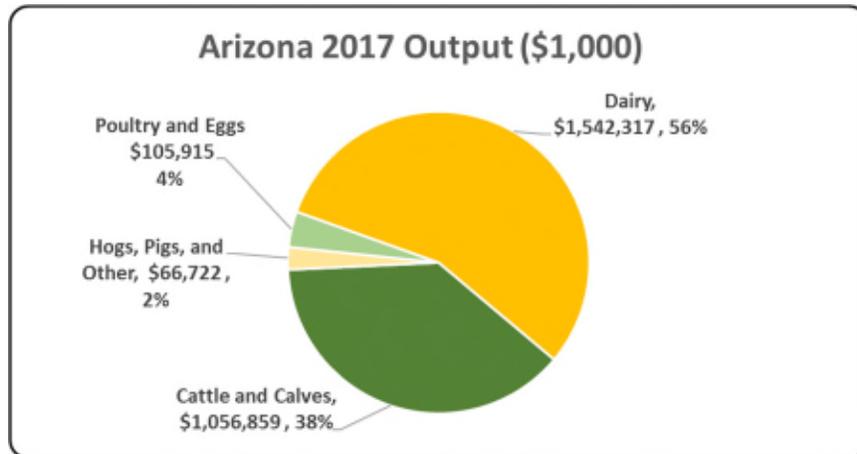
- Decreased economic output by \$11.7 million
- Reduced household earnings by \$8.6 million
- Shrunk by 280 jobs
- Paid \$2.0 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,771,813	\$ (11,705)	-0.42%
Earnings (\$1,000)	\$ 637,824	\$ (8,573)	-1.33%
Employment (Jobs)	19,857	(280)	-1.39%
Income Taxes Paid (\$1,000)	\$ 148,390	\$ (1,994)	-1.33%
Property Taxes Paid in 2012 (\$1,000)	\$ 42,014		

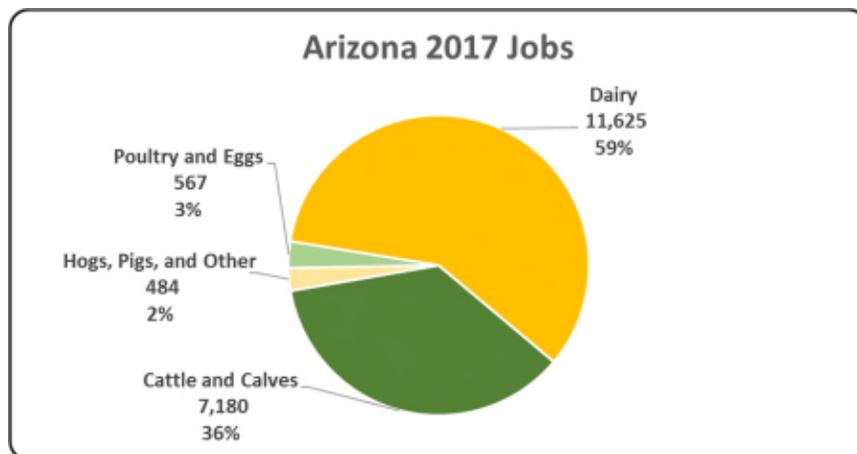
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Arizona Jobs

“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 19,857 jobs within and outside of animal agriculture.



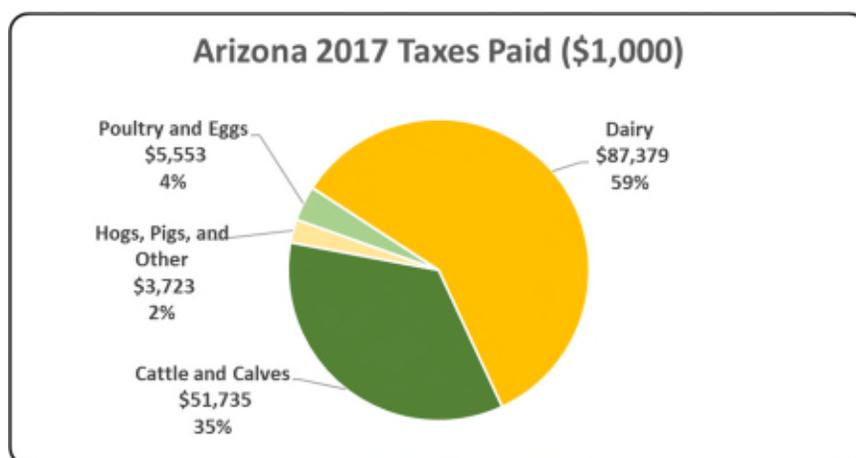
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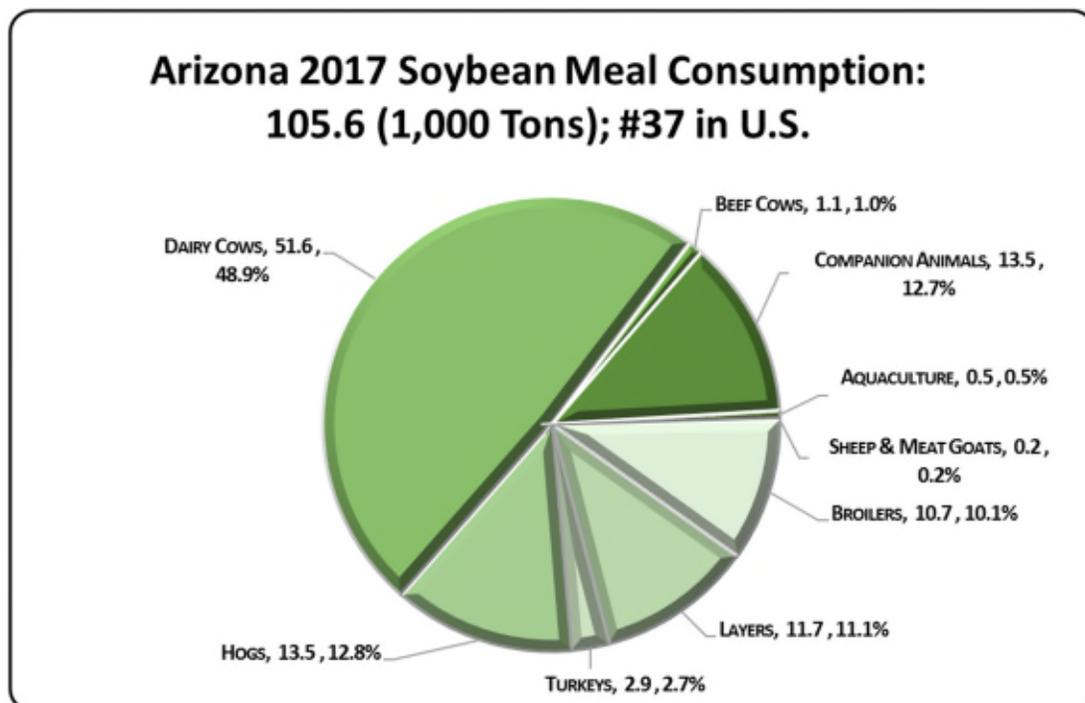
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Arizona's animal agriculture consumed almost 105.6 thousand tons of soybean meal in 2017, placing the state as #37 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Arizona consumed 13,632.6 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (51.6 thousand tons)
- Hogs (13.5 thousand tons)
- Companion Animals (13.5 thousand tons)

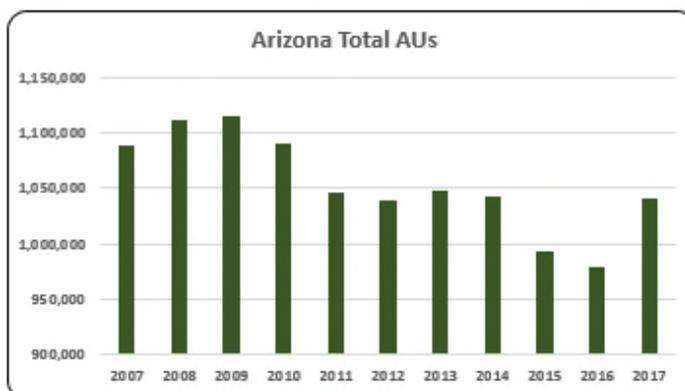
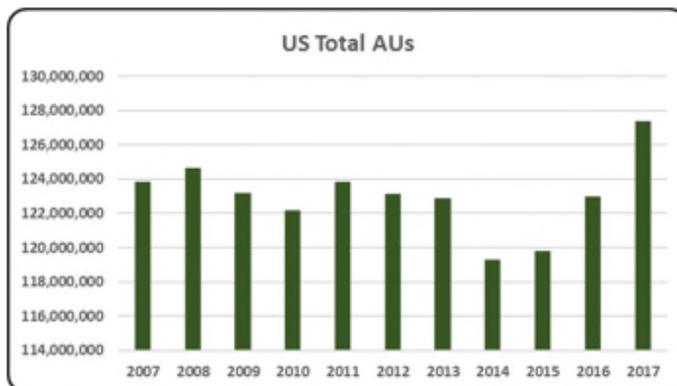


Arizona Animal Unit (AU) Trends

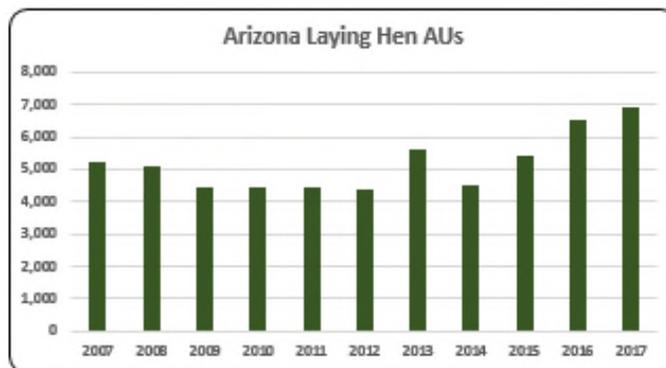
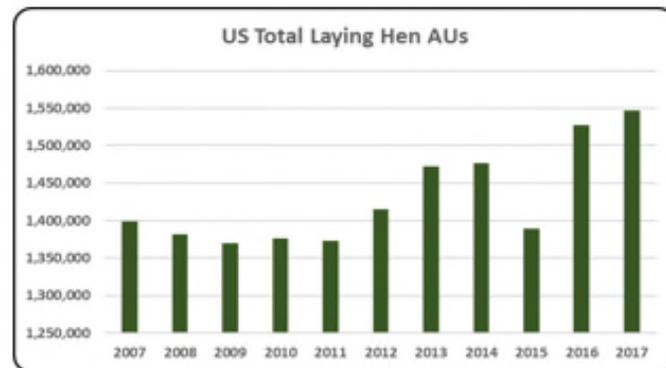
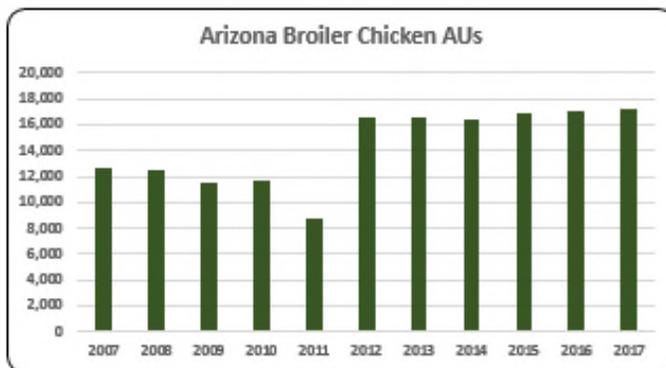
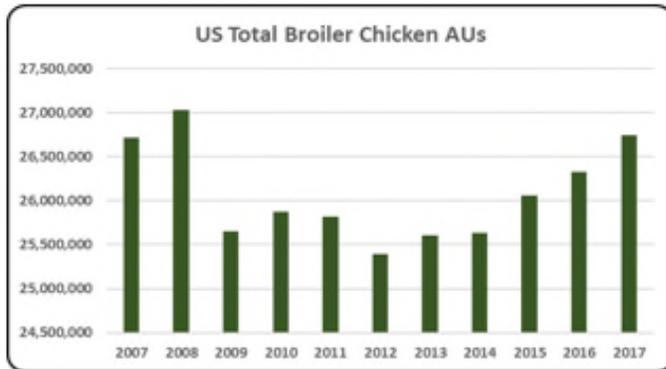
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Arizona. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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 Arizona and to give perspective on Arizona'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.

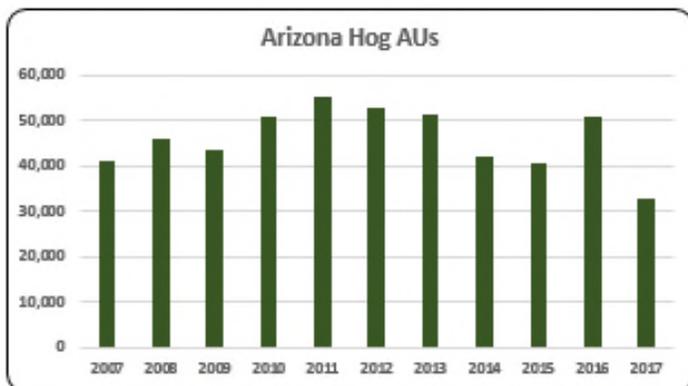
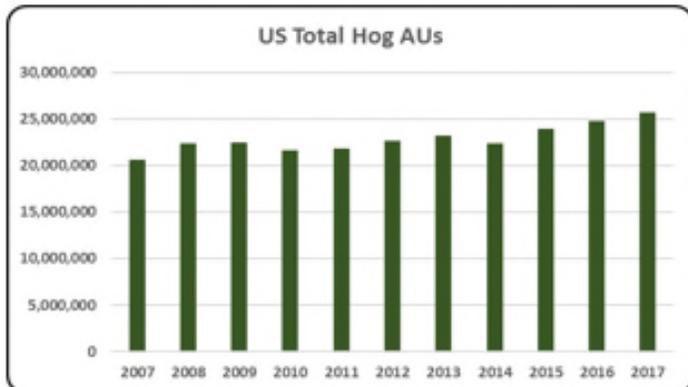
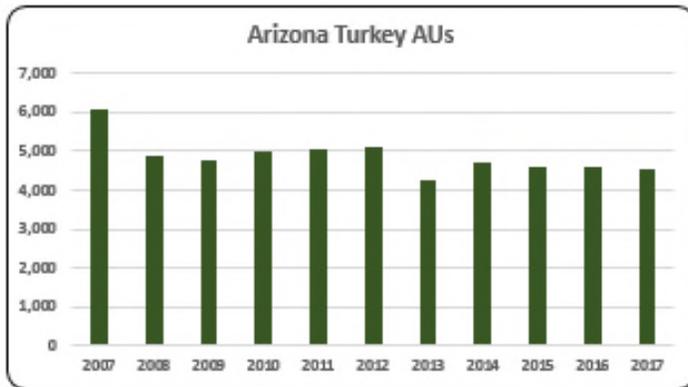
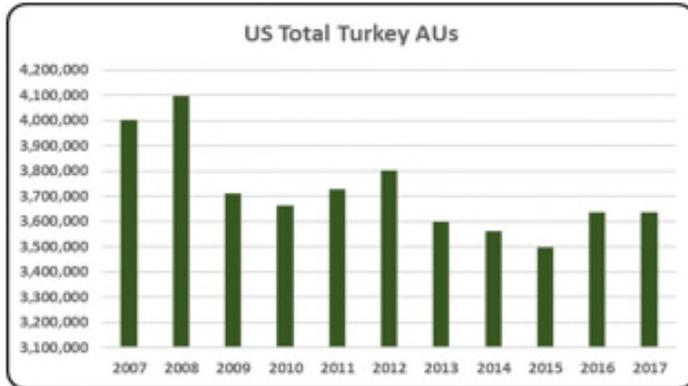
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Arizona, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (705,225 AUs), Dairy Cows (274,400 AUs), and Hogs (32,700 AUs). Total animal units in Arizona during 2017 were 1.04 million AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Arizona's AUs have hovered around 1 million since before 2007. 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 2017 AUs returned to a total 1.04 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 2017 Arizona broiler AUs were 17,243. Of the 27 million U.S. broiler AUs, Arizona’s 2017 broiler AUs represented only 0.06% of the U.S. total.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layer AUs in 2017 were 6,916, this is 0.7% of all AUs in Arizona. Since 2007, layer numbers in Arizona have increased almost 32%.

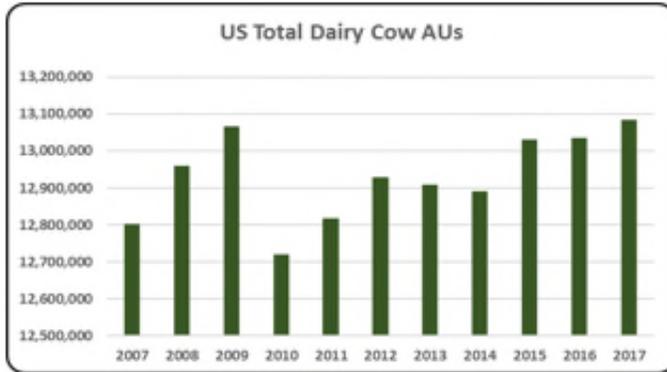


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

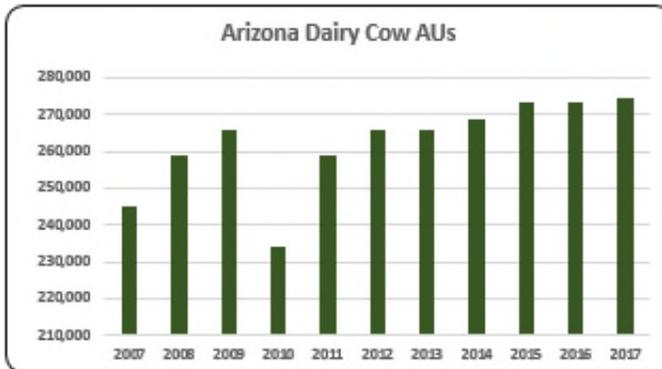
- Turkeys are a very small animal industry in Arizona, representing less than half-a-percent of the total AUs in the state (4,545 (2017)).

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

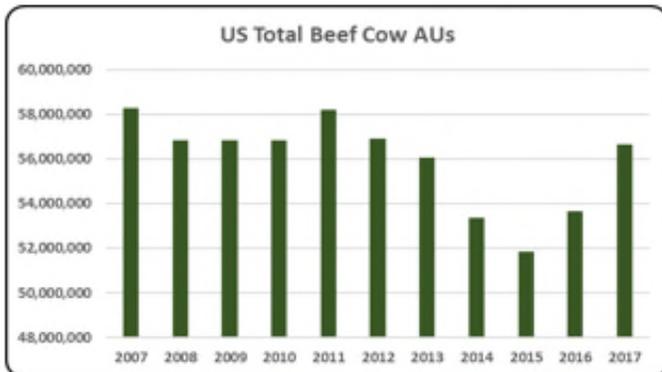
- Arizona hog AUs averaged 46,152 AUs the past decade. In 2017 hog AUs decreased to 32,700, the lowest of the decade.



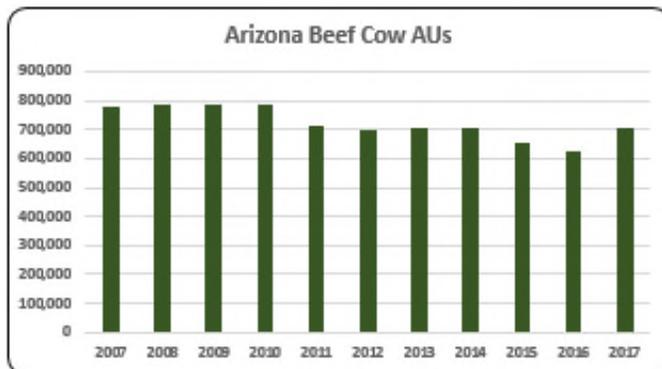
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- On average, there were 258,873 dairy cow AUs from 2007 to 2017. In 2017, dairy cow AUs reached a record number of 274,400 AUs.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow AUs in 2017 came in at 705,225. Additionally, beef cow AUs averaged 721,384 during the past decade.

Arizona Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	778,650	783,900	783,900	783,900	713,250	695,100	704,700	705,600	653,400	627,600	705,225
	Hog and Pig AUs	40,950	46,200	43,800	50,850	55,200	52,725	51,450	42,000	40,650	51,150	32,700
	Broiler AUs	12,631	12,434	11,561	11,716	8,828	16,601	16,543	16,449	16,873	17,000	17,243
	Turkey AUs	6,110	4,884	4,784	4,983	5,072	5,095	4,250	4,692	4,590	4,575	4,545
	Egg Layer AUs	5,248	5,099	4,459	4,430	4,456	4,352	5,635	4,490	5,403	6,562	6,916
	Dairy AUs	245,000	259,000	266,000	233,800	259,000	266,000	266,000	268,800	273,000	273,000	274,400
	Total Animal Units	1,088,590	1,111,517	1,114,504	1,089,679	1,045,806	1,039,873	1,048,578	1,042,031	993,916	979,887	1,041,029
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 425,743	\$ 400,883	\$ 321,152	\$ 372,692	\$ 594,015	\$ 615,659	\$ 624,078	\$ 693,792	\$ 644,700	\$ 514,051	\$ 584,578
	Hogs and Pigs (\$1,000)	\$ 34,363	\$ 41,713	\$ 38,575	\$ 51,594	\$ 63,606	\$ 55,619	\$ 58,422	\$ 53,303	\$ 41,013	\$ 47,820	\$ 32,873
	Broilers (\$1,000)	\$ 9,748	\$ 9,959	\$ 8,593	\$ 8,979	\$ 7,861	\$ 16,541	\$ 20,155	\$ 21,144	\$ 18,446	\$ 16,401	\$ 19,259
	Turkeys (\$1,000)	\$ 3,853	\$ 4,702	\$ 4,456	\$ 10,236	\$ 8,049	\$ 8,654	\$ 6,273	\$ 4,150	\$ 4,297	\$ 4,859	\$ 3,290
	Eggs (\$1,000)	\$ 22,347	\$ 26,931	\$ 19,168	\$ 21,041	\$ 23,070	\$ 25,873	\$ 29,231	\$ 46,789	\$ 78,001	\$ 30,674	\$ 41,475
	Milk (\$1,000)	\$ 804,110	\$ 765,776	\$ 493,922	\$ 660,009	\$ 873,774	\$ 793,408	\$ 875,355	\$ 1,091,096	\$ 757,440	\$ 730,387	\$ 836,670
	Other	\$ 5,255	\$ 5,878	\$ 6,797	\$ 7,722	\$ 9,307	\$ 9,860	\$ 9,389	\$ 10,116	\$ 11,479	\$ 12,068	\$ 11,136
	Sheep and Lambs (\$1,000)	\$ 3,358	\$ 3,314	\$ 3,566	\$ 3,824	\$ 4,742	\$ 4,627	\$ 3,489	\$ 3,549	\$ 4,244	\$ 4,166	\$ 4,116
	Aquaculture (\$1,000)	\$ 1,897	\$ 2,564	\$ 3,231	\$ 3,898	\$ 4,566	\$ 5,233	\$ 5,900	\$ 6,567	\$ 7,235	\$ 7,902	\$ 7,020
	Total (\$1,000)	\$ 1,305,418	\$ 1,255,842	\$ 892,662	\$ 1,132,274	\$ 1,579,683	\$ 1,525,614	\$ 1,622,903	\$ 1,920,391	\$ 1,555,376	\$ 1,356,260	\$ 1,529,281

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	2,242	2,067	4,901	4,201	
	Cattle feedlots (112112)	100	61	65	14	
	Dairy cattle and milk production (11212)	114	140	146	102	
	Hog and pig farming (1122)	49	73	86	213	
	Poultry and egg production (1123)	79	107	468	267	
	Sheep and goat farming (1124)	143	230	2,513	4,593	
	Animal aquaculture and other animal production (1125,1129)	1,087	1,874	3,056	5,506	
Value of Sales (\$1,000)	Cattle and Calves	366,250	403,959	585,479	700,307	
	Hogs and Pigs	20,860	withheld	withheld	withheld	
	Poultry and Eggs	5,322	withheld	withheld	withheld	
	Milk and Other Dairy Products	282,845	352,784	634,509	762,957	
	Aquaculture	1,718	755	2,713	5,363	
	Other (calculated)	17,819	50,174	98,837	11,276	
	Total	694,814	807,672	1,321,538	1,479,903	
Input Purchases	Livestock and poultry purchased	(Farms)	1,852	1,631	2,283	3,226
		\$1,000	149,969	171,369	315,343	166,502
	Breeding livestock purchased	(Farms)	n/a	954	1,374	1,817
		\$1,000	n/a	21,233	46,303	20,253
	Other livestock and poultry purchased	(Farms)	n/a	869	1,257	1,783
		\$1,000	n/a	150,137	269,040	146,249
	Feed purchased	(Farms)	3,260	4,524	12,611	16,346
	\$1,000	263,765	307,212	617,035	795,229	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,056,859	\$ 222,373	7,180	\$ 51,735
	Hogs, Pigs, and Other	\$ 66,722	\$ 16,002	484	\$ 3,723
	Poultry and Eggs	\$ 105,915	\$ 23,868	567	\$ 5,553
	Dairy	\$ 1,542,317	\$ 375,581	11,625	\$ 87,379
	Total	\$ 2,771,813	\$ 637,824	19,857	\$ 148,390
Change from 2007 to 2017	Cattle and Calves	\$ 153,443	\$ 32,286	1,042	\$ 7,511
	Hogs, Pigs, and Other	\$ (3,777)	\$ (906)	(27)	\$ (211)
	Poultry and Eggs	\$ 36,115	\$ 8,139	193	\$ 1,893
	Dairy	\$ (197,487)	\$ (48,092)	(1,489)	\$ (11,189)
	Total	\$ (11,705)	\$ (8,573)	(280)	\$ (1,994)
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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.6%	
	Total			23.3%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$14.4 billion in economic output
- 66,294 jobs
- \$3.0 billion in earnings
- \$715.0 million in income taxes paid at local, state, and federal levels
- \$86.7 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Arkansas has increased economic output by over \$1.5 billion, boosted household earnings by \$324.5 million, contributed 6,537 additional jobs and paid \$76.6 million in additional tax revenues.

Arkansas's animal agriculture consumed over 2.1 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (1.8 million tons)
- Turkeys (234.6 thousand tons)
- Egg-Laying Hens (45.4 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 2017, Arkansas's animal agriculture contributed the following to the economy:

- About \$14.4 billion in economic output
- \$3.0 billion in household earnings
- 66,294 jobs
- \$715.0 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:

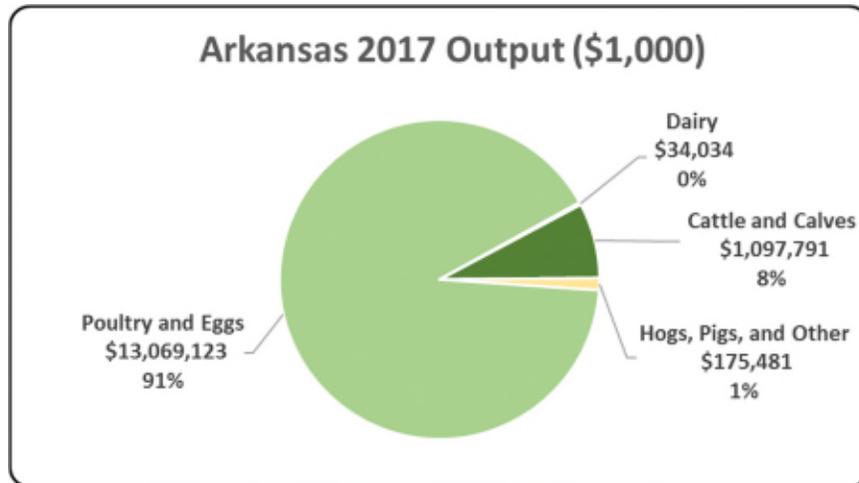
- Increased economic output by \$1.5 billion
- Boosted household earnings by \$324.5 million
- Added 6,537 jobs
- Paid an additional \$76.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 14,376,428	\$ 1,543,718	12.03%
Earnings (\$1,000)	\$ 3,029,833	\$ 324,488	11.99%
Employment (Jobs)	66,294	6,537	10.94%
Income Taxes Paid (\$1,000)	\$ 715,041	\$ 76,579	11.99%
Property Taxes Paid in 2012 (\$1,000)	\$ 86,682		

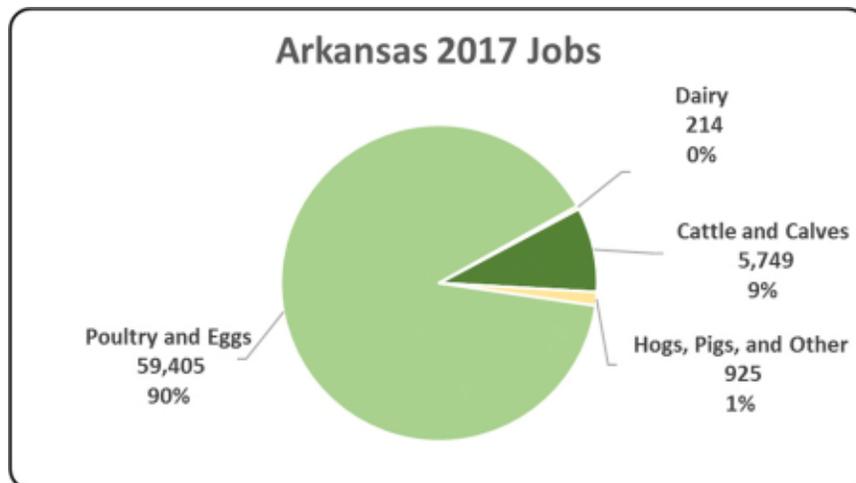
Arkansas Output

“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 \$14.4 billion.



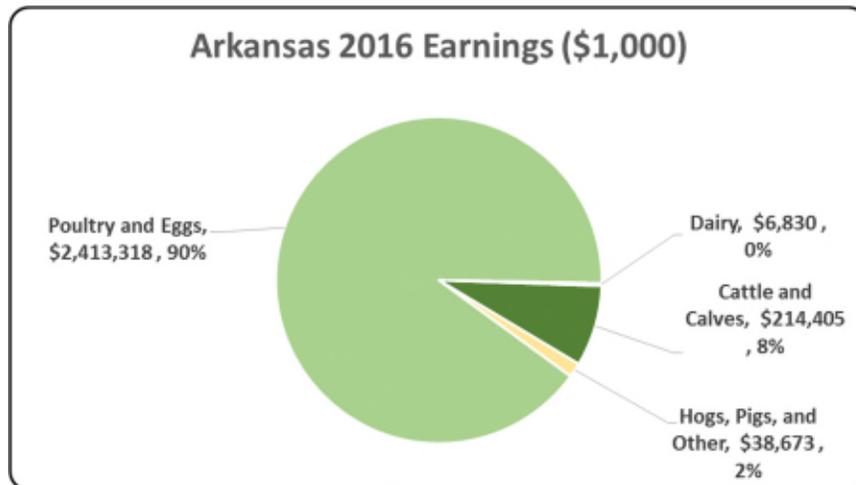
Arkansas Jobs

“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 66,294 jobs within and outside of animal agriculture.



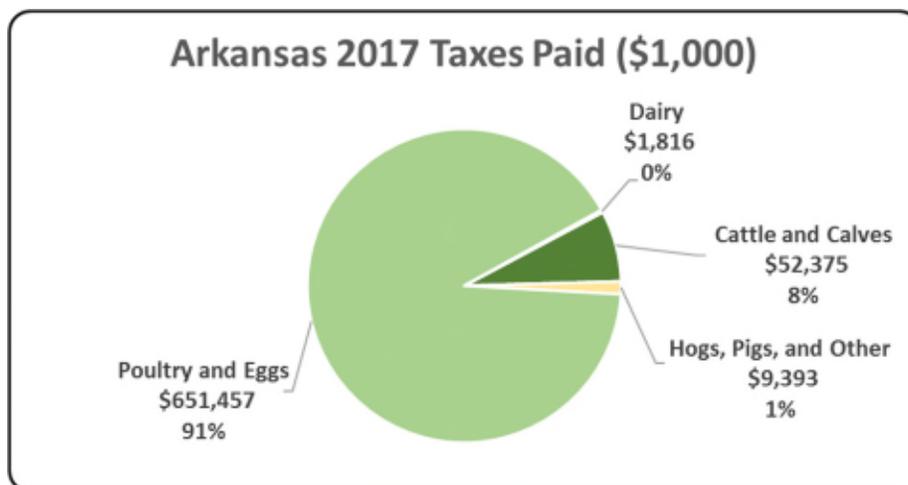
Arkansas Earnings

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 \$3.0 billion to household earnings in 2017.



Arkansas Taxes Paid by Animal Agriculture

Arkansas's animal agriculture is also a significant source of tax revenue. In 2017, the state's animal agriculture industry paid about \$715.0 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$86.7 million in property taxes paid by all of Arkansas agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



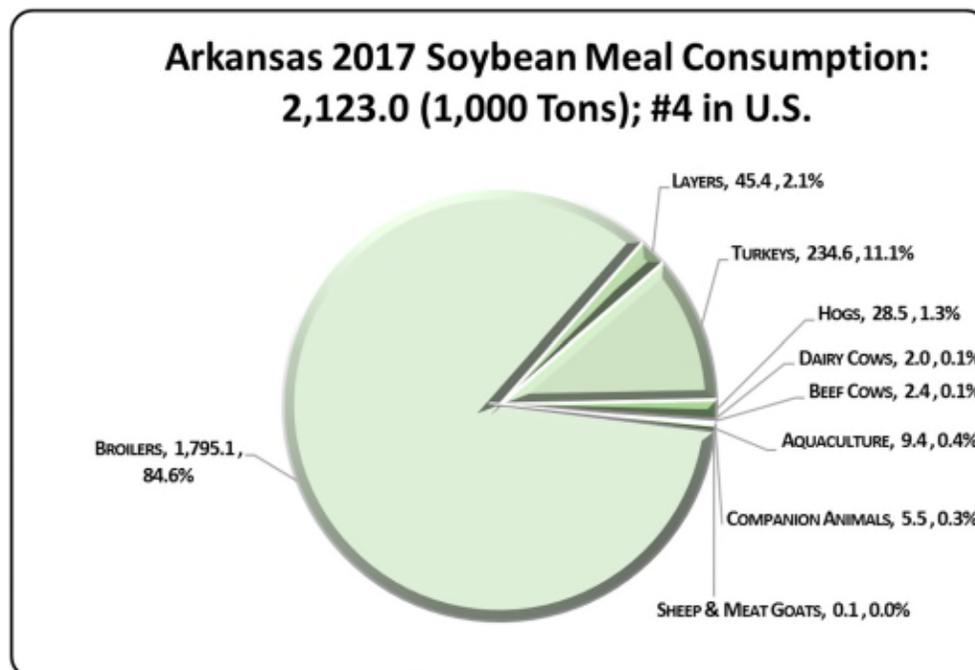
Arkansas Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Arkansas's animal agriculture consumed over 2.1 million tons of soybean meal in 2017, placing the state as #4 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Arkansas consumed 10,088.9 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (1.8 million tons)
- Turkeys (234.6 thousand tons)
- Egg-Laying Hens (45.4 thousand tons)

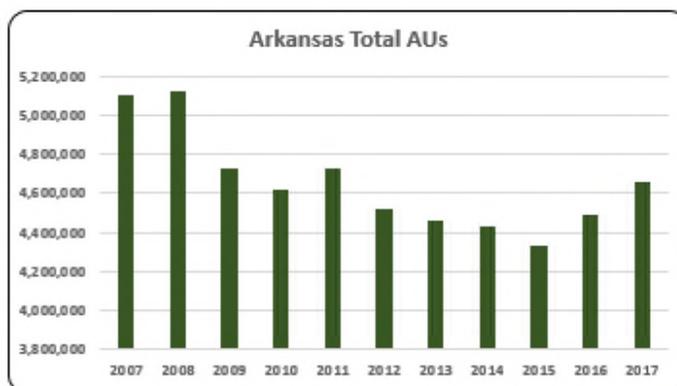
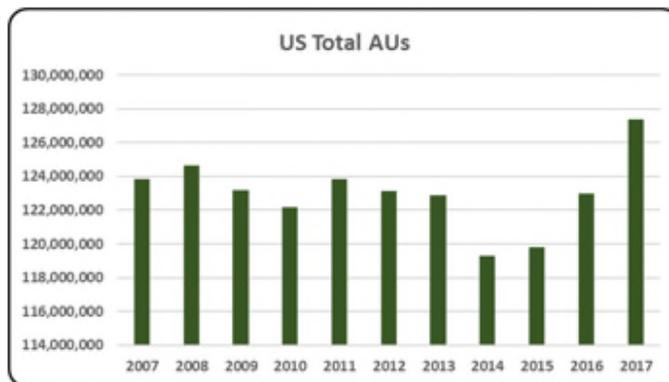


Arkansas Animal Unit (AU) Trends

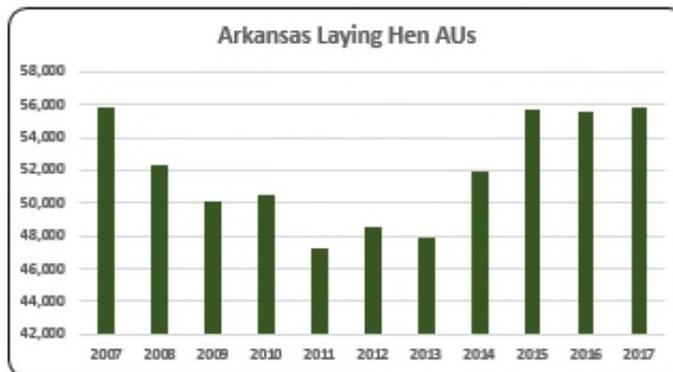
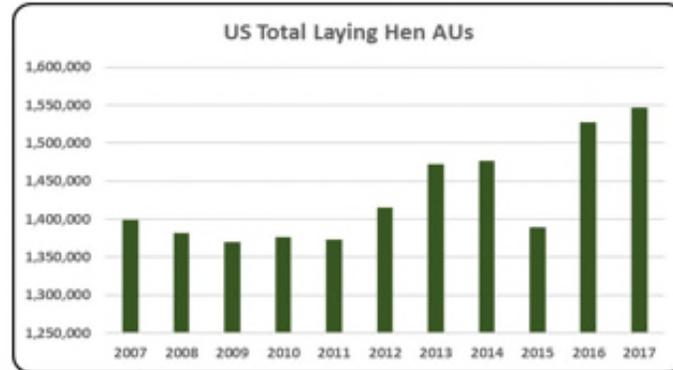
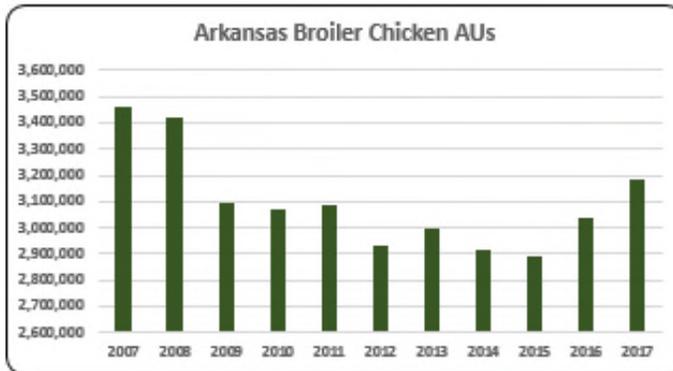
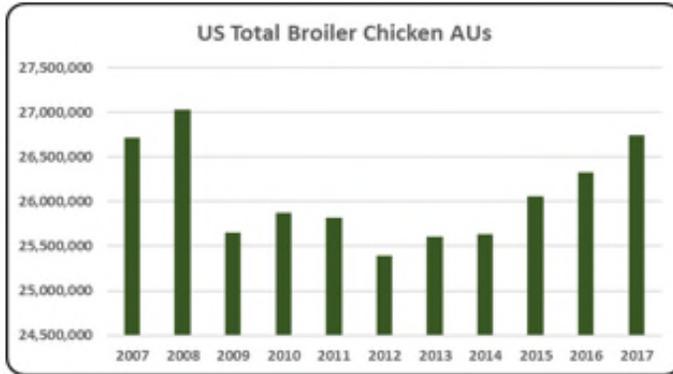
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Arkansas. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

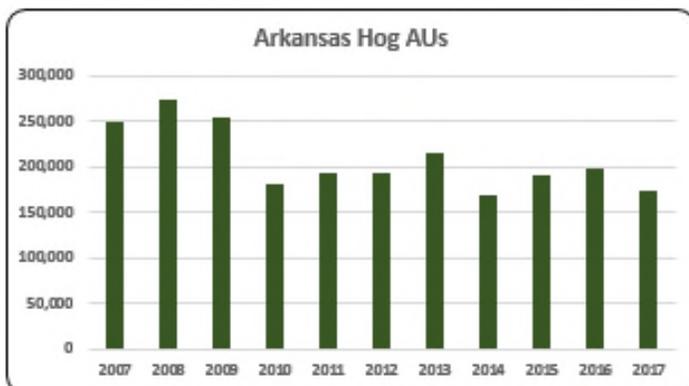
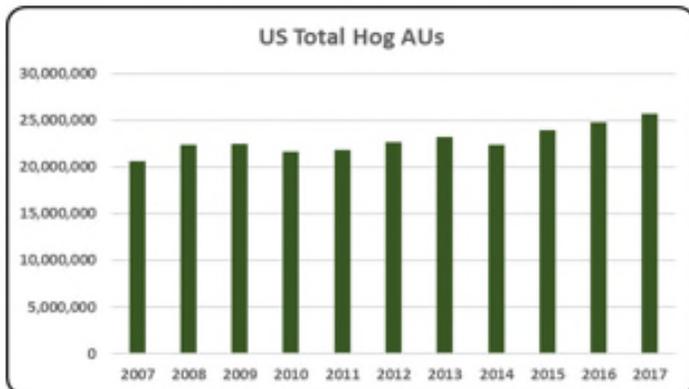
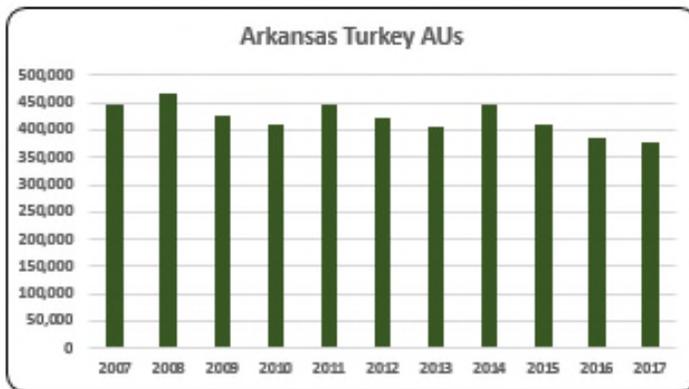
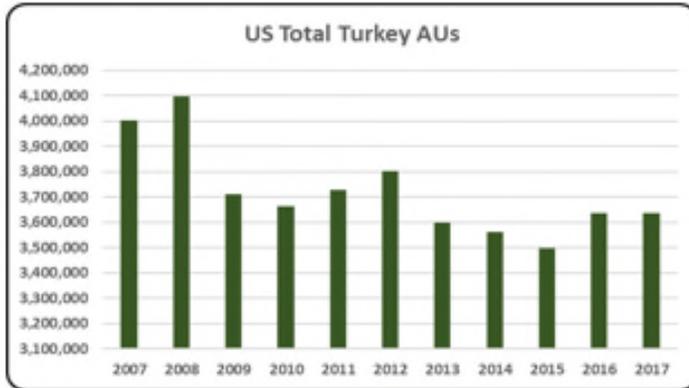
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Arkansas, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (3.2 million AUs), Beef Cows (859,500 AUs), and Turkeys (379,199 AUs). Total animal units in Arkansas during 2017 were nearly 4.7 million AUs.



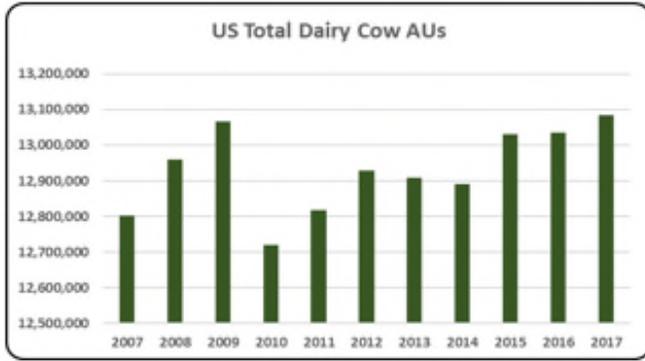
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- 3.7% (4.7 million) of the total U.S. AUs in 2017 were in Arkansas. Overall AUs in Arkansas have been decreasing over the last ten years from about 5.1 million in 2007 to 4.7 million in 2017.



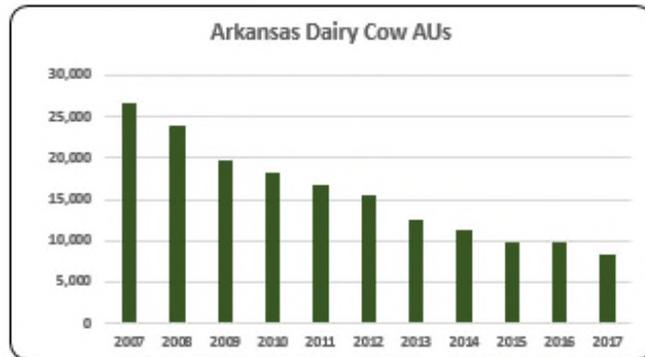
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler chickens are the largest animal sector in Arkansas in terms of animal units, representing about 68.32% (3.2 million) of all AUs in the state in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layer AUs rose to 55,819 in 2017. Layer AUs numbers remained slightly below the 2007 level of 58,840.



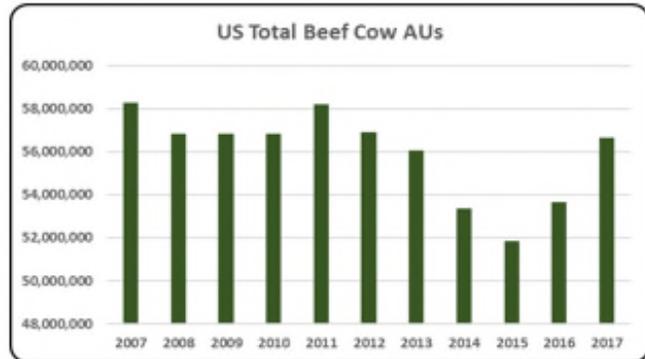
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkey AUs in 2017 were at a total of 379,199. The average number of turkey AUs in the last decade was 422,166 AUs.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs increased to 172,950 AUs in 2017. This is a 30% decrease in hog AUs compared to 2007. Overall, hog AUs represented 3.7% of all AUs in the state.



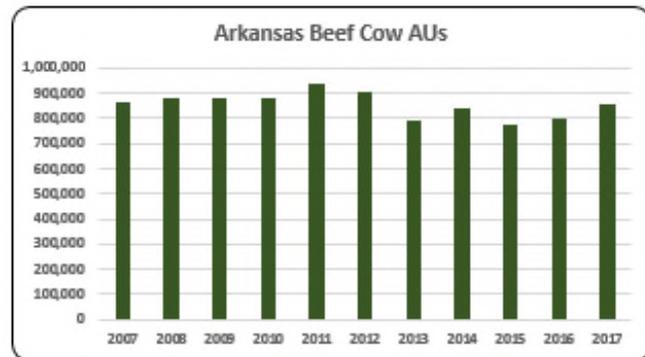
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cow AUs have consistently decreased (-68%) throughout the decade from 26,600 in 2007 to 8,400 in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Arkansas' beef cows are the second largest animal unit sector in the state with an average of 856,814 beef cow AUs during the last ten years (2007-2017).

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	867,900	884,250	884,250	884,250	936,150	904,200	789,000	838,950	773,850	802,650	859,500
	Hog and Pig AUs	248,700	274,500	255,000	181,800	193,800	192,600	214,650	168,450	191,400	198,450	172,950
	Broiler AUs	3,458,395	3,420,365	3,092,179	3,070,820	3,086,550	2,933,648	2,994,828	2,915,668	2,891,365	3,033,955	3,182,805
	Turkey AUs	445,427	468,010	424,942	409,602	445,508	423,624	405,521	446,951	408,904	386,140	379,199
	Egg Layer AUs	55,840	52,300	50,076	50,448	47,288	48,496	47,950	51,881	55,683	55,640	55,819
	Dairy AUs	26,600	23,800	19,600	18,200	16,800	15,400	12,600	11,200	9,800	9,800	8,400
	Total Animal Units	5,102,862	5,123,225	4,726,047	4,615,120	4,726,096	4,517,968	4,464,549	4,433,100	4,331,003	4,486,635	4,658,672
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 483,335	\$ 423,360	\$ 415,817	\$ 432,186	\$ 486,144	\$ 485,745	\$ 474,912	\$ 612,860	\$ 635,468	\$ 432,994	\$ 450,154
	Hogs and Pigs (\$1,000)	\$ 84,903	\$ 89,283	\$ 75,690	\$ 80,809	\$ 95,731	\$ 79,885	\$ 104,985	\$ 82,975	\$ 69,971	\$ 64,682	\$ 57,388
	Broilers (\$1,000)	\$ 2,617,566	\$ 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
	Turkeys (\$1,000)	\$ 320,488	\$ 335,121	\$ 254,424	\$ 309,372	\$ 394,705	\$ 400,718	\$ 357,896	\$ 452,684	\$ 456,934	\$ 432,587	\$ 336,201
	Eggs (\$1,000)	\$ 364,490	\$ 427,404	\$ 372,702	\$ 366,173	\$ 406,514	\$ 438,769	\$ 454,913	\$ 490,121	\$ 572,449	\$ 485,411	\$ 479,956
	Milk (\$1,000)	\$ 43,120	\$ 37,014	\$ 22,110	\$ 26,163	\$ 29,601	\$ 24,472	\$ 21,840	\$ 24,480	\$ 16,471	\$ 13,280	\$ 14,773
	Other	\$ 98,438	\$ 92,228	\$ 86,060	\$ 79,998	\$ 73,753	\$ 67,610	\$ 61,515	\$ 55,315	\$ 49,182	\$ 42,983	\$ 46,478
	Sheep and Lambs (\$1,000)	\$ 281	\$ 265	\$ 289	\$ 421	\$ 369	\$ 418	\$ 516	\$ 509	\$ 569	\$ 563	\$ 537
	Aquaculture (\$1,000)	\$ 98,156	\$ 91,963	\$ 85,771	\$ 79,578	\$ 73,385	\$ 67,192	\$ 60,999	\$ 54,806	\$ 48,613	\$ 42,420	\$ 45,941
	Total (\$1,000)	\$ 4,012,340	\$ 4,339,210	\$ 3,868,263	\$ 4,156,576	\$ 4,174,168	\$ 4,376,399	\$ 5,104,950	\$ 5,549,735	\$ 5,112,833	\$ 4,608,143	\$ 5,187,184

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	24,329	23,888	22,854	22,009
	Cattle feedlots (112112)	703	781	65	3
	Dairy cattle and milk production (11212)	637	348	291	106
	Hog and pig farming (1122)	582	444	396	228
	Poultry and egg production (1123)	4,948	4,737	4,212	3,298
	Sheep and goat farming (1124)	184	419	775	1,111
	Animal aquaculture and other animal production (1125,1129)	1,922	4,406	4,922	4,148
Value of Sales (\$1,000)	Cattle and Calves	383,466	421,226	625,996	766,476
	Hogs and Pigs	218,626	123,803	84,202	47,178
	Poultry and Eggs	2,605,644	2,617,592	3,716,164	4,011,725
	Milk and Other Dairy Products	78,845	54,049	44,770	28,225
	Aquaculture	84,120	92,638	118,744	67,453
	Other (calculated)	10,016	20,706	17,957	8,123
	Total	3,380,717	3,330,014	4,607,833	4,929,180
Input Purchases	Livestock and poultry purchased (Farms)	14,619	15,183	12,921	12,996
	\$1,000	467,737	515,620	828,459	891,909
	Breeding livestock purchased (Farms)	n/a	8,543	7,012	7,686
	\$1,000	n/a	22,752	49,799	108,357
	Other livestock and poultry purchased (Farms)	n/a	8,638	7,713	7,155
	\$1,000	n/a	492,868	778,660	783,552
	Feed purchased (Farms)	29,654	34,143	30,394	32,540
\$1,000	1,654,949	1,250,849	2,023,611	2,617,016	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,097,791	\$ 221,926	5,749	\$ 52,375
	Hogs, Pigs, and Other	\$ 175,481	\$ 39,801	925	\$ 9,393
	Poultry and Eggs	\$ 13,069,123	\$ 2,760,412	59,405	\$ 651,457
	Dairy	\$ 34,034	\$ 7,694	214	\$ 1,816
	Total	\$ 14,376,428	\$ 3,029,833	66,294	\$ 715,041

Change from 2007 to 2017	Cattle and Calves	\$ (285,687)	\$ (57,754)	(1,496)	\$ (13,630)
	Hogs, Pigs, and Other	\$ (188,084)	\$ (42,660)	(992)	\$ (10,068)
	Poultry and Eggs	\$ 2,100,053	\$ 443,565	9,546	\$ 104,681
	Dairy	\$ (82,563)	\$ (18,664)	(520)	\$ (4,405)
	Total	\$ 1,543,718	\$ 324,488	6,537	\$ 76,579

	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.9%
	Total	23.6%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$18.7 billion in economic output
- 85,995 jobs
- \$4.3 billion in earnings
- \$1.2 billion in income taxes paid at local, state, and federal levels
- \$827.6 million in the form of property taxes

California's animal agriculture consumed almost 788.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (451.6 thousand tons)
- Egg-Laying Hens (124.6 thousand tons)
- Turkeys (105.6 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 2017, California's animal agriculture contributed the following to the economy:

- About \$18.7 billion in economic output
- \$4.3 billion in household earnings
- 85,995 jobs
- \$1.2 billion in income taxes

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

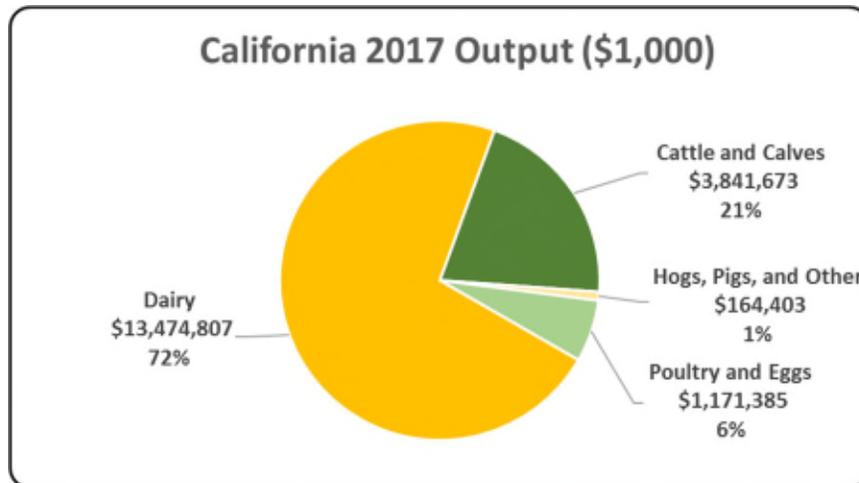
- Decreased economic output by \$3.6 billion
- Reduced household earnings by \$897.8 million
- Shrunk by 18,163 jobs
- Paid \$241.1 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 18,652,268	\$ (3,644,457)	-16.35%
Earnings (\$1,000)	\$ 4,329,793	\$ (897,827)	-17.17%
Employment (Jobs)	85,995	(18,163)	-17.44%
Income Taxes Paid (\$1,000)	\$ 1,162,549	\$ (241,067)	-17.17%
Property Taxes Paid in 2012 (\$1,000)	\$ 827,587		

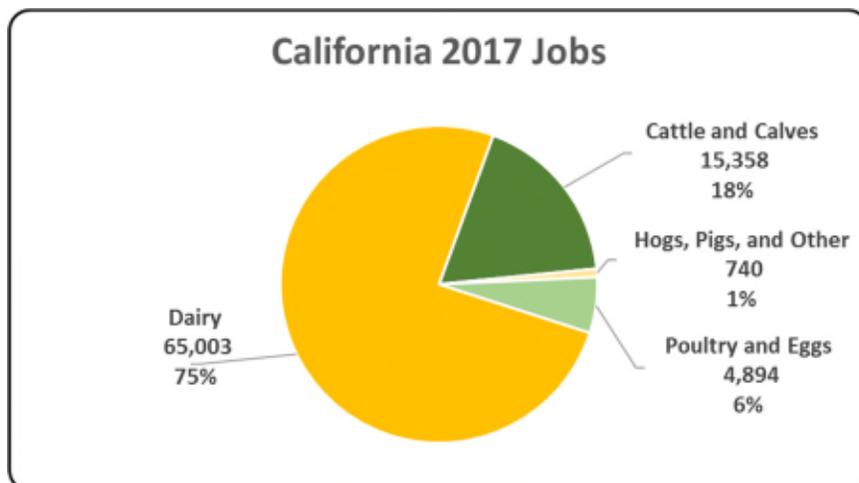
California Output

“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 \$18.7 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 85,995 jobs within and outside of animal agriculture in California.



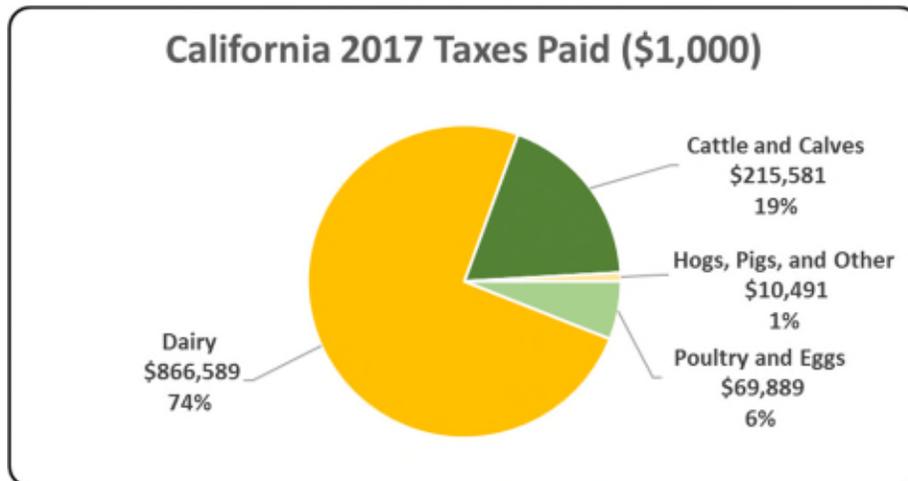
California Earnings

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 \$4.3 billion to household earnings in 2017.



California Taxes Paid by Animal Agriculture

California’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$1.2 billion in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$827.6 million in property taxes paid by all of California agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



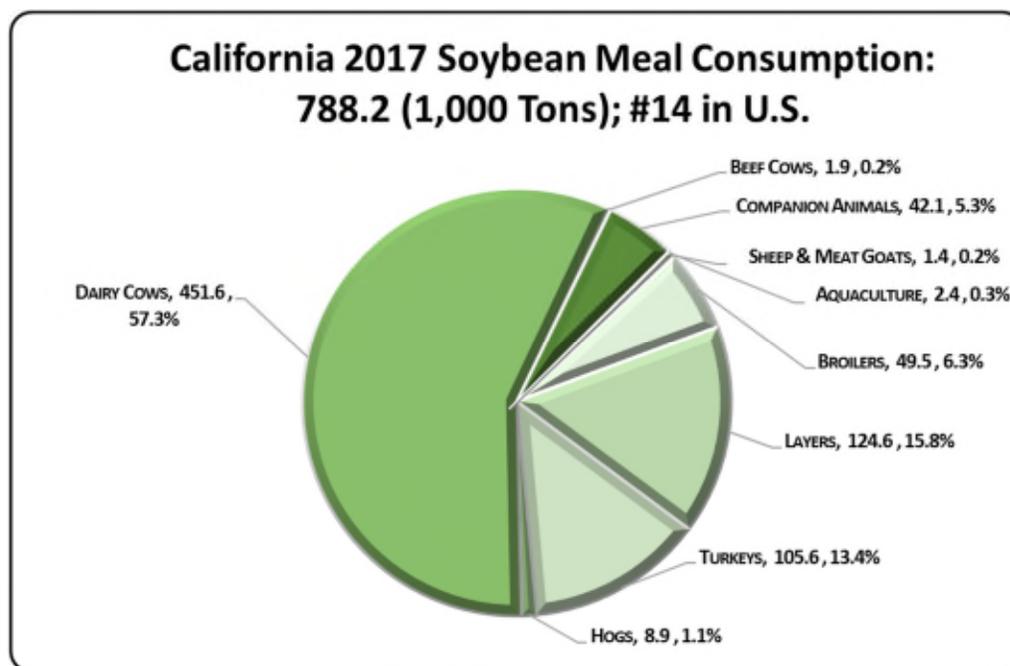
California Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

California's animal agriculture consumed almost 788.2 thousand tons of soybean meal in 2017, placing the state as #14 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in California consumed 91,318 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (451.6 thousand tons)
- Egg-Laying Hens (124.6 thousand tons)
- Turkeys (105.6 thousand tons)

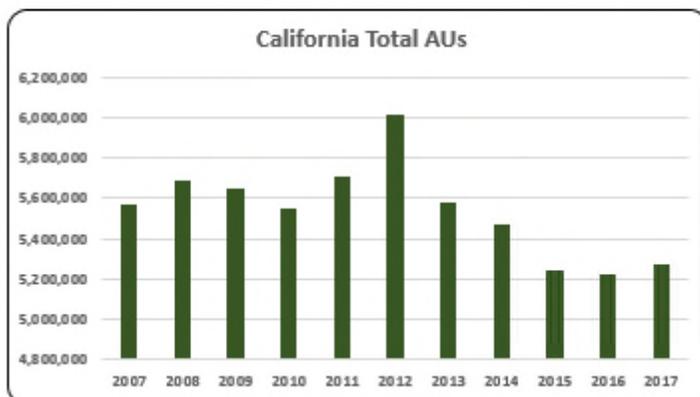
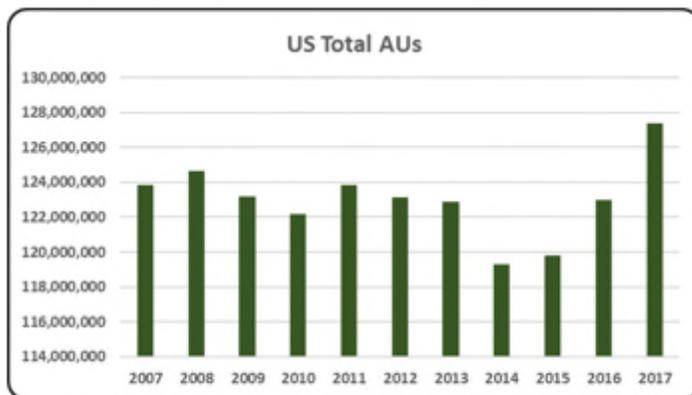


California Animal Unit (AU) Trends

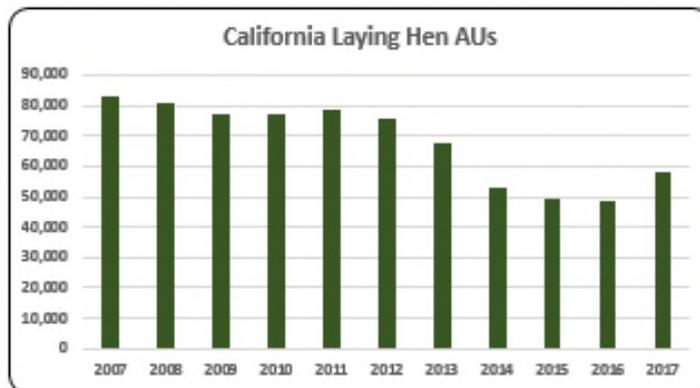
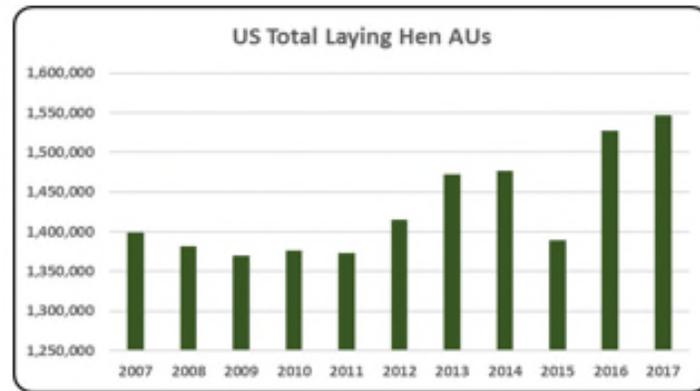
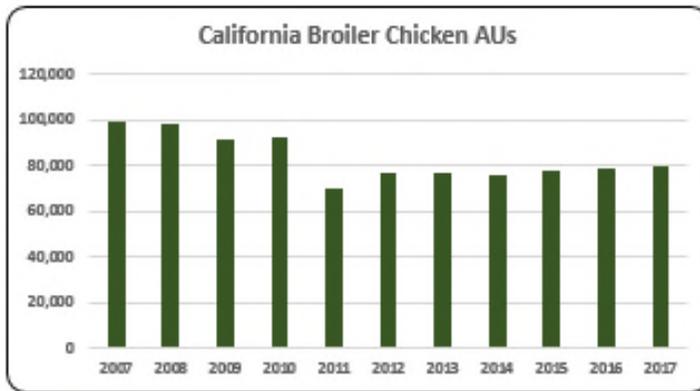
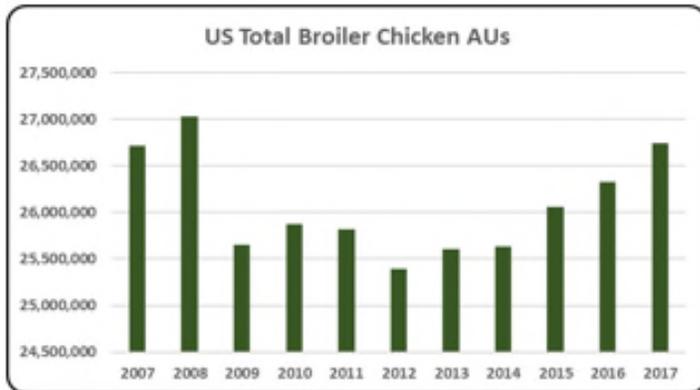
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of California. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

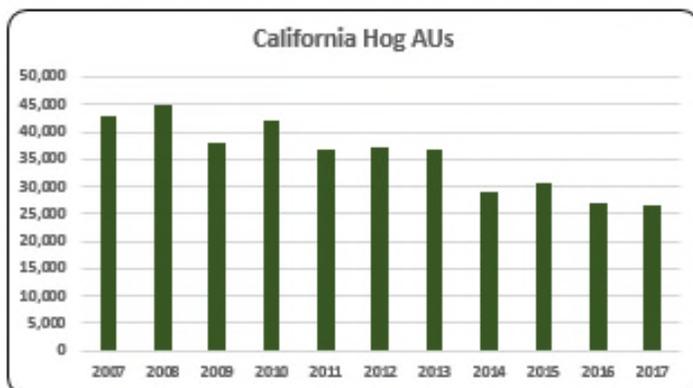
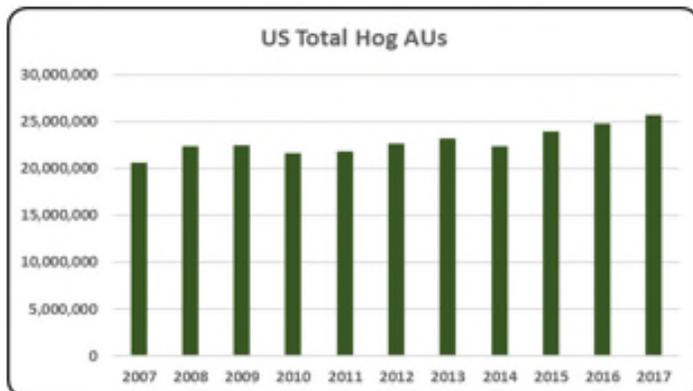
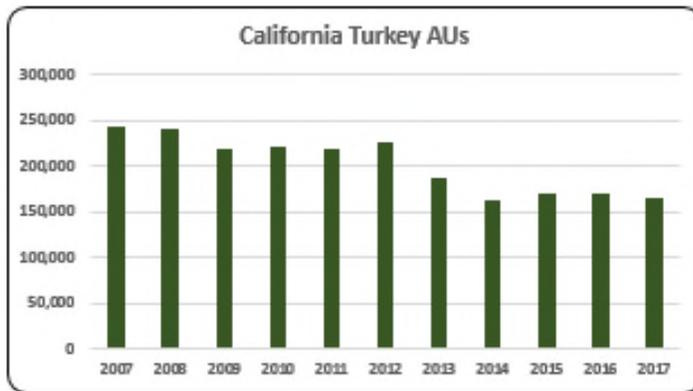
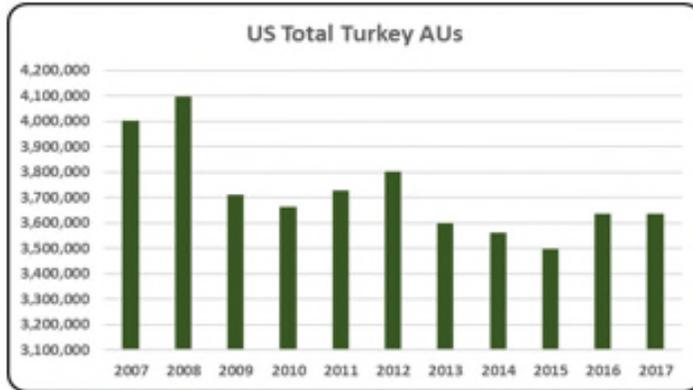
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In California, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (2.48 million AUs), Dairy Cows (2.46 million AUs), and Turkeys (164,558 AUs). Total animal units in California during 2017 were 5.3 million AUs.



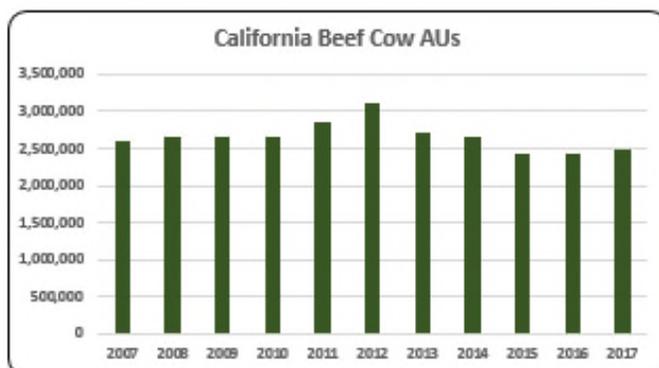
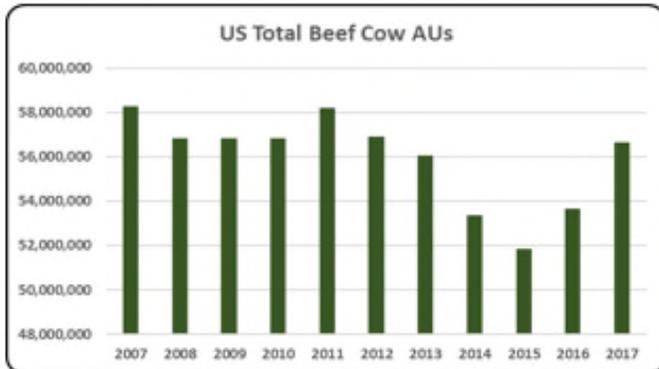
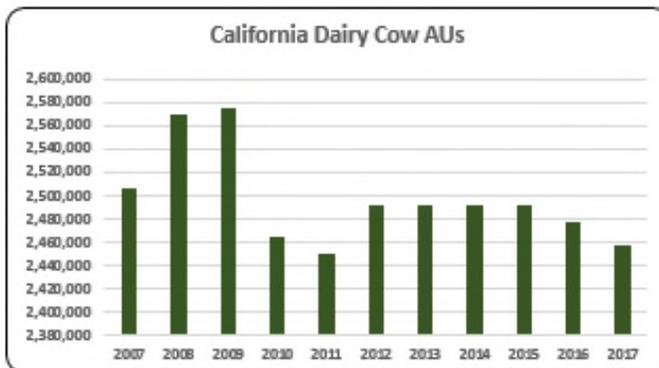
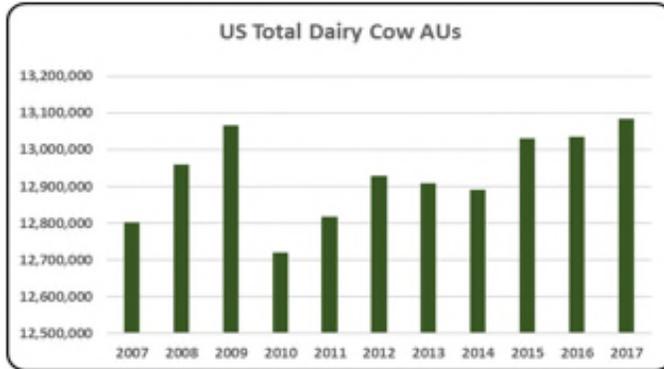
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- California’s total AUs in 2017 reached 5.3 million. From 2007 to 2017 AUs in California averaged 5.5 million (4.1% of total U.S. AUs).



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Over the last decade there were, on average, 88,398 broiler AUs in California. Overall, broiler numbers in California declined since 2007, but broiler AUs over the last four years have been stable between 76,000 and 79,000 AUs, with 2017 having 79,773 broiler AUs.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In 2017, there were 58,300 layer AUs in California. Layer AUs have decreased since 2007 (82,796) to 2017 (58,300).



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- There were 164,558 turkey AUs in California in 2017. Turkey AUs have decreased 33% since 2007.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- California’s hog AUs decreased 38% to 26,550 AUs, the lowest of the decade.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- California had 18.78% (nearly 2.5 million) of all dairy cow AUs in the U.S. (47% of state AUs) in 2017; however, California’s dairy cow AUs in 2017 (2.457 million) were lower than in 2008-2009 (2.57 million).
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- California’s beef cow AUs in 2017 were 2.5 million animal units. Beef cow AUs averaged in at 2.7 million AUs for the past decade.

California Additional Information and Methodology

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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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 California, \$1.60 to \$2.09 million in total economic activity, \$0.38 to \$0.49 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	\$ 1.851	\$ 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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	2,592,750	2,650,500	2,650,500	2,650,500	2,852,250	3,103,050	2,722,650	2,651,850	2,419,350	2,419,350	2,484,600
	Hog and Pig AUs	42,750	45,000	37,950	42,000	36,900	37,350	36,600	29,100	30,600	27,000	26,550
	Broiler AUs	99,743	98,188	91,292	92,520	69,714	76,801	76,533	76,098	78,063	78,651	79,773
	Turkey AUs	244,607	241,554	219,798	222,355	219,102	226,420	188,277	163,882	170,996	169,307	164,558
	Egg Layer AUs	82,796	80,580	77,092	77,372	78,876	75,806	67,455	53,096	49,217	48,633	58,300
	Dairy AUs	2,506,000	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
	Total Animal Units	5,568,647	5,684,822	5,652,631	5,548,747	5,706,843	6,011,427	5,583,515	5,466,026	5,240,226	5,220,941	5,270,781
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,289,346	\$ 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
	Hogs and Pigs (\$1,000)	\$ 32,955	\$ 26,177	\$ 18,979	\$ 23,925	\$ 28,859	\$ 24,991	\$ 21,269	\$ 20,110	\$ 29,667	\$ 24,311	\$ 25,635
	Broilers (\$1,000)	\$ 76,976	\$ 78,642	\$ 67,851	\$ 70,907	\$ 62,078	\$ 76,525	\$ 93,245	\$ 97,821	\$ 85,340	\$ 75,878	\$ 89,099
	Turkeys (\$1,000)	\$ 211,669	\$ 243,005	\$ 181,552	\$ 237,833	\$ 274,105	\$ 295,973	\$ 233,464	\$ 229,449	\$ 275,382	\$ 266,669	\$ 203,818
	Eggs (\$1,000)	\$ 346,426	\$ 440,438	\$ 319,805	\$ 367,788	\$ 387,522	\$ 392,950	\$ 382,690	\$ 422,607	\$ 527,701	\$ 210,160	\$ 267,581
	Milk (\$1,000)	\$ 7,343,282	\$ 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
	Other	\$ 100,841	\$ 100,670	\$ 106,821	\$ 124,046	\$ 121,507	\$ 136,732	\$ 124,195	\$ 128,793	\$ 142,110	\$ 135,784	\$ 77,104
	Sheep and Lambs (\$1,000)	\$ 27,740	\$ 25,822	\$ 30,226	\$ 45,704	\$ 41,418	\$ 54,896	\$ 40,612	\$ 43,463	\$ 55,033	\$ 46,960	\$ 50,962
	Aquaculture (\$1,000)	\$ 73,101	\$ 74,848	\$ 76,595	\$ 78,342	\$ 80,089	\$ 81,836	\$ 83,583	\$ 85,330	\$ 87,077	\$ 88,824	\$ 26,142
	Total (\$1,000)	\$ 9,401,495	\$ 9,188,903	\$ 6,332,111	\$ 8,075,524	\$ 10,566,820	\$ 10,152,040	\$ 10,754,319	\$ 12,846,266	\$ 9,819,572	\$ 8,786,164	\$ 9,305,141

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	11,840	11,259	11,153	11,767	
	Cattle feedlots (112112)	528	553	404	156	
	Dairy cattle and milk production (11212)	2,122	2,361	1,839	1,594	
	Hog and pig farming (1122)	522	626	425	446	
	Poultry and egg production (1123)	1,046	914	1,798	1,202	
	Sheep and goat farming (1124)	1,533	2,485	3,041	3,246	
	Animal aquaculture and other animal production (1125,1129)	5,739	10,035	11,096	7,809	
Value of Sales (\$1,000)	Cattle and Calves	1,447,849	1,582,334	2,536,571	3,259,325	
	Hogs and Pigs	41,288	27,488	34,188	51,526	
	Poultry and Eggs	1,195,967	1,017,968	1,536,763	1,663,919	
	Milk and Other Dairy Products	3,184,363	3,739,213	6,569,172	6,945,102	
	Aquaculture	43,509	64,557	102,228	103,016	
	Other (calculated)	165,398	152,891	203,121	175,445	
	Total	6,078,374	6,584,451	10,982,043	12,198,333	
Input Purchases	Livestock and poultry purchased	(Farms) 10,957	10,745	10,881	12,585	
		\$1,000	759,223	949,697	1,264,818	1,254,286
	Breeding livestock purchased	(Farms) <i>n/a</i>	6,070	5,951	6,850	
		\$1,000	<i>n/a</i>	114,594	186,901	255,730
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	6,404	6,356	7,673	
		\$1,000	<i>n/a</i>	835,104	1,077,917	998,556
	Feed purchased	(Farms) 20,385	28,663	29,596	30,014	
	\$1,000	2,588,982	2,494,806	4,274,263	6,069,374	

	2017 Animal Agriculture		Change from 2007 to 2017		
	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 3,841,673	\$ 802,908	15,358	\$ 215,581
	Hogs, Pigs, and Other	\$ 164,403	\$ 39,072	740	\$ 10,491
	Poultry and Eggs	\$ 1,171,385	\$ 260,295	4,894	\$ 69,889
	Dairy	\$ 13,474,807	\$ 3,227,518	65,003	\$ 866,589
	Total	\$ 18,652,268	\$ 4,329,793	85,995	\$ 1,162,549
Change from 2007 to 2017	Cattle and Calves	\$ 1,040,188	\$ 217,399	4,158	\$ 58,372
	Hogs, Pigs, and Other	\$ (86,892)	\$ (20,650)	(391)	\$ (5,545)
	Poultry and Eggs	\$ (386,422)	\$ (85,867)	(1,615)	\$ (23,055)
	Dairy	\$ (4,211,332)	\$ (1,008,708)	(20,316)	\$ (270,838)
	Total	\$ (3,644,457)	\$ (897,827)	(18,163)	\$ (241,067)
	RIMS II Multipliers		Tax Rates		
	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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			7.2%	
	Total			26.9%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$7.4 billion in economic output
- 44,763 jobs
- \$1.6 billion in earnings
- \$395.8 million in income taxes paid at local, state, and federal levels
- \$96.2 million in the form of property taxes

Colorado's animal agriculture consumed almost 282.0 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (137.4 thousand tons)
- Egg-Laying Hens (40.7 thousand tons)
- Dairy Cows (40.4 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 an important but shrinking part of Colorado's economy. In 2017, Colorado's animal agriculture contributed the following to the economy:

- About \$7.4 billion in economic output
- \$1.6 billion in household earnings
- 44,763 jobs
- \$395.8 million in income taxes

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

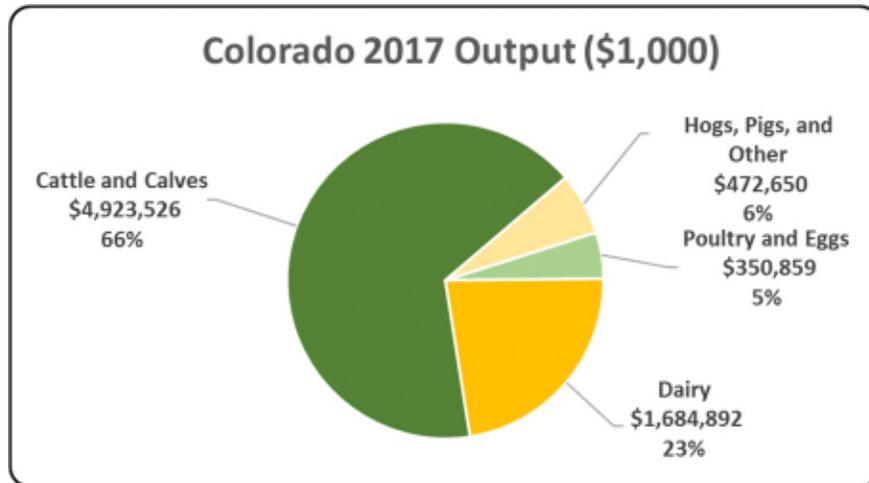
- Decreased economic output by \$259.2 million
- Reduced household earnings by \$47.6 million
- Shrunk by 1,292 jobs
- Paid \$11.6 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 7,431,927	\$ (259,208)	-3.37%
Earnings (\$1,000)	\$ 1,626,998	\$ (47,594)	-2.84%
Employment (Jobs)	44,763	(1,292)	-2.80%
Income Taxes Paid (\$1,000)	\$ 395,849	\$ (11,580)	-2.84%
Property Taxes Paid in 2012 (\$1,000)	\$ 96,212		

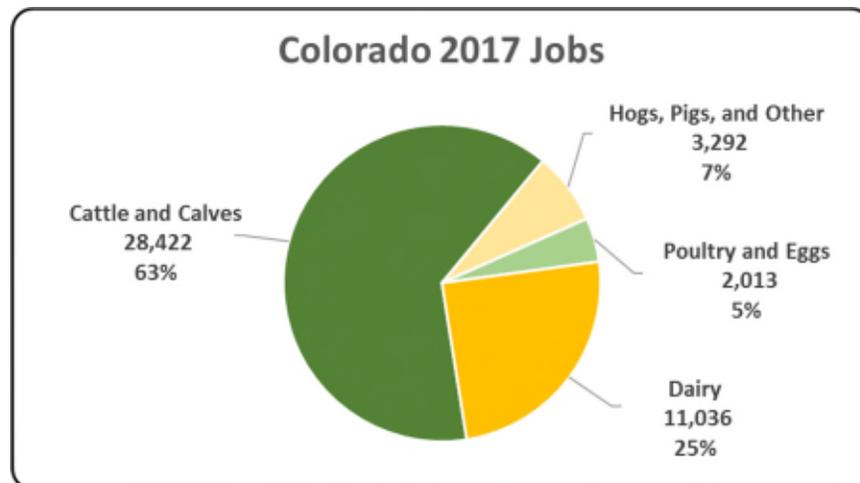
Colorado Output

“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.



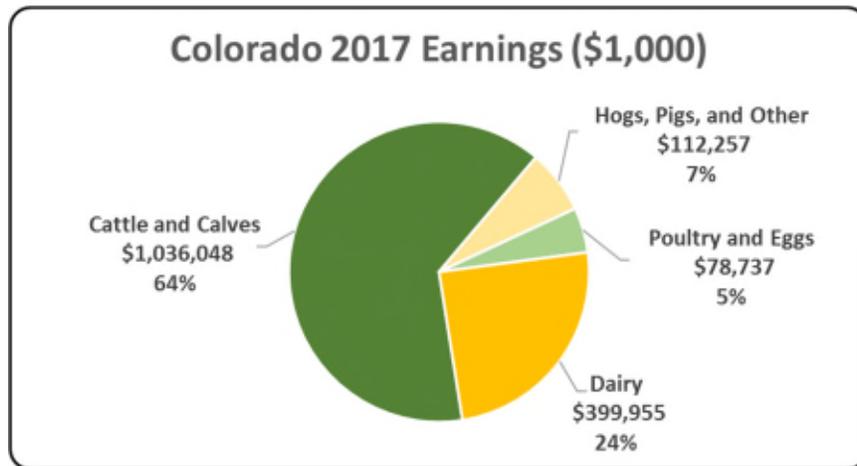
Colorado Jobs

“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 significantly to Colorado total jobs, contributing 44,763 jobs within and outside of animal agriculture.



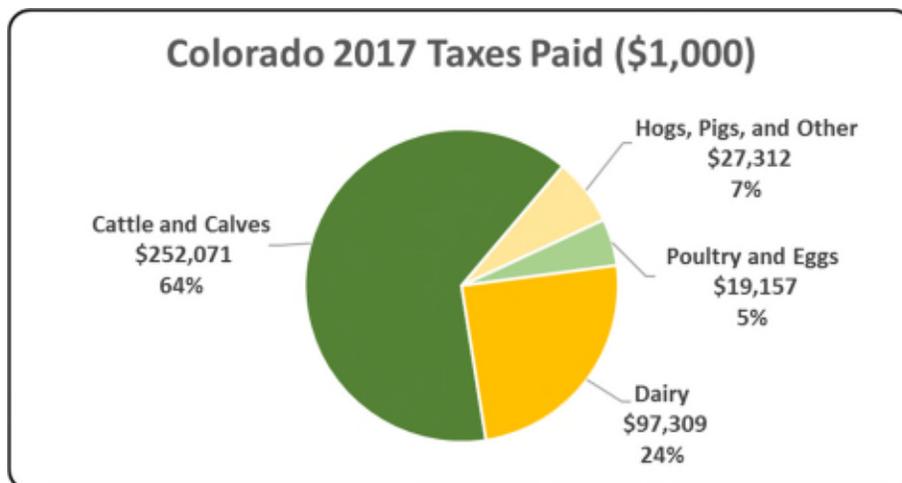
Colorado Earnings

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 2017.



Colorado Taxes Paid by Animal Agriculture

Colorado’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$395.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$96.2 million in property taxes paid by all of Colorado agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



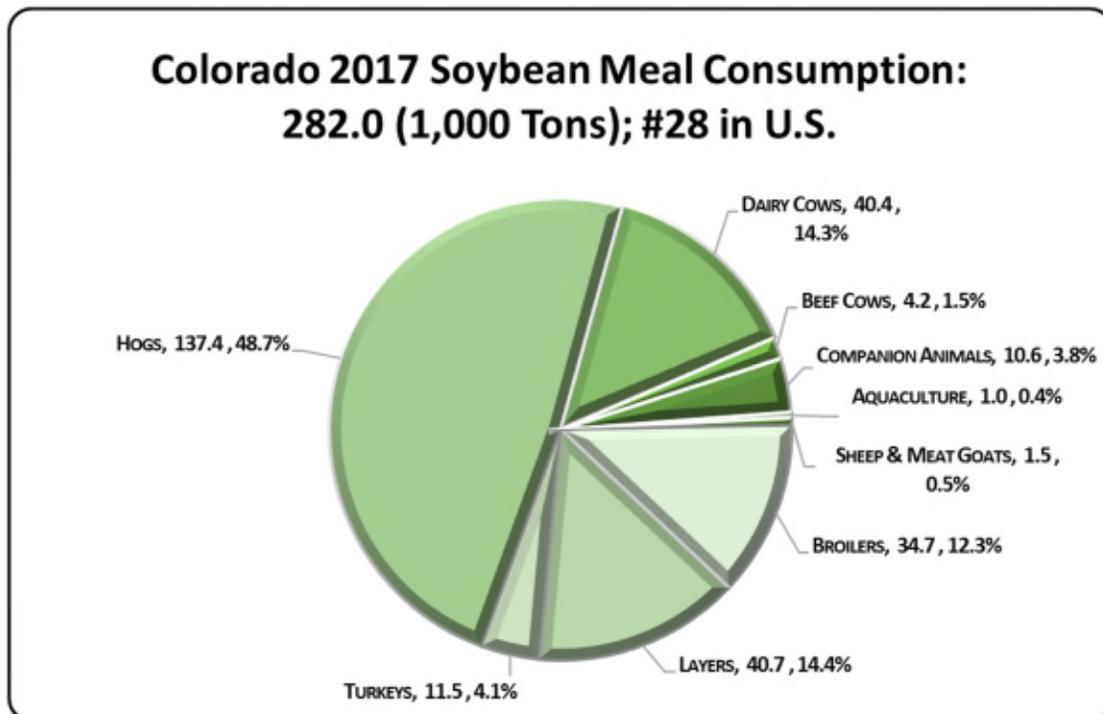
Colorado Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Colorado's animal agriculture consumed almost 282.0 thousand tons of soybean meal in 2017, placing the state as #28 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Colorado consumed 29,378 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (137.4 thousand tons)
- Egg-Laying Hens (40.7 thousand tons)
- Dairy Cows (40.4 thousand tons)

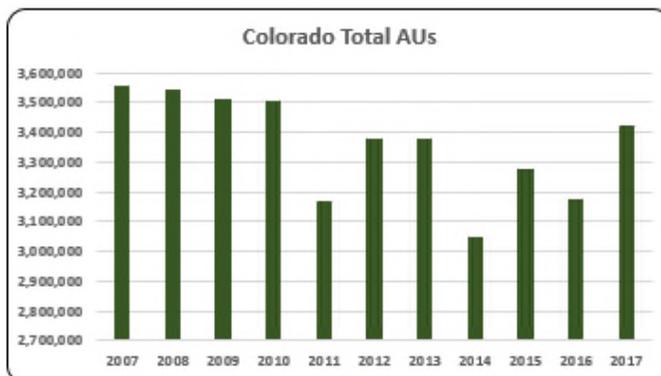
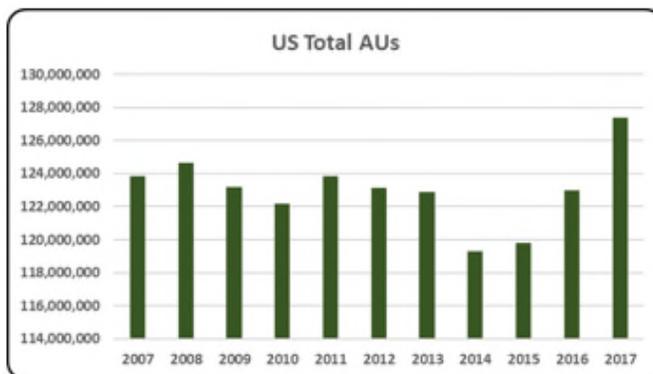


Colorado Animal Unit (AU) Trends

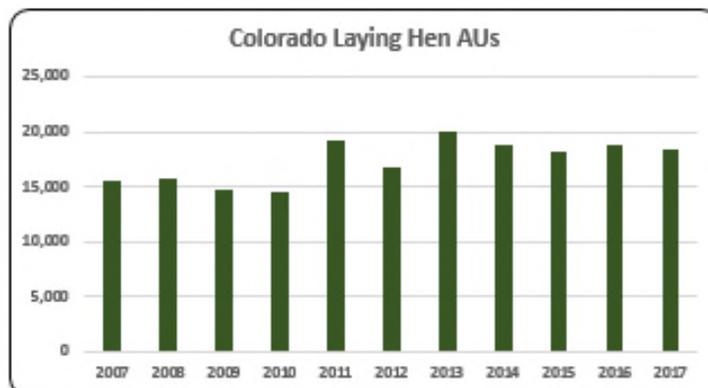
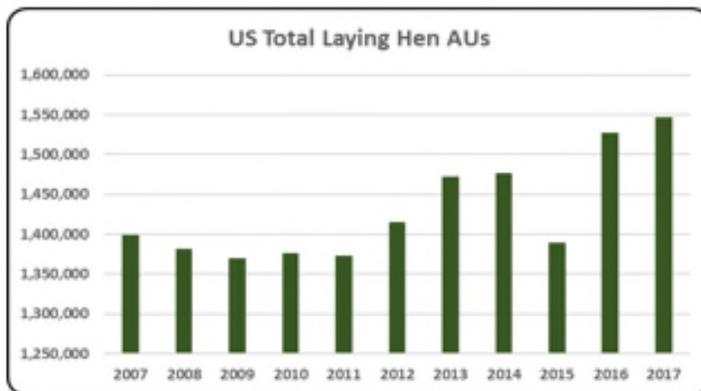
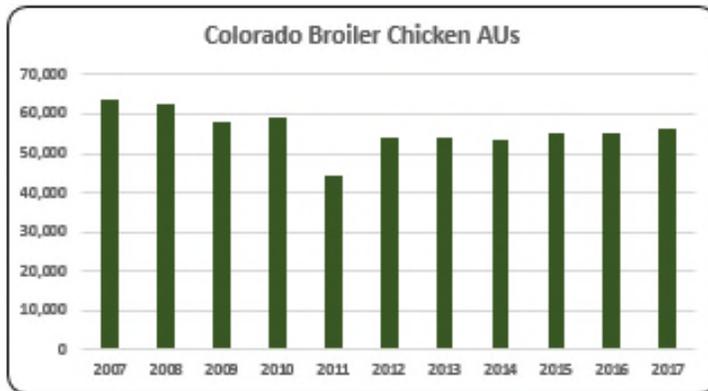
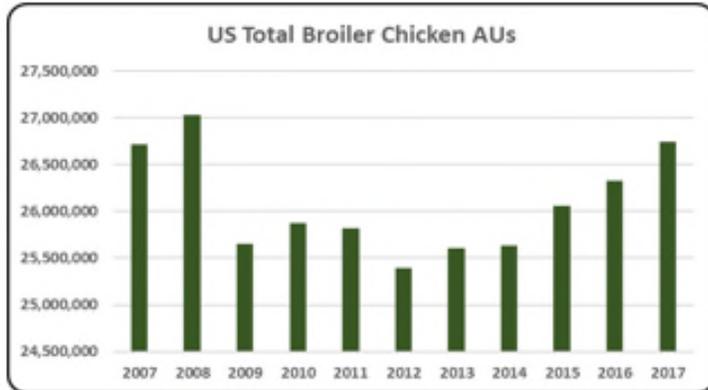
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Colorado. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

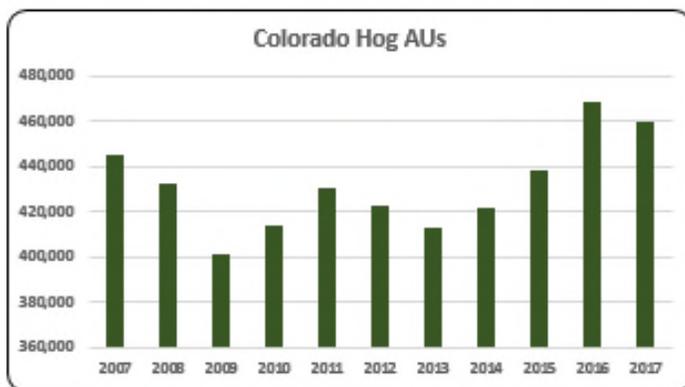
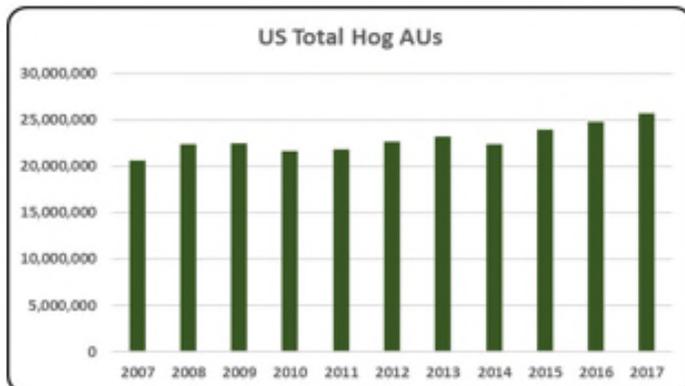
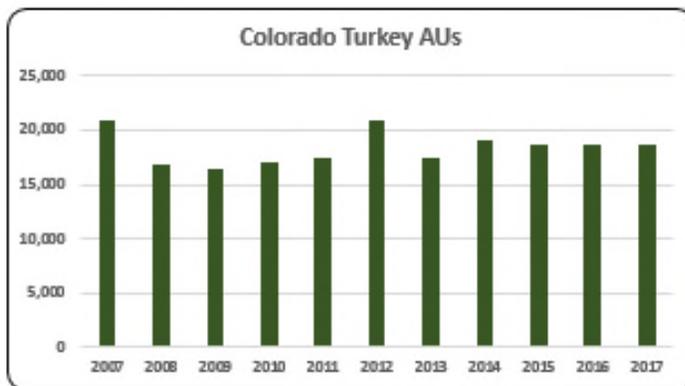
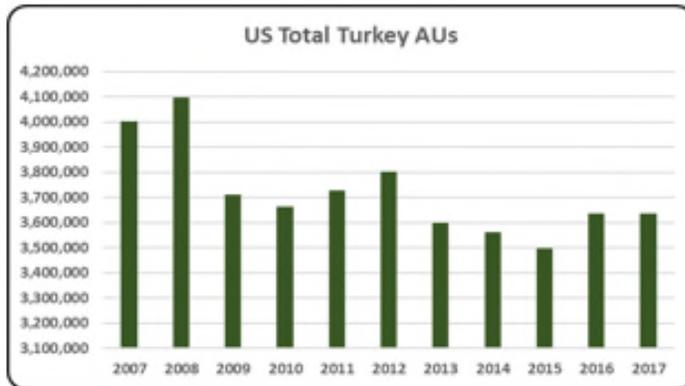
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Colorado, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (2.7 million AUs), Hogs (460,200 AUs), and Dairy Cows (217,000 AUs). Total animal units in Colorado during 2017 were 3.4 million AUs.



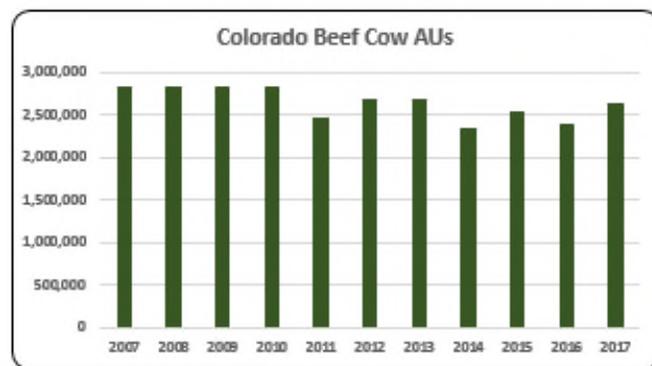
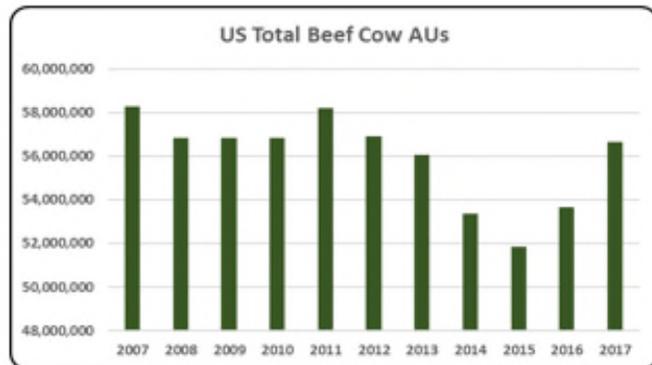
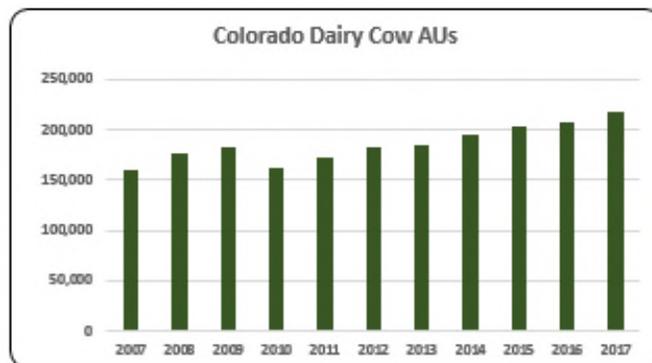
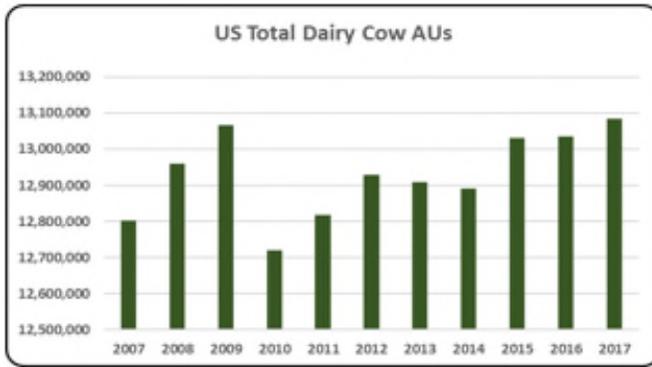
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The average number of AUs in Colorado from 2007 to 2017 was 3.4 million (2.69% of total U.S. AUs).



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- At the state level, broiler AUs in 2017 were reported at 56,087. In general, broiler AUs have decreased since 2007 (63,592), but have recovered from the low levels in 2011 (44,447).
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Colorado layer AUs in 2017 (18,279) were 1.18% of all layer AUs in the U.S. Colorado layer AUs in 2017 have risen by 18.3% relative to the numbers in 2007.



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- The average number of turkey AUs in Colorado from 2007 to 2017 was 18,567.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- The number of hog AUs (460,200) in 2017 represents 1.79% of all hog AUs in the country in that year. From 2007 to 2017, there have been 431,639 hog AUs in Colorado, on average.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- The third largest animal sector in terms of animal units in Colorado is dairy with 217,000 AUs in 2017. On average, there have been 185,945 dairy cow AUs in Colorado from 2007 to 2017.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- In 2017 there were 2.7 million beef cow AUs in Colorado with an average for the 2007-2017 decade also at 2.7 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	2,850,600	2,838,600	2,838,600	2,838,600	2,482,875	2,681,250	2,692,500	2,339,550	2,541,900	2,404,500	2,654,025
	Hog and Pig AUs	445,050	432,450	400,950	414,450	430,125	422,700	413,100	421,650	438,150	469,200	460,200
	Broiler AUs	63,592	62,600	58,203	58,986	44,447	53,998	53,809	53,504	54,885	55,298	56,087
	Turkey AUs	20,993	16,780	16,437	17,121	17,426	20,813	17,361	19,166	18,753	18,689	18,567
	Egg Layer AUs	15,452	15,820	14,804	14,512	19,112	16,788	20,040	18,681	18,200	18,749	18,279
	Dairy AUs	161,000	176,400	182,000	162,400	172,200	183,400	184,800	196,000	203,000	207,200	217,000
	Total Animal Units	3,556,687	3,542,650	3,510,994	3,506,069	3,166,185	3,378,948	3,381,611	3,048,551	3,274,887	3,173,637	3,424,158
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,914,783	\$ 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
	Hogs and Pigs (\$1,000)	\$ 196,673	\$ 159,404	\$ 126,971	\$ 189,680	\$ 227,019	\$ 206,066	\$ 206,725	\$ 236,205	\$ 195,371	\$ 183,485	\$ 166,435
	Broilers (\$1,000)	\$ 49,077	\$ 50,139	\$ 43,259	\$ 45,207	\$ 39,578	\$ 53,804	\$ 65,559	\$ 68,777	\$ 60,001	\$ 53,349	\$ 62,644
	Turkeys (\$1,000)	\$ 24,082	\$ 29,385	\$ 27,849	\$ 35,171	\$ 27,655	\$ 29,736	\$ 21,554	\$ 14,259	\$ 17,553	\$ 19,849	\$ 13,439
	Eggs (\$1,000)	\$ 74,074	\$ 96,842	\$ 70,308	\$ 77,131	\$ 85,801	\$ 96,215	\$ 103,782	\$ 130,350	\$ 177,115	\$ 67,929	\$ 76,212
	Milk (\$1,000)	\$ 522,258	\$ 540,040	\$ 363,136	\$ 461,824	\$ 599,800	\$ 597,618	\$ 672,256	\$ 862,320	\$ 668,746	\$ 655,475	\$ 758,209
	Other	\$ 55,713	\$ 59,049	\$ 58,733	\$ 60,191	\$ 74,238	\$ 121,708	\$ 78,928	\$ 81,982	\$ 99,524	\$ 103,678	\$ 106,631
	Sheep and Lambs (\$1,000)	\$ 51,976	\$ 55,118	\$ 54,608	\$ 55,872	\$ 69,725	\$ 117,001	\$ 74,027	\$ 76,887	\$ 94,235	\$ 98,195	\$ 95,028
	Aquaculture (\$1,000)	\$ 3,737	\$ 3,931	\$ 4,125	\$ 4,319	\$ 4,513	\$ 4,707	\$ 4,901	\$ 5,095	\$ 5,289	\$ 5,483	\$ 11,603
	Total (\$1,000)	\$ 2,836,660	\$ 2,669,009	\$ 2,287,682	\$ 2,635,904	\$ 2,981,475	\$ 3,245,310	\$ 3,310,938	\$ 3,792,149	\$ 3,691,819	\$ 2,983,334	\$ 3,225,850

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,883	9,819	9,598	10,528
	Cattle feedlots (112112)	786	1,081	615	268
	Dairy cattle and milk production (11212)	301	232	267	183
	Hog and pig farming (1122)	398	445	453	343
	Poultry and egg production (1123)	150	237	742	611
	Sheep and goat farming (1124)	741	902	1,010	1,212
	Animal aquaculture and other animal production (1125,1129)	2,862	6,111	7,941	7,153
Value of Sales (\$1,000)	Cattle and Calves	2,530,329	2,632,740	3,156,348	4,321,308
	Hogs and Pigs	171,972	179,415	159,808	208,763
	Poultry and Eggs	142,256	113,256	161,320	102,175
	Milk and Other Dairy Products	188,783	247,035	456,076	559,422
	Aquaculture	4,337	28,805	11,258	14,475
	Other (calculated)	165,238	107,667	134,925	108,550
	Total	3,202,915	3,308,918	4,079,735	5,314,693
Input Purchases	Livestock and poultry purchased	(Farms) 9,954	8,174	8,517	9,728
		\$1,000 1,271,336	1,662,797	1,778,706	1,885,482
	Breeding livestock purchased	(Farms) <i>n/a</i>	4,686	4,866	5,372
		\$1,000 <i>n/a</i>	46,389	86,507	98,374
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	4,650	4,944	5,838
		\$1,000 <i>n/a</i>	1,616,409	1,692,199	1,787,108
Feed purchased	(Farms) 15,919	18,525	18,817	21,744	
	\$1,000 861,580	866,170	1,221,367	1,972,993	

2017 Animal Agriculture	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 4,923,526	\$ 1,036,048	28,422	\$ 252,071
Hogs, Pigs, and Other	\$ 472,650	\$ 112,257	3,292	\$ 27,312	
Poultry and Eggs	\$ 350,859	\$ 78,737	2,013	\$ 19,157	
Dairy	\$ 1,684,892	\$ 399,955	11,036	\$ 97,309	
Total	\$ 7,431,927	\$ 1,626,998	44,763	\$ 395,849	

Change from 2007 to 2017	Cattle and Calves	\$ (494,564)	\$ (104,070)	(2,855)	\$ (25,320)
	Hogs, Pigs, and Other	\$ (40,097)	\$ (9,523)	(279)	\$ (2,317)
	Poultry and Eggs	\$ (47,261)	\$ (10,606)	(271)	\$ (2,580)
	Dairy	\$ 322,715	\$ 76,605	2,114	\$ 18,638
	Total	\$ (259,208)	\$ (47,594)	(1,292)	\$ (11,580)

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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.6%
	Total	24.3%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$237.5 million in economic output
- 1,573 jobs
- \$50.2 million in earnings
- \$12.4 million in income taxes paid at local, state, and federal levels
- \$29.5 million in the form of property taxes

Connecticut's animal agriculture consumed almost 34.7 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (17.7 thousand tons)
- Dairy Cows (7.1 thousand tons)
- Egg-Laying Hens (5.0 thousand 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 minor 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 2017, Connecticut's animal agriculture contributed the following to the economy:

- About \$237.5 million in economic output
- \$50.2 million in household earnings
- 1,573 jobs
- \$12.4 million in income taxes

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

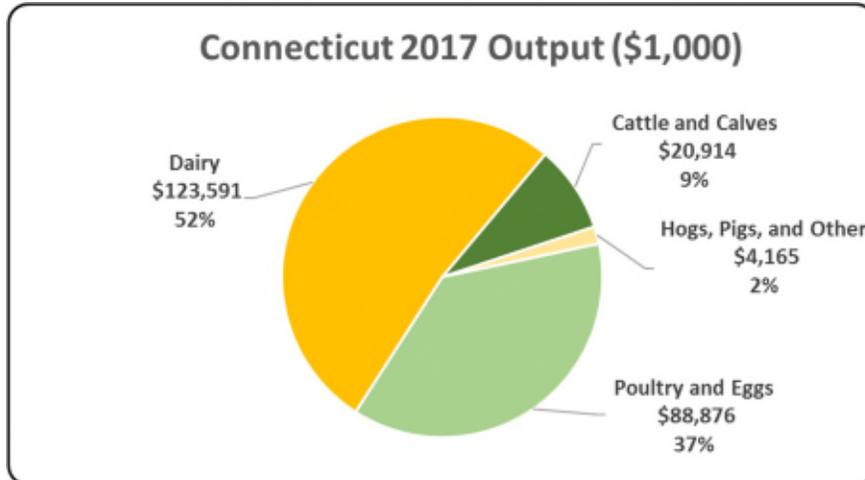
- Decreased economic output by \$81.1 million
- Reduced household earnings by \$17.5 million
- Shrunk by 528 jobs
- Paid \$4.3 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 237,545	\$ (81,063)	-25.44%
Earnings (\$1,000)	\$ 50,221	\$ (17,461)	-25.80%
Employment (Jobs)	1,573	(528)	-25.13%
Income Taxes Paid (\$1,000)	\$ 12,402	\$ (4,312)	-25.80%
Property Taxes Paid in 2012 (\$1,000)	\$ 29,547		

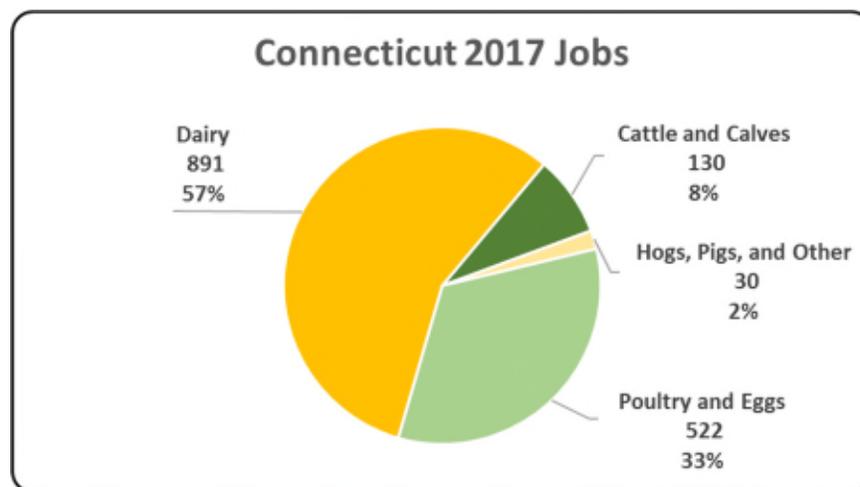
Connecticut Output

“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 \$237.5 million.



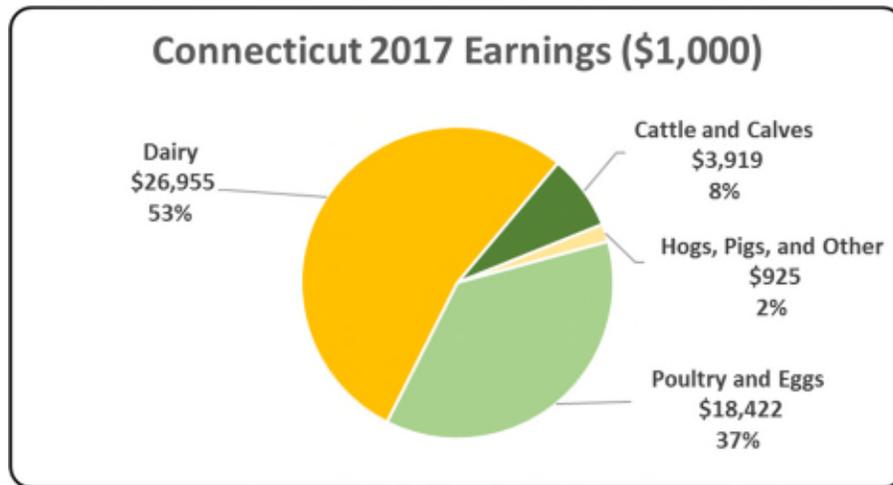
Connecticut Jobs

“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 1,573 jobs within and outside of animal agriculture in Connecticut.



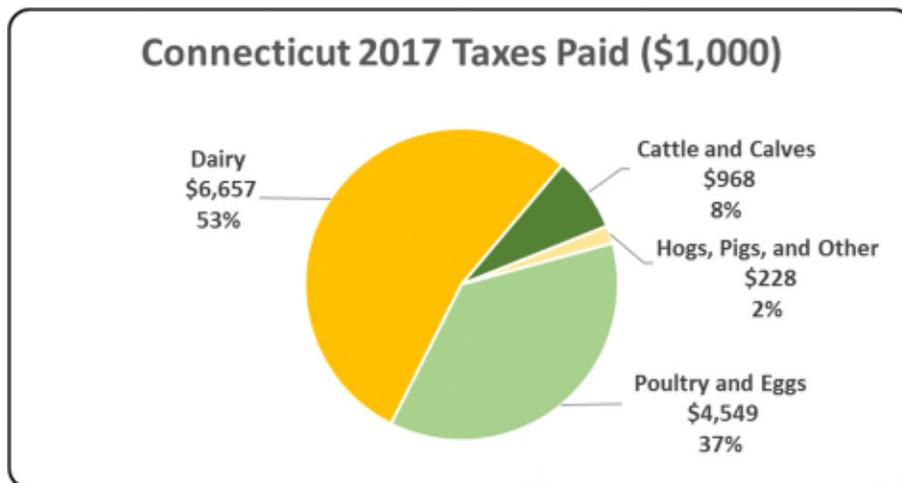
Connecticut Earnings

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 \$50.2 million to household earnings in 2017.



Connecticut Taxes Paid by Animal Agriculture

Connecticut’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$12.4 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$29.5 million in property taxes paid by all of Connecticut agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



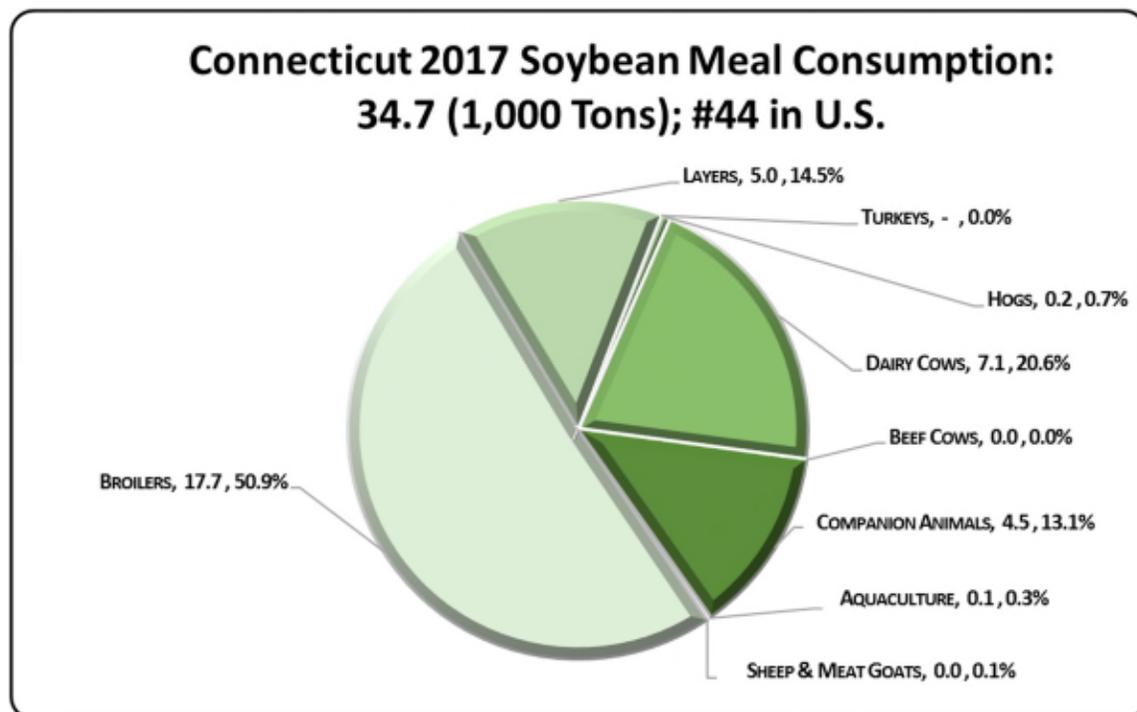
Connecticut Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Connecticut's animal agriculture consumed almost 34.7 thousand tons of soybean meal in 2017, placing the state as #44 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:

- Broilers (17.7 thousand tons)
- Dairy Cows (7.1 thousand tons)
- Egg-Laying Hens (5.0 thousand tons)

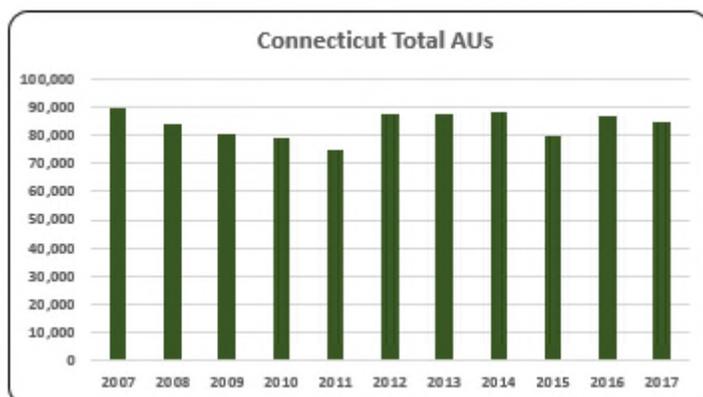
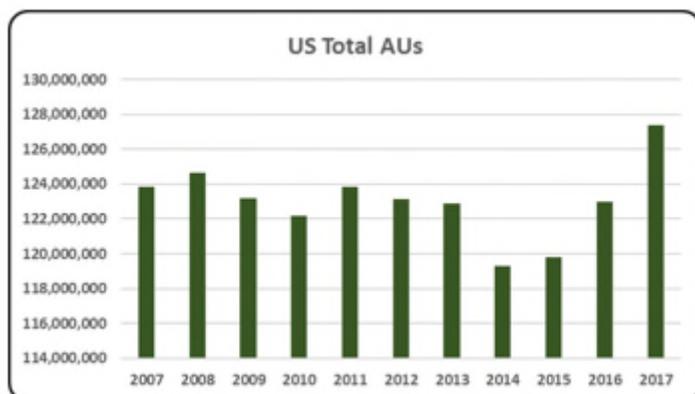


Connecticut Animal Unit (AU) Trends

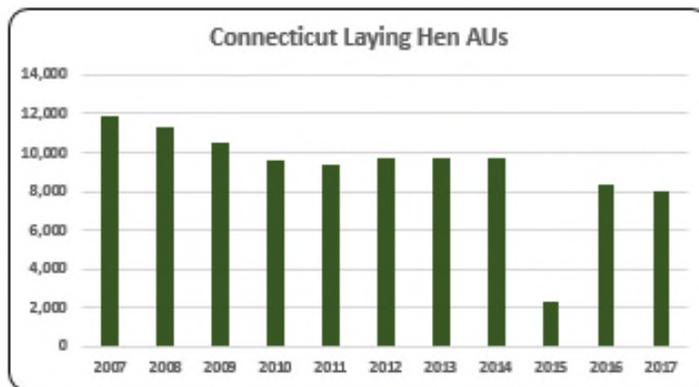
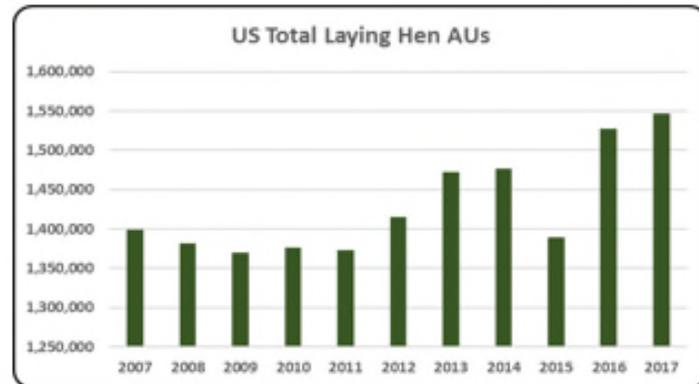
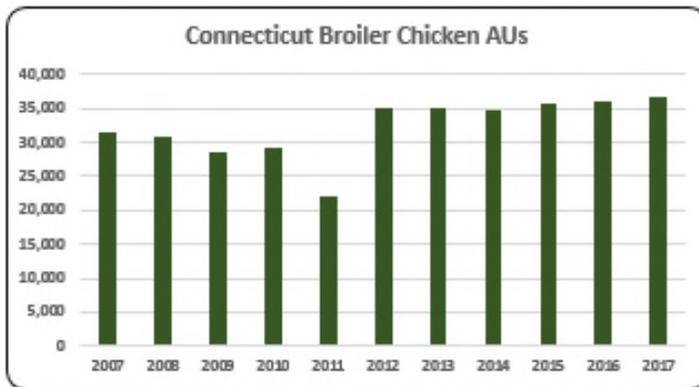
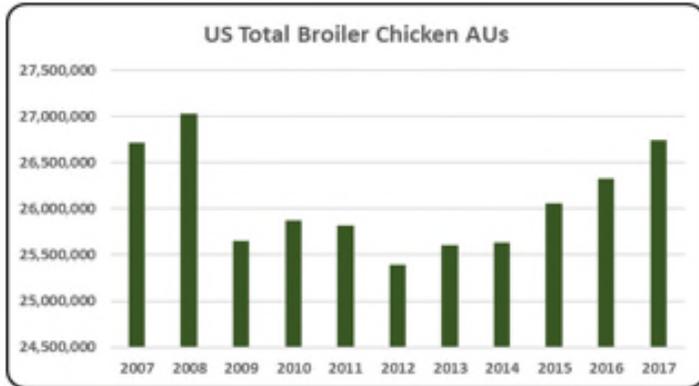
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Connecticut. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

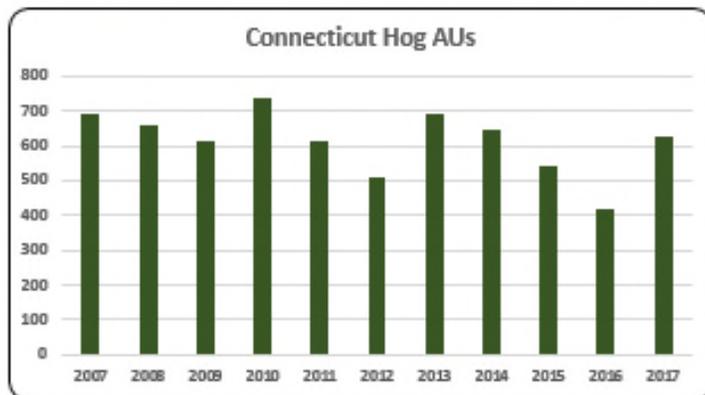
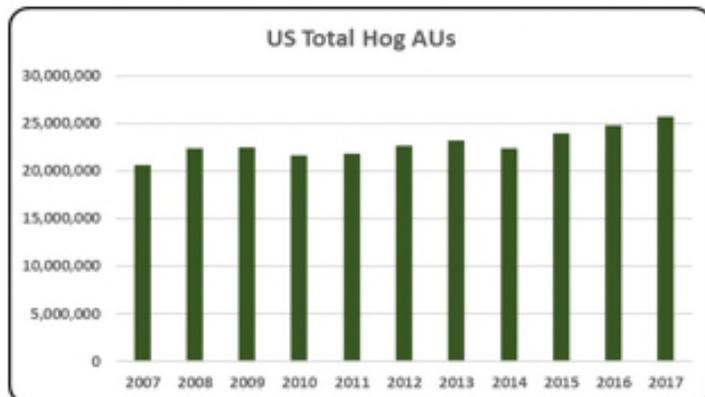
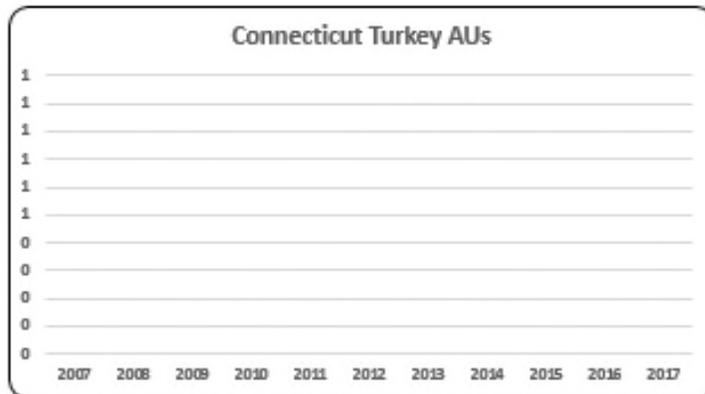
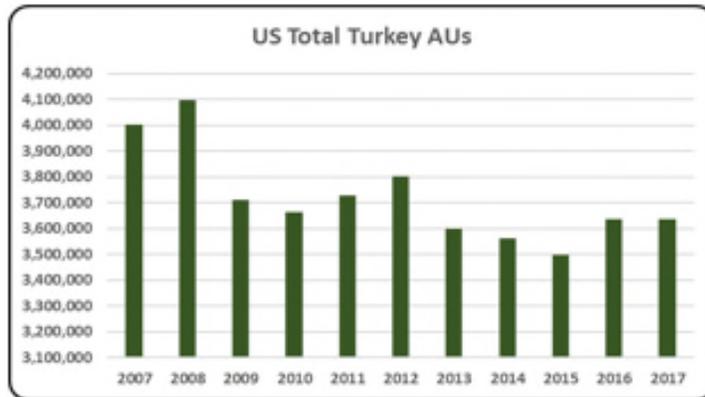
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Connecticut, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (36,570 AUs), Dairy Cows (26,600 AUs), and Beef Cows (12,975 AUs). Total animal units in Connecticut during 2017 were 84,812 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 84,812 total AUs in Connecticut in 2017. On average, there were 83,853 AUs in the state from 2007 to 2017.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler chickens are the largest animal sector in Connecticut with 36,570 broiler AUs in 2017. The number of broiler AUs in the state increased 17% from 2007 (31,360).
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- On average (2007 to 2017), 9,144 AUs in the state were layer AUs, with 8,037 layer AUs in 2017.

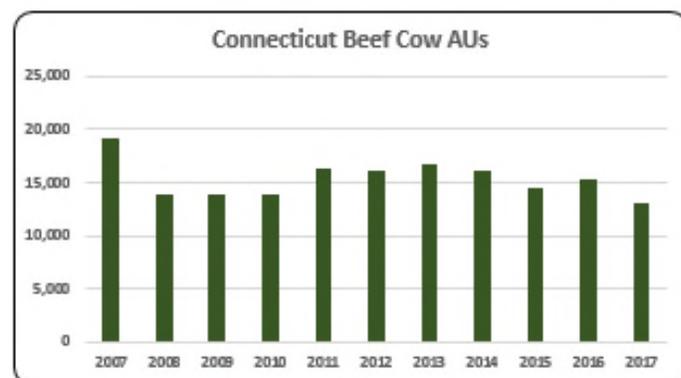
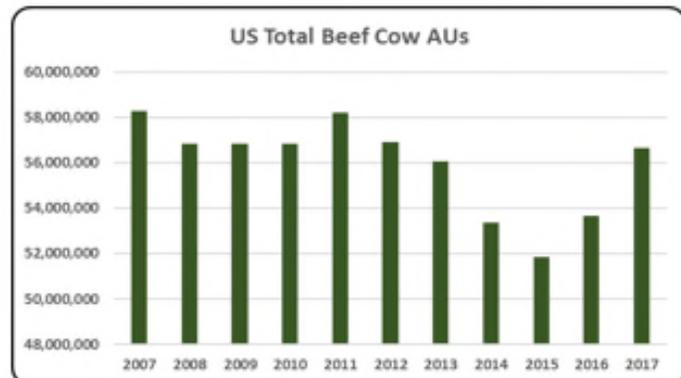
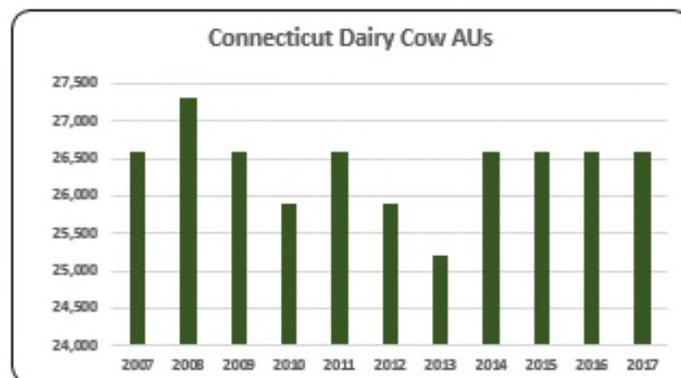
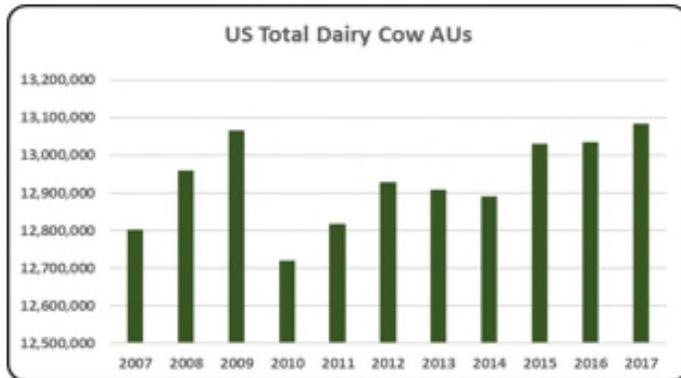


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

- Turkey production is nearly nonexistent in Connecticut.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

- Hog AUs represented 0.74% (630) of all AUs in Connecticut in 2017. This is a 9% decrease from 2007.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- The average number of dairy cow AUs in Connecticut during last decade was 26,409 which represented 31% of the average number of all AUs in the state.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- On average, there were 12,975 beef cow AUs from 2007 to 2017. The AU numbers have decreased 32% since 2007.

Connecticut Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	19,200	13,890	13,890	13,890	16,305	16,230	16,650	16,125	14,445	15,405	12,975
	Hog and Pig AUs	690	660	615	735	615	510	690	645	540	420	630
	Broiler AUs	31,360	30,871	28,703	29,089	21,919	35,208	35,085	34,886	35,786	36,056	36,570
	Turkey AUs	-	-	-	-	-	-	-	-	-	-	-
	Egg Layer AUs	11,932	11,340	10,528	9,620	9,368	9,699	9,672	9,670	2,336	8,385	8,037
	Dairy AUs	26,600	27,300	26,600	25,900	26,600	25,900	25,200	26,600	26,600	26,600	26,600
	Total Animal Units	89,782	84,061	80,336	79,234	74,807	87,547	87,297	87,926	79,708	86,866	84,812
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 9,044	\$ 8,858	\$ 8,552	\$ 8,626	\$ 14,205	\$ 14,451	\$ 13,008	\$ 21,129	\$ 24,175	\$ 15,655	\$ 15,034
	Hogs and Pigs (\$1,000)	\$ 346	\$ 280	\$ 324	\$ 565	\$ 450	\$ 453	\$ 864	\$ 736	\$ 520	\$ 366	\$ 619
	Broilers (\$1,000)	\$ 24,202	\$ 24,726	\$ 21,333	\$ 22,294	\$ 19,518	\$ 35,082	\$ 42,746	\$ 44,844	\$ 39,123	\$ 34,785	\$ 40,846
	Turkeys (\$1,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Eggs (\$1,000)	\$ 51,938	\$ 60,116	\$ 41,686	\$ 39,566	\$ 41,948	\$ 46,588	\$ 52,024	\$ 20,232	\$ 33,728	\$ 13,264	\$ 17,934
	Milk (\$1,000)	\$ 76,285	\$ 73,528	\$ 50,479	\$ 65,520	\$ 79,059	\$ 70,526	\$ 79,920	\$ 99,963	\$ 72,864	\$ 69,530	\$ 78,540
	Other	\$ 16,979	\$ 18,943	\$ 20,926	\$ 22,960	\$ 24,907	\$ 26,902	\$ 28,920	\$ 30,889	\$ 32,889	\$ 34,858	\$ 2,425
	Sheep and Lambs (\$1,000)	\$ 133	\$ 125	\$ 137	\$ 199	\$ 174	\$ 198	\$ 244	\$ 241	\$ 269	\$ 266	\$ 254
	Aquaculture (\$1,000)	\$ 16,846	\$ 18,817	\$ 20,789	\$ 22,761	\$ 24,733	\$ 26,704	\$ 28,676	\$ 30,648	\$ 32,620	\$ 34,591	\$ 2,171
	Total (\$1,000)	\$ 178,794	\$ 186,450	\$ 143,300	\$ 159,531	\$ 180,087	\$ 194,002	\$ 217,483	\$ 217,793	\$ 203,299	\$ 168,457	\$ 155,398

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	420	342	490	693	
	Cattle feedlots (112112)	63	90	32	6	
	Dairy cattle and milk production (11212)	266	231	212	146	
	Hog and pig farming (1122)	46	47	69	160	
	Poultry and egg production (1123)	89	128	273	175	
	Sheep and goat farming (1124)	100	120	198	246	
	Animal aquaculture and other animal production (1125,1129)	419	792	820	1,507	
Value of Sales (\$1,000)	Cattle and Calves	6,777	7,025	9,405	9,751	
	Hogs and Pigs	1,189	-	616	1,259	
	Poultry and Eggs	72,500	62,411	45,274	48,859	
	Milk and Other Dairy Products	67,118	56,523	72,338	69,843	
	Aquaculture	n/a	12,848	15,142	19,665	
	Other (calculated)	13,338	4,303	7,406	4,018	
	Total	160,922	143,110	150,181	153,395	
Input Purchases	Livestock and poultry purchased	(Farms) 837	948	1,077	1,487	
		\$1,000	8,740	8,644	7,164	6,536
	Breeding livestock purchased	(Farms) n/a	361	392	527	
		\$1,000	n/a	686	2,058	1,583
	Other livestock and poultry purchased	(Farms) n/a	701	846	1,190	
		\$1,000	n/a	7,957	5,106	4,953
	Feed purchased	(Farms) 1,446	2,372	2,458	3,617	
	\$1,000	58,691	42,832	55,295	66,754	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 20,914	\$ 3,919	130	\$ 968
	Hogs, Pigs, and Other	\$ 4,165	\$ 925	30	\$ 228
	Poultry and Eggs	\$ 88,876	\$ 18,422	522	\$ 4,549
	Dairy	\$ 123,591	\$ 26,955	891	\$ 6,657
	Total	\$ 237,545	\$ 50,221	1,573	\$ 12,402

Change from 2007 to 2017	Cattle and Calves	\$ 6,147	\$ 1,152	38	\$ 284
	Hogs, Pigs, and Other	\$ (23,657)	\$ (5,253)	(170)	\$ (1,297)
	Poultry and Eggs	\$ (46,248)	\$ (9,586)	(272)	\$ (2,367)
	Dairy	\$ (17,306)	\$ (3,774)	(125)	\$ (932)
	Total	\$ (81,063)	\$ (17,461)	(528)	\$ (4,312)

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	5.0%
	Total	24.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 Animal Agriculture: DELAWARE

Delaware Executive Summary

The use of soybean meal as a key feed ingredient is an important 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 2017 animal agriculture contributed:

- \$2.1 billion in economic output
- 7,018 jobs
- \$375.9 million in earnings
- \$90.6 million in income taxes paid at local, state, and federal levels
- \$6.2 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Delaware has increased economic output by over \$297.9 million, boosted household earnings by \$52.4 million, contributed 974 additional jobs and paid \$12.6 million in additional tax revenues.

Delaware's animal agriculture consumed almost 394.7 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (375.3 thousand tons)
- Companion Animals (12.0 thousand tons)
- Horses (11.5 thousand 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 integral part of Delaware's economy. In 2017, Delaware's animal agriculture contributed the following to the economy:

- About \$2.1 billion in economic output
- \$375.9 million in household earnings
- 7,018 jobs
- \$90.6 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:

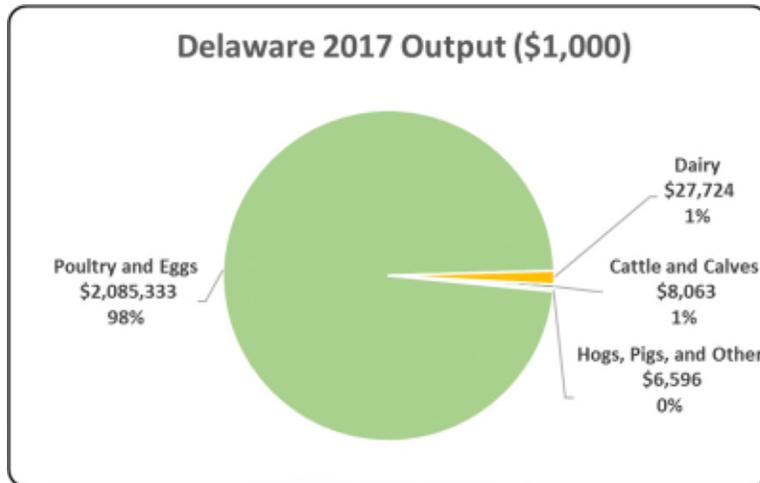
- Increased economic output by \$297.9 million
- Boosted household earnings by \$52.4 million
- Added 974 jobs
- Paid an additional \$12.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,127,716	\$ 297,910	16.28%
Earnings (\$1,000)	\$ 375,880	\$ 52,401	16.20%
Employment (Jobs)	7,018	974	16.11%
Income Taxes Paid (\$1,000)	\$ 90,587	\$ 12,629	16.20%
Property Taxes Paid in 2012 (\$1,000)	\$ 6,223		

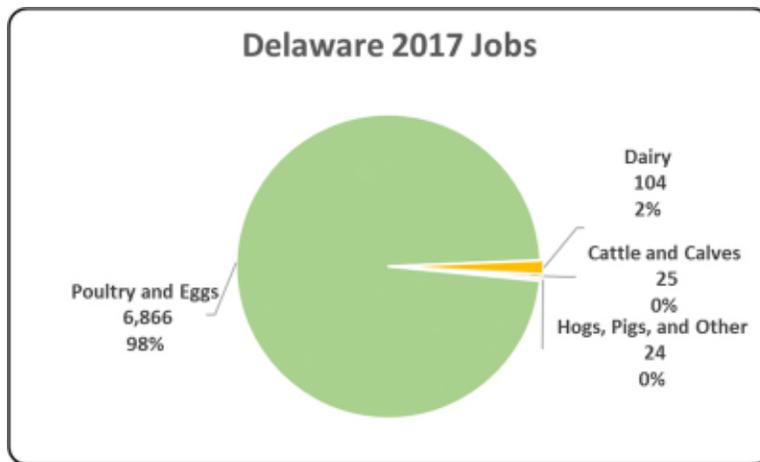
Delaware Output

“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 \$2.1 billion.



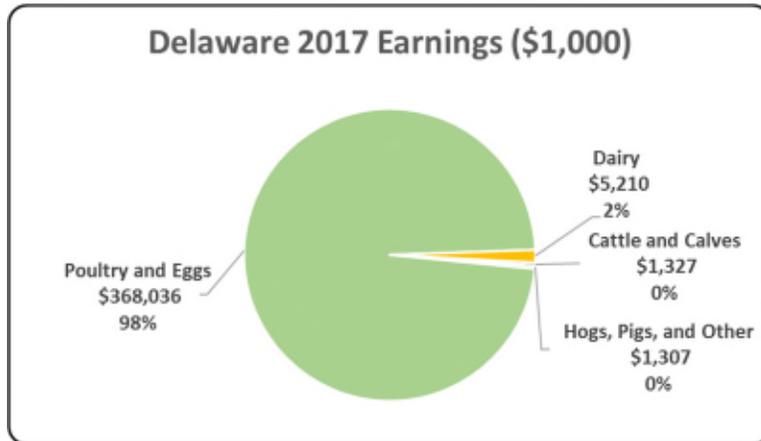
Delaware Jobs

“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 7,018 jobs within and outside of animal agriculture in Delaware.



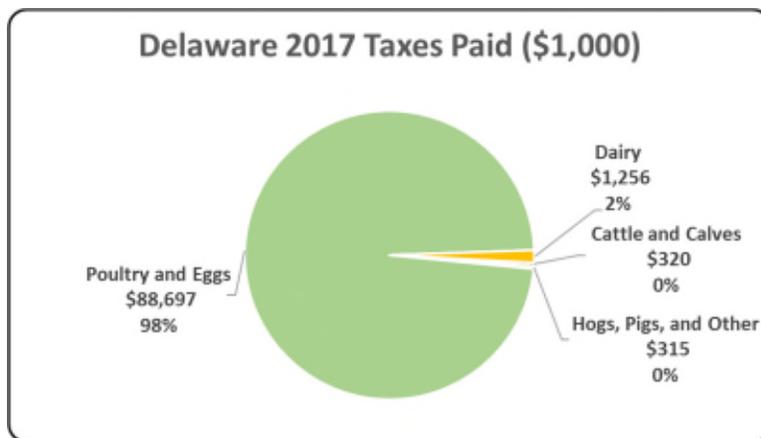
Delaware Earnings

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 \$375.9 million to household earnings in 2017.



Delaware Taxes Paid by Animal Agriculture

Delaware’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$90.6 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$6.2 million in property taxes paid by all of Delaware agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



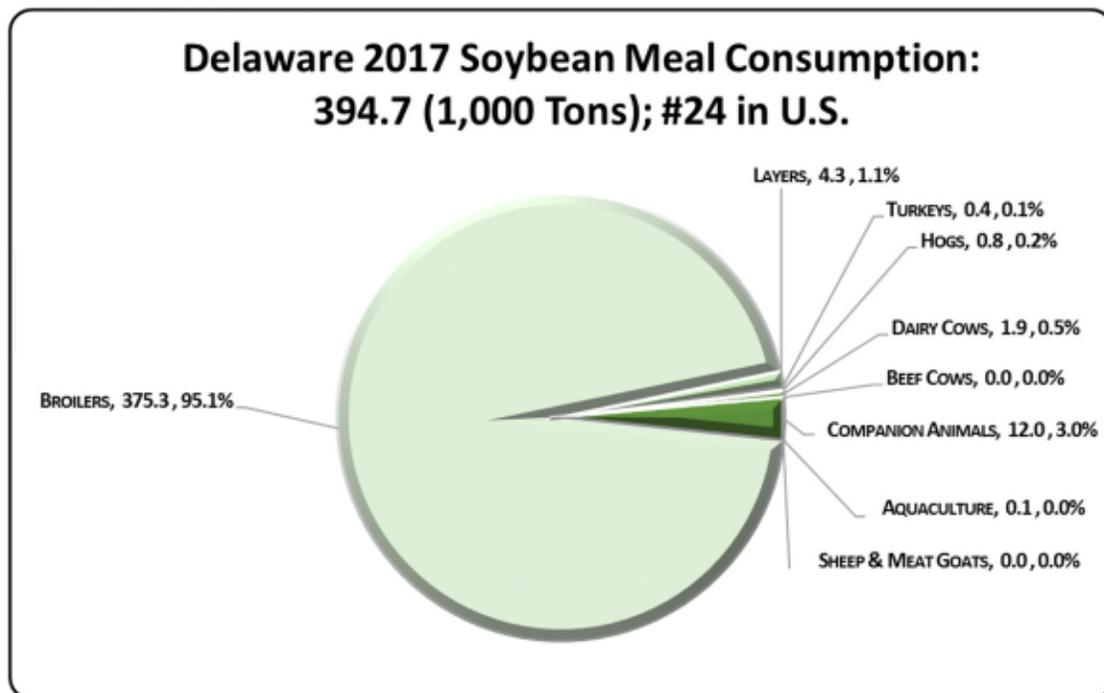
Delaware Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Delaware's animal agriculture consumed almost 394.7 thousand tons of soybean meal in 2017, placing the state as #24 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:

- Broilers (375.3 thousand tons)
- Companion Animals (12.0 thousand tons)
- Horses (11.5 thousand tons)

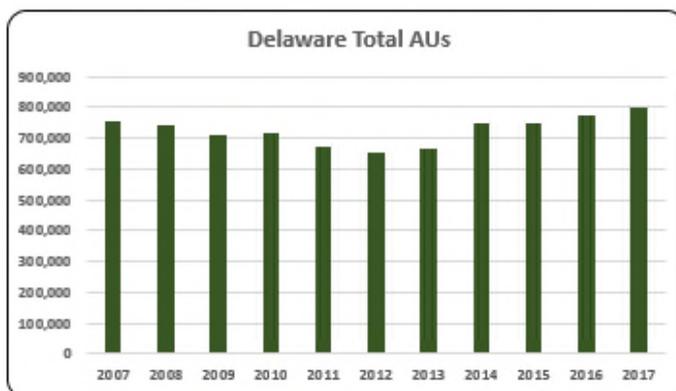
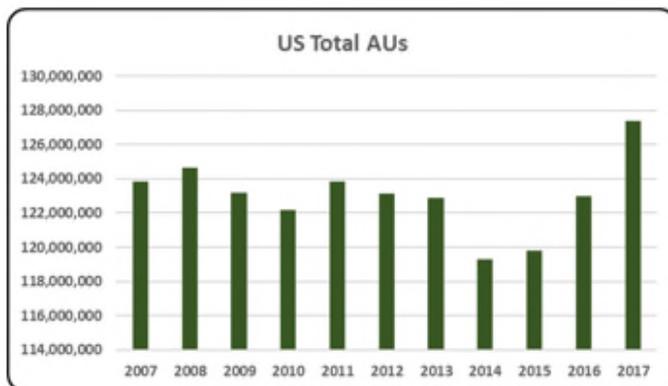


Delaware Animal Unit (AU) Trends

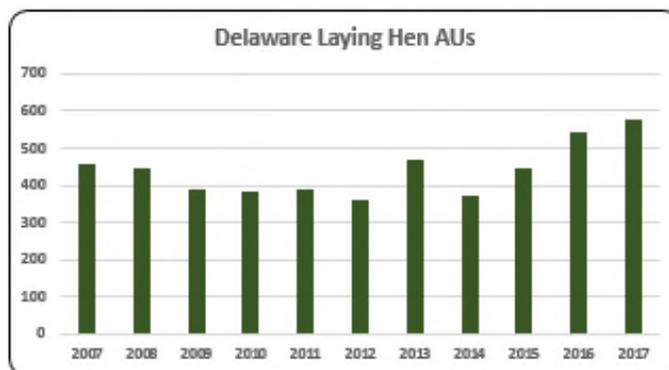
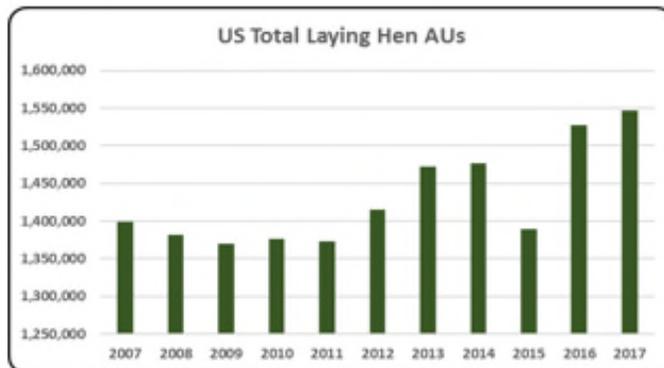
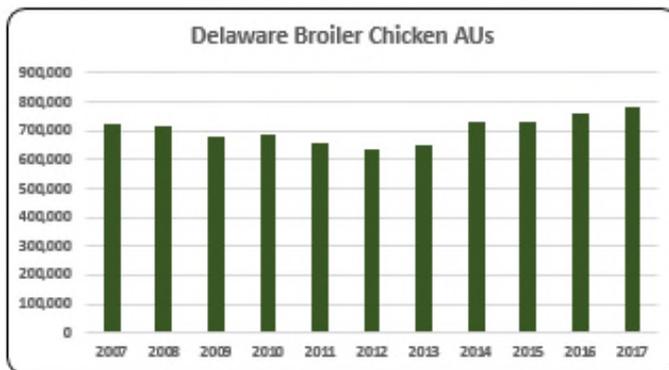
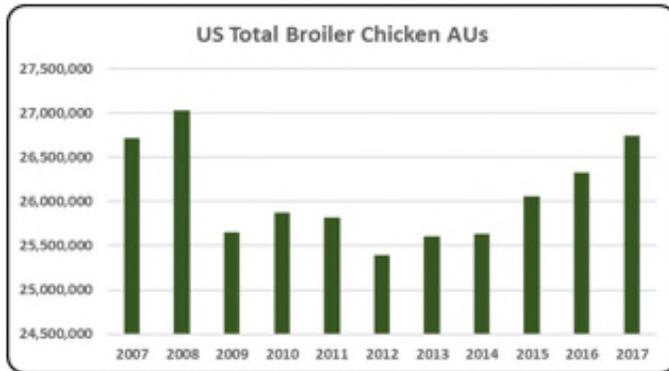
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Delaware. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

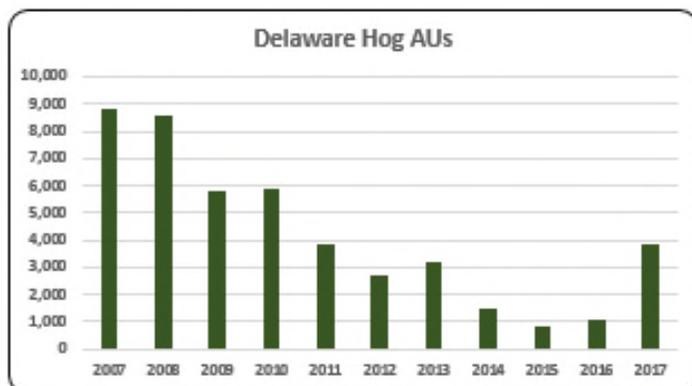
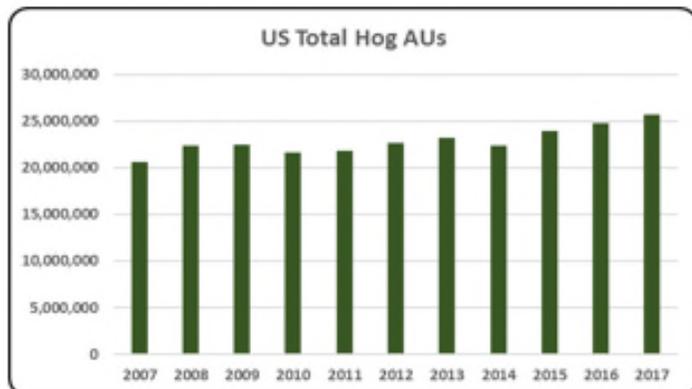
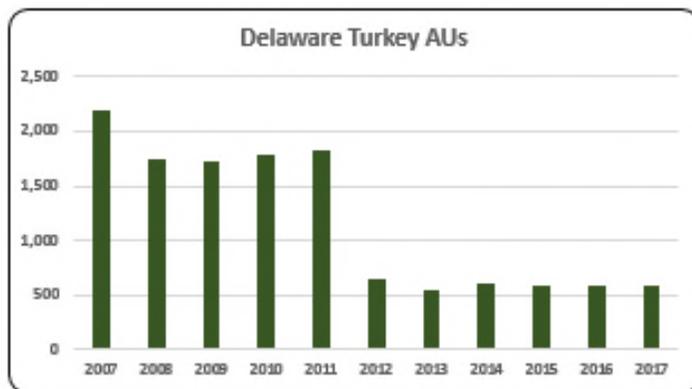
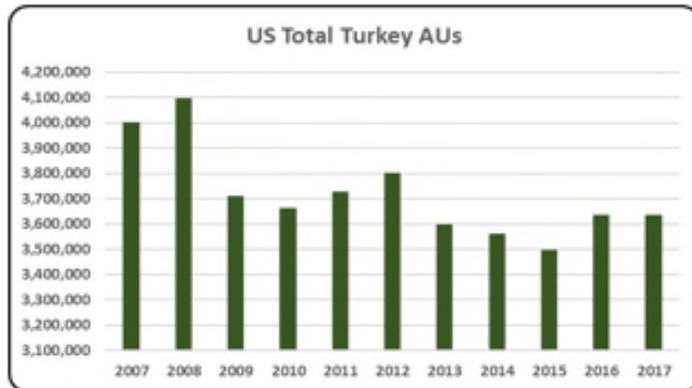
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Delaware, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (780,824 AUs), Dairy Cows (7,000 AUs), and Beef Cows (5,475 AUs). Total animal units in Delaware during 2017 were 798,324 AUs.



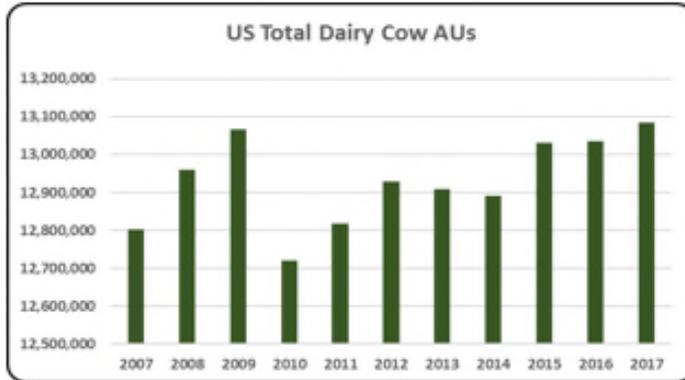
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The total number of AUs in Delaware in 2017 was 798,324. The state housed 2.92% of all broiler AUs in the U.S. in 2017.



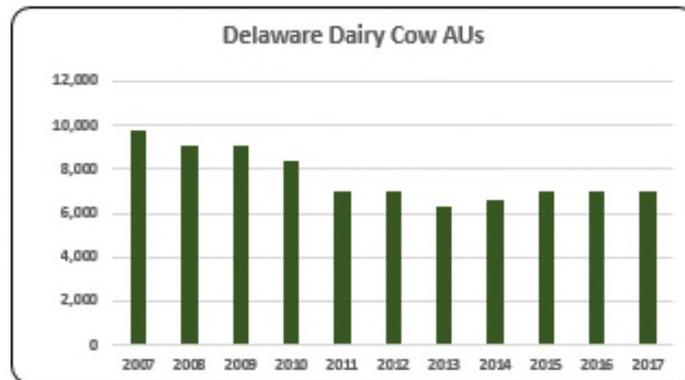
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- The largest animal sector in Delaware in terms of animal units is broiler chickens with 97.8% of all AUs in the state in 2017. Broiler AUs steadily declined from 2008-2012, but have recently rebounded to a record level of 780,824 AUs in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 439 layer AUs, on average, from 2007 to 2017.



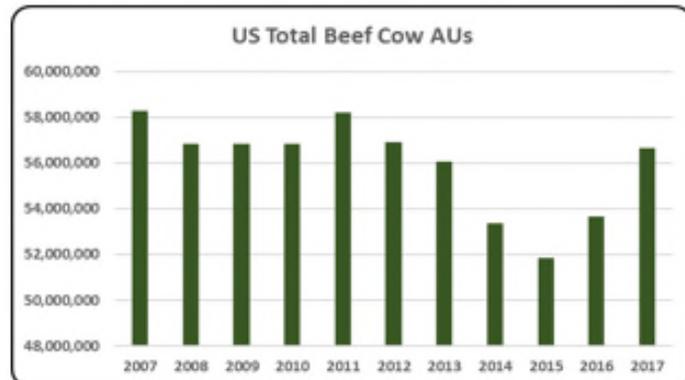
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Delaware turkey AUs in 2017 were at 580 AUs. Turkey AUs have declined 74% since record high numbers in 2007 (2,193 turkey AUs).
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- The hog industry has declined since 2007 (8,805). 2017 Hog AUs in Delaware increased from 2015's 870 AUs to 3,870 hog AUs in 2017.



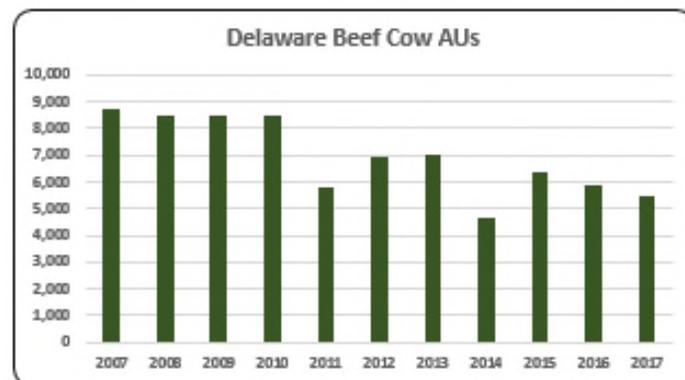
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Delaware’s dairy cow AUs in were 7,000 AUs in the state in 2017. This is a 29% decrease from 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- On average, there were 6,933 beef cow AUs from 2007 to 2017. Delaware beef cow AUs were 5,475 in 2017. Beef cow AUs shrank 37% compared to the beef cow AUs in 2007.

Delaware Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	8,730	8,475	8,475	8,475	5,805	6,900	7,020	4,635	6,375	5,895	5,475
	Hog and Pig AUs	8,805	8,550	5,835	5,910	3,885	2,700	3,225	1,515	870	1,095	3,870
	Broiler AUs	722,913	716,213	681,756	689,206	654,386	637,227	648,018	733,651	734,263	758,940	780,824
	Turkey AUs	2,193	1,753	1,717	1,789	1,821	650	543	599	586	584	580
	Egg Layer AUs	457	444	388	385	388	362	468	373	449	545	574
	Dairy AUs	9,800	9,100	9,100	8,400	7,000	7,000	6,300	6,580	7,000	7,000	7,000
	Total Animal Units	752,898	744,534	707,272	714,165	673,284	654,839	665,573	747,353	749,542	774,059	798,324
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 6,316	\$ 5,929	\$ 5,114	\$ 4,233	\$ 5,472	\$ 5,664	\$ 5,014	\$ 6,435	\$ 5,825	\$ 5,676	\$ 5,318
	Hogs and Pigs (\$1,000)	\$ 2,947	\$ 2,879	\$ 1,793	\$ 2,260	\$ 1,645	\$ 1,524	\$ 2,586	\$ 1,362	\$ 972	\$ 1,047	\$ 3,662
	Broilers (\$1,000)	\$ 734,942	\$ 726,294	\$ 730,606	\$ 783,395	\$ 699,791	\$ 752,600	\$ 929,196	\$ 1,103,985	\$ 946,342	\$ 881,097	\$ 1,017,606
	Turkeys (\$1,000)	\$ 482	\$ 588	\$ 557	\$ 3,675	\$ 2,889	\$ 3,107	\$ 2,252	\$ 1,490	\$ 549	\$ 620	\$ 420
	Eggs (\$1,000)	\$ 1,856	\$ 2,237	\$ 1,592	\$ 1,748	\$ 1,916	\$ 2,149	\$ 2,428	\$ 3,886	\$ 6,479	\$ 2,548	\$ 3,445
	Milk (\$1,000)	\$ 22,148	\$ 20,570	\$ 14,484	\$ 16,560	\$ 19,215	\$ 17,822	\$ 19,209	\$ 23,257	\$ 17,041	\$ 15,376	\$ 16,333
	Other	\$ 1,729	\$ 1,646	\$ 1,567	\$ 1,495	\$ 1,410	\$ 1,332	\$ 1,258	\$ 1,176	\$ 1,099	\$ 1,017	\$ 977
	Sheep and Lambs (\$1,000)	\$ 22	\$ 21	\$ 23	\$ 34	\$ 29	\$ 33	\$ 41	\$ 41	\$ 45	\$ 45	\$ 43
	Aquaculture (\$1,000)	\$ 1,707	\$ 1,625	\$ 1,543	\$ 1,462	\$ 1,380	\$ 1,298	\$ 1,217	\$ 1,135	\$ 1,054	\$ 972	\$ 934
	Total (\$1,000)	\$ 770,420	\$ 760,143	\$ 755,713	\$ 813,366	\$ 732,338	\$ 784,198	\$ 961,943	\$ 1,141,591	\$ 978,306	\$ 907,381	\$ 1,047,761

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	89	92	155	137	
	Cattle feedlots (112112)	30	25	21	2	
	Dairy cattle and milk production (11212)	91	78	63	32	
	Hog and pig farming (1122)	26	14	13	16	
	Poultry and egg production (1123)	822	809	777	645	
	Sheep and goat farming (1124)	11	38	77	31	
	Animal aquaculture and other animal production (1125,1129)	164	250	211	520	
Value of Sales (\$1,000)	Cattle and Calves	9,495	3,254	7,567	9,489	
	Hogs and Pigs	6,582	2,853	2,754	1,427	
	Poultry and Eggs	553,635	440,774	837,378	811,301	
	Milk and Other Dairy Products	19,357	20,651	21,715	16,593	
	Aquaculture	withheld	240	withheld	withheld	
	Other (calculated)	1,829	677	2,986	289	
	Total	590,898	468,449	872,400	839,099	
Input Purchases	Livestock and poultry purchased	(Farms) 1,122	1,039	981	947	
		\$1,000	63,980	55,182	102,328	94,265
	Breeding livestock purchased	(Farms) <i>n/a</i>	158	131	151	
		\$1,000	<i>n/a</i>	444	1,043	1,871
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	928	899	842	
		\$1,000	<i>n/a</i>	54,738	101,284	92,394
	Feed purchased	(Farms) 1,405	1,540	1,426	1,602	
	\$1,000	363,258	207,528	416,368	503,159	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 8,063	\$ 1,327	25	\$ 320
	Hogs, Pigs, and Other	\$ 6,596	\$ 1,307	24	\$ 315
	Poultry and Eggs	\$ 2,085,333	\$ 368,036	6,866	\$ 88,697
	Dairy	\$ 27,724	\$ 5,210	104	\$ 1,256
	Total	\$ 2,127,716	\$ 375,880	7,018	\$ 90,587

Change from 2007 to 2017	Cattle and Calves	\$ (3,177)	\$ (523)	(10)	\$ (126)
	Hogs, Pigs, and Other	\$ (1,209)	\$ (239)	(4)	\$ (58)
	Poultry and Eggs	\$ 318,697	\$ 56,246	1,049	\$ 13,555
	Dairy	\$ (16,401)	\$ (3,082)	(61)	\$ (743)
	Total	\$ 297,910	\$ 52,401	974	\$ 12,629

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.4%
	Total	24.1%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$2.4 billion in economic output
- 14,711 jobs
- \$548.8 million in earnings
- \$108.1 million in income taxes paid at local, state, and federal levels
- \$189.3 million in the form of property taxes

Florida's animal agriculture consumed almost 248.0 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (108.5 thousand tons)
- Egg-Laying Hens (63.5 thousand tons)
- Dairy Cows (36.8 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 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 2017, Florida's animal agriculture contributed the following to the economy:

- About \$2.4 billion in economic output
- \$548.8 million in household earnings
- 14,711 jobs
- \$108.1 million in income taxes

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

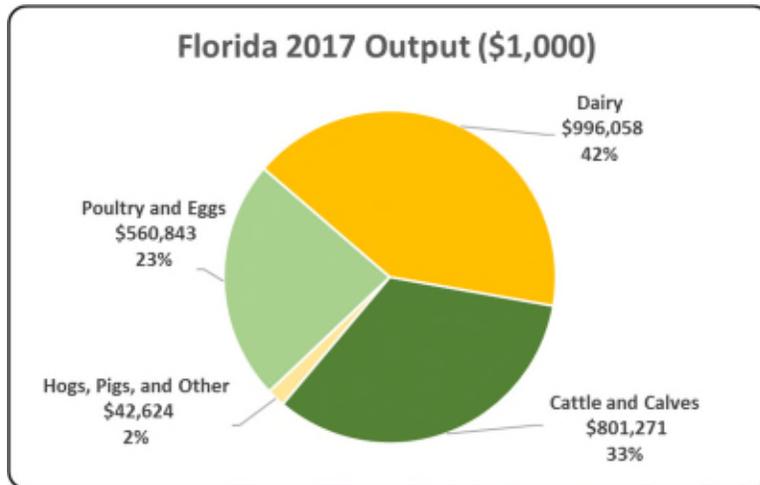
- Decreased economic output by \$221.5 million
- Reduced household earnings by \$52.5 million
- Shrunk by 1,342 jobs
- Paid \$10.3 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,400,795	\$ (221,469)	-8.45%
Earnings (\$1,000)	\$ 548,805	\$ (52,473)	-8.73%
Employment (Jobs)	14,711	(1,342)	-8.36%
Income Taxes Paid (\$1,000)	\$ 108,115	\$ (10,337)	-8.73%
Property Taxes Paid in 2012 (\$1,000)	\$ 189,340		

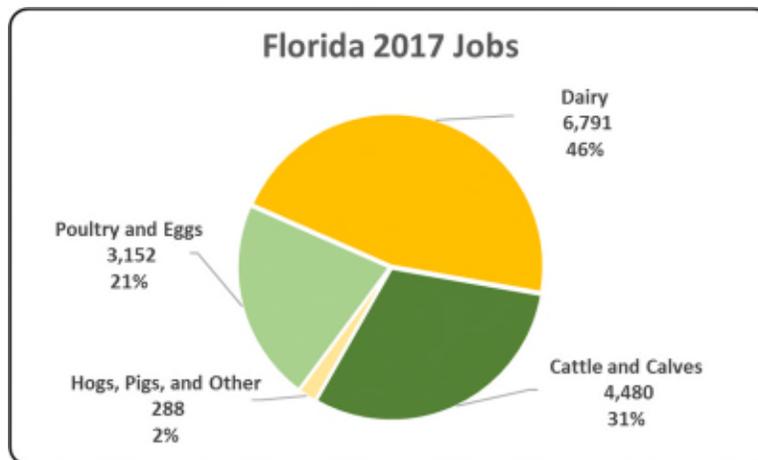
Florida Output

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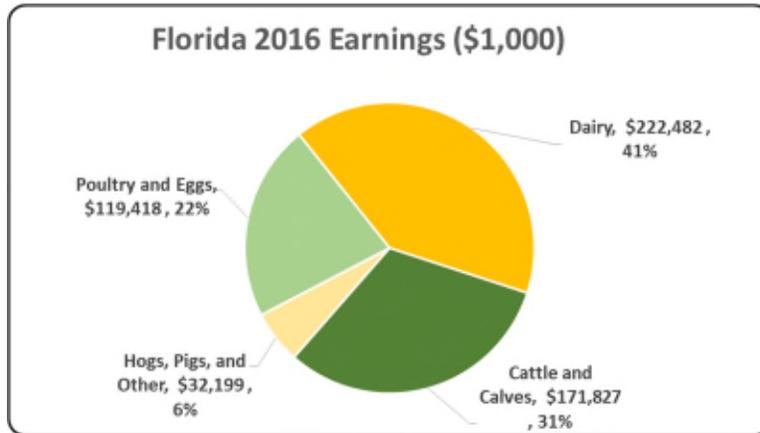
Florida Jobs

“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 14,711 jobs within and outside of animal agriculture in Florida.



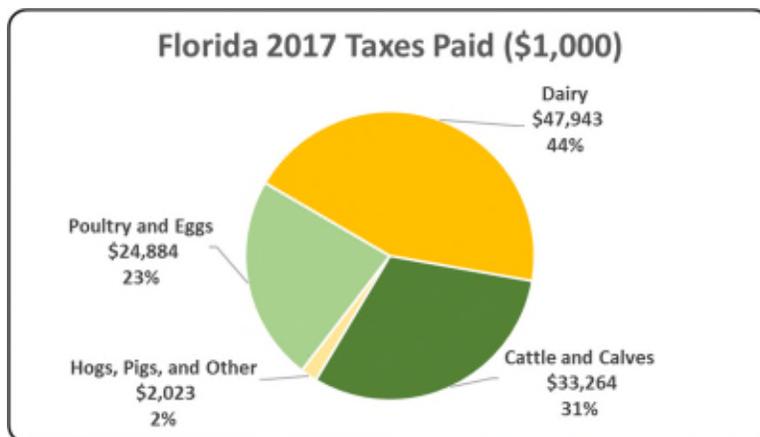
Florida Earnings

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 Florida economy in terms of earnings. Florida’s animal agriculture contributed about \$548.8 million to household earnings in 2017.



Florida Taxes Paid by Animal Agriculture

Florida’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$108.1 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$189.3 million in property taxes paid by all of Florida agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



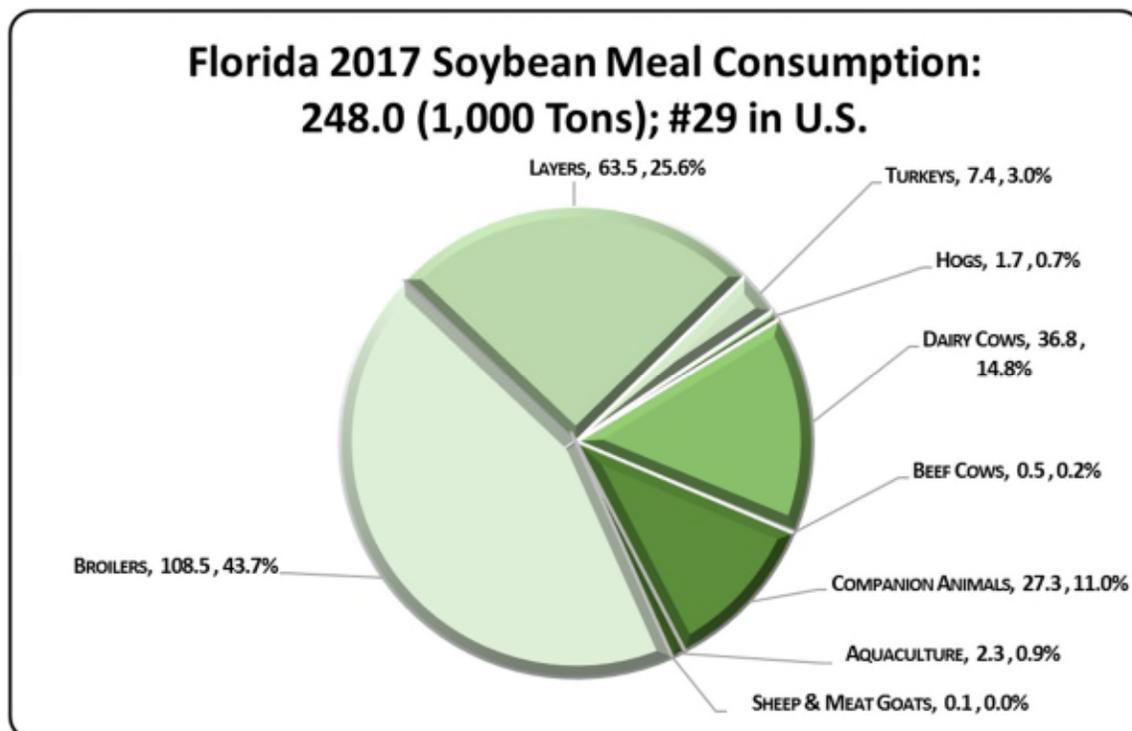
Florida Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Florida's animal agriculture consumed almost 248.0 thousand tons of soybean meal in 2017, placing the state as #29 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Florida consumed 17,556 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (108.5 thousand tons)
- Egg-Laying Hens (63.5 thousand tons)
- Dairy Cows (36.8 thousand tons)

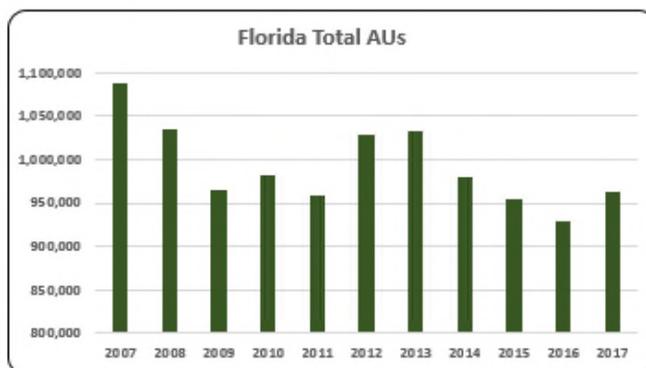
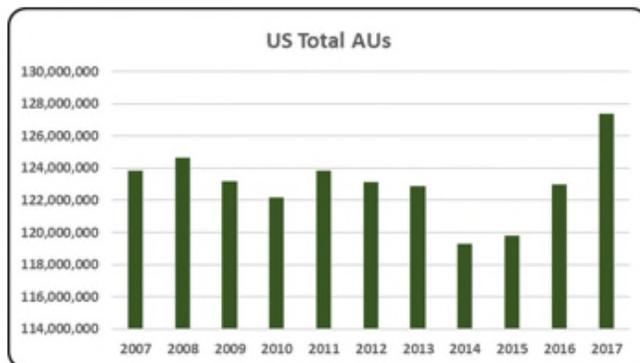


Florida Animal Unit (AU) Trends

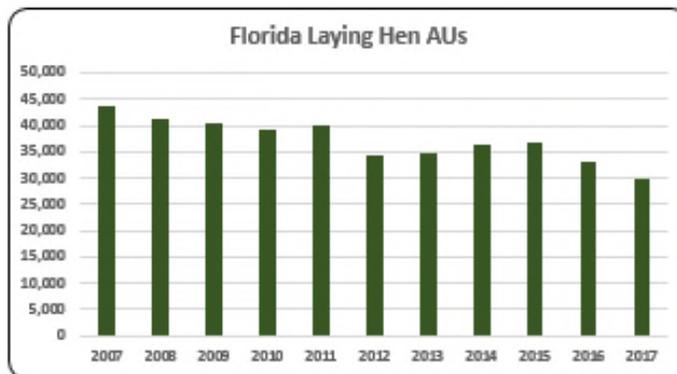
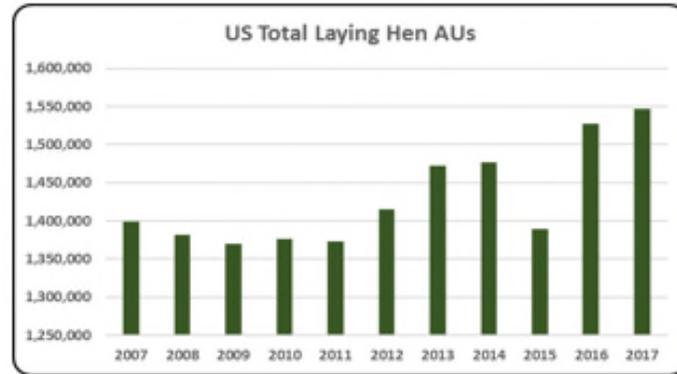
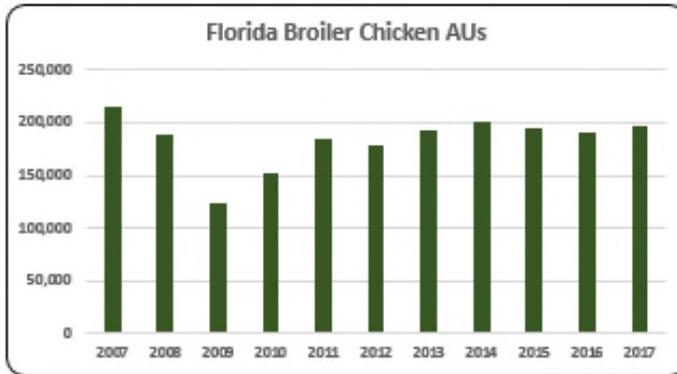
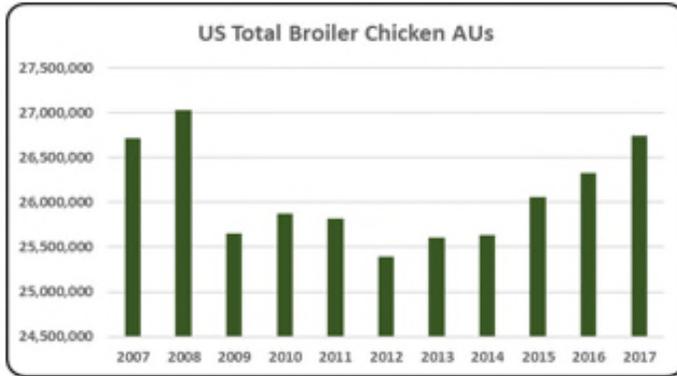
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Florida. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

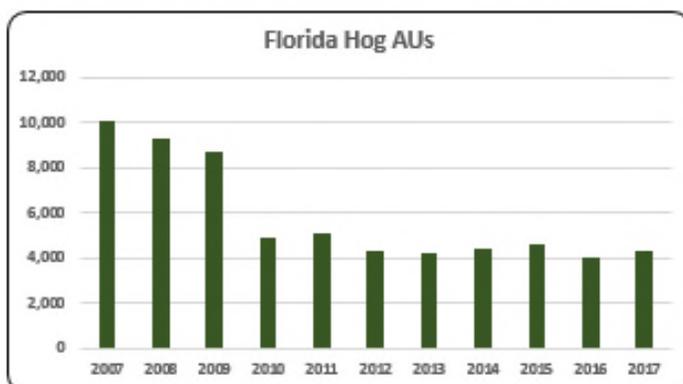
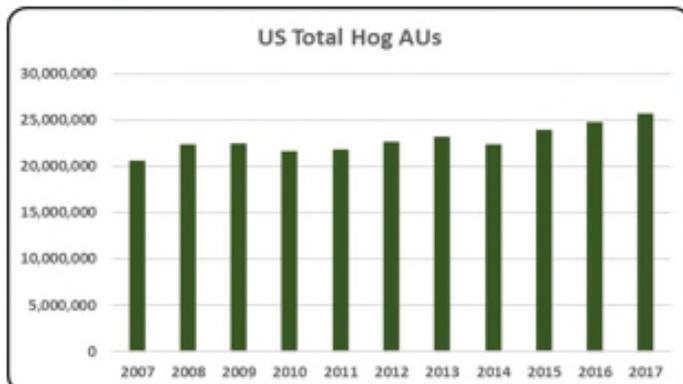
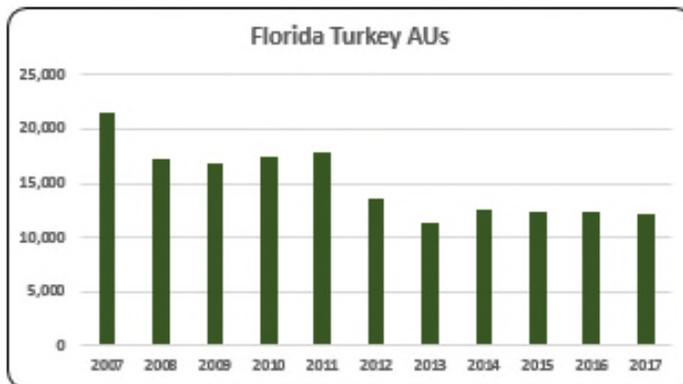
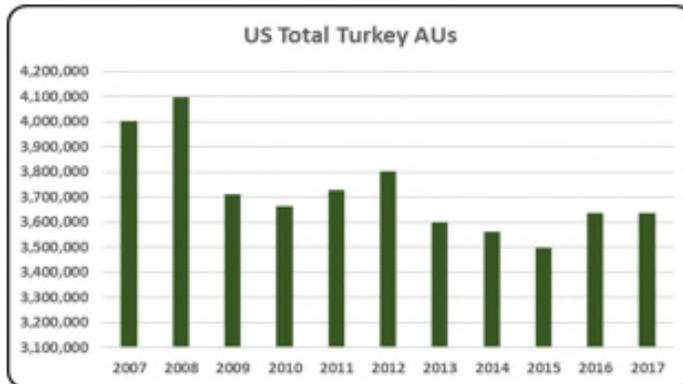
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Florida, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (549,525 AUs), Broiler Chickens (195,957 AUs), and Dairy Cows (170,800 AUs). Total animal units in Florida during 2017 were 962,423 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- In 2017 there were 992,423 AUs in Florida; 59.1% (549,525) of which were beef cow AUs, up 4% from 2016.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the U.S. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- In 2017 there were 195,957 broiler AUs in the state. Florida’s broiler sector makes up 20.4% of Florida’s total AUs.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 2007-2017 decade was 37,234 but layer AUs fell from the 2007 high of 43,792 layer AUs in the state compared to 29,681 AUs in 2017.

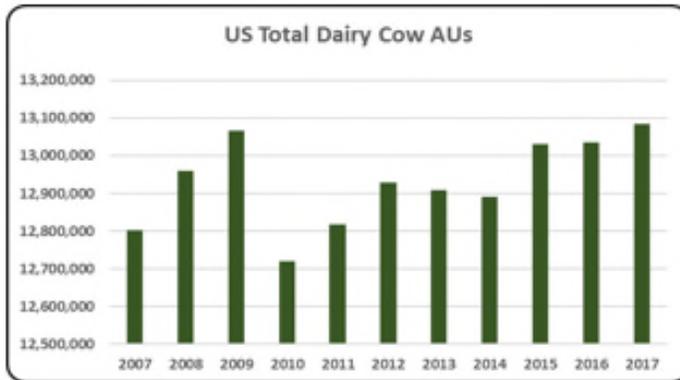


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

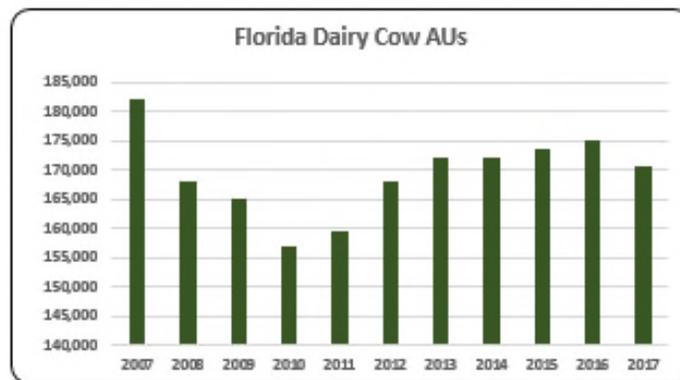
- In 2017 turkey AUs declined 43% relative to 2007.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

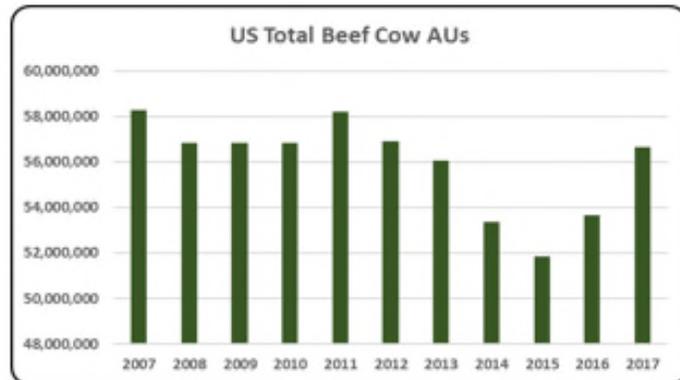
- In 2017, hogs in Florida were the smallest (4,275) animal sector in the state in terms of animal units. Overall hog numbers have been declining. Since 2008, hog AUs have averaged 5,823 AUs.



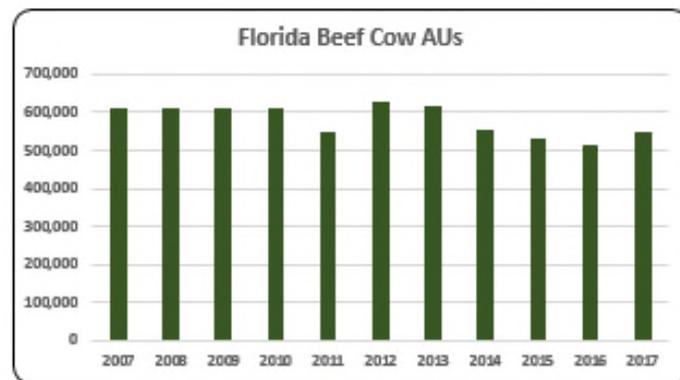
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cow animal inventory makes up 18% (170,800) of all AUs in the state. Dairy cow AUs have dropped 6% since 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow AUs are the largest animal sector in the state with 549,525 AUs in 2017. On average, from 2007 to 2017 there were 581,039 beef cow AUs in the state.

Florida Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	613,650	610,650	610,650	610,650	550,350	629,700	617,550	553,650	530,925	514,125	549,525
	Hog and Pig AUs	10,050	9,300	8,700	4,950	5,100	4,350	4,260	4,410	4,635	4,020	4,275
	Broiler AUs	215,580	188,120	123,581	152,143	185,680	178,844	193,564	200,469	195,663	189,960	195,957
	Turkey AUs	21,463	17,156	16,805	17,504	17,816	13,658	11,393	12,578	12,306	12,265	12,185
	Egg Layer AUs	43,792	41,360	40,508	39,176	40,012	34,391	34,509	36,426	36,592	33,131	29,681
	Dairy AUs	182,000	168,000	165,200	156,800	159,600	168,000	172,200	172,200	173,600	175,000	170,800
	Total Animal Units	1,086,535	1,034,586	965,444	981,223	958,558	1,028,943	1,033,476	979,733	953,721	928,501	962,423
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 380,746	\$ 333,654	\$ 311,595	\$ 395,161	\$ 451,169	\$ 532,525	\$ 533,592	\$ 798,434	\$ 786,325	\$ 510,629	\$ 501,798
	Hogs and Pigs (\$1,000)	\$ 3,013	\$ 2,813	\$ 3,274	\$ 2,297	\$ 2,759	\$ 2,318	\$ 2,293	\$ 3,114	\$ 2,574	\$ 1,842	\$ 2,088
	Broilers (\$1,000)	\$ 179,654	\$ 173,144	\$ 115,164	\$ 151,493	\$ 175,889	\$ 178,500	\$ 238,430	\$ 246,455	\$ 203,149	\$ 175,235	\$ 202,150
	Turkeys (\$1,000)	\$ 20,390	\$ 24,879	\$ 23,579	\$ 35,958	\$ 28,275	\$ 30,401	\$ 22,037	\$ 14,579	\$ 11,519	\$ 13,026	\$ 8,820
	Eggs (\$1,000)	\$ 186,471	\$ 234,515	\$ 152,616	\$ 150,746	\$ 177,861	\$ 183,258	\$ 167,335	\$ 219,087	\$ 315,651	\$ 110,028	\$ 112,171
	Milk (\$1,000)	\$ 460,776	\$ 465,786	\$ 351,520	\$ 441,531	\$ 549,098	\$ 521,820	\$ 569,537	\$ 707,256	\$ 549,966	\$ 489,020	\$ 536,640
	Other	\$ 62,847	\$ 65,396	\$ 67,991	\$ 70,701	\$ 73,212	\$ 75,834	\$ 78,508	\$ 81,068	\$ 83,700	\$ 86,261	\$ 25,960
	Sheep and Lambs (\$1,000)	\$ 305	\$ 287	\$ 314	\$ 456	\$ 400	\$ 453	\$ 560	\$ 552	\$ 617	\$ 610	\$ 582
	Aquaculture (\$1,000)	\$ 62,542	\$ 65,109	\$ 67,677	\$ 70,245	\$ 72,813	\$ 75,380	\$ 77,948	\$ 80,516	\$ 83,084	\$ 85,651	\$ 25,378
	Total (\$1,000)	\$ 1,293,896	\$ 1,300,187	\$ 1,025,738	\$ 1,247,887	\$ 1,458,263	\$ 1,524,656	\$ 1,611,731	\$ 2,069,992	\$ 1,952,885	\$ 1,386,041	\$ 1,389,626

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	12,040	15,304	16,819	17,351	
	Cattle feedlots (112112)	309	-	240	-	
	Dairy cattle and milk production (11212)	296	517	210	187	
	Hog and pig farming (1122)	468	601	594	581	
	Poultry and egg production (1123)	560	739	1,185	1,106	
	Sheep and goat farming (1124)	272	608	1,260	1,796	
	Animal aquaculture and other animal production (1125,1129)	3,202	8,281	8,531	7,904	
Value of Sales (\$1,000)	Cattle and Calves	310,548	328,820	436,193	531,869	
	Hogs and Pigs	9,670	3,154	2,220	2,158	
	Poultry and Eggs	403,366	336,295	410,148	378,453	
	Milk and Other Dairy Products	383,616	371,691	412,211	508,847	
	Aquaculture	76,696	56,949	61,340	88,463	
	Other (calculated)	100,489	103,930	206,888	60,021	
	Total	1,284,385	1,200,839	1,529,000	1,569,811	
Input Purchases	Livestock and poultry purchased	(Farms)	6,697	8,931	8,322	9,474
		\$1,000	145,770	147,080	175,186	163,843
	Breeding livestock purchased	(Farms)	n/a	5,337	5,111	5,623
		\$1,000	n/a	49,880	59,350	61,772
	Other livestock and poultry purchased	(Farms)	n/a	4,919	4,460	5,138
		\$1,000	n/a	97,200	115,836	102,071
	Feed purchased	(Farms)	14,829	26,515	27,297	30,765
	\$1,000	446,861	410,603	547,947	750,800	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 801,271	\$ 168,855	4,480	\$ 33,264
	Hogs, Pigs, and Other	\$ 42,624	\$ 10,268	288	\$ 2,023
	Poultry and Eggs	\$ 560,843	\$ 126,316	3,152	\$ 24,884
	Dairy	\$ 996,058	\$ 243,366	6,791	\$ 47,943
	Total	\$ 2,400,795	\$ 548,805	14,711	\$ 108,115

Change from 2007 to 2017	Cattle and Calves	\$ 87,677	\$ 18,476	490	\$ 3,640
	Hogs, Pigs, and Other	\$ (74,850)	\$ (18,032)	(506)	\$ (3,552)
	Poultry and Eggs	\$ (226,531)	\$ (51,020)	(1,273)	\$ (10,051)
	Dairy	\$ (7,764)	\$ (1,897)	(53)	\$ (374)
	Total	\$ (221,469)	\$ (52,473)	(1,342)	\$ (10,337)

	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	0.0%
	Total	19.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$15.2 billion in economic output
- 68,222 jobs
- \$3.4 billion in earnings
- \$778.9 million in income taxes paid at local, state, and federal levels
- \$131.7 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Georgia has increased economic output by over \$1,954.3 million, boosted household earnings by \$431.3 million, contributed 8,742 additional jobs and paid \$100.1 million in additional tax revenues.

Georgia's animal agriculture consumed almost 2.5 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (2.3 million tons)
- Egg-Laying Hens (98.0 thousand tons)
- Hogs (24.9 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 2017, Georgia's animal agriculture contributed the following to the economy:

- About \$15.2 billion in economic output
- \$3.4 billion in household earnings
- 68,222 jobs
- \$778.9 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:

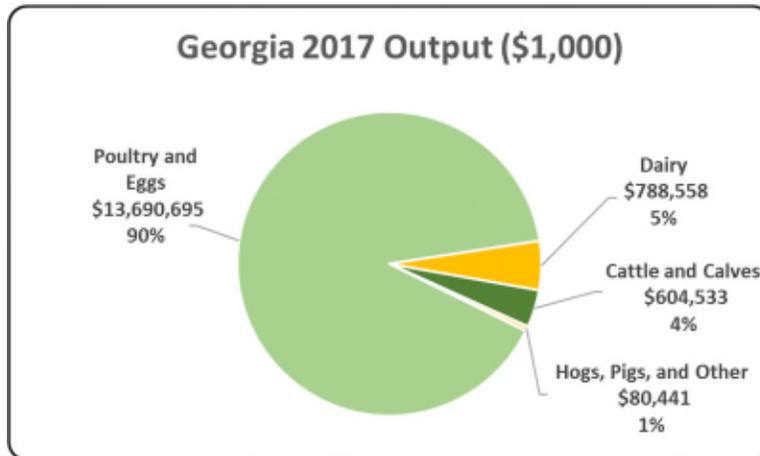
- Increased economic output by almost \$2.0 billion
- Boosted household earnings by \$431.3 million
- Added 8,742 jobs
- Paid an additional \$100.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 15,164,226	\$ 1,954,334	14.79%
Earnings (\$1,000)	\$ 3,357,532	\$ 431,271	14.74%
Employment (Jobs)	68,222	8,742	14.70%
Income Taxes Paid (\$1,000)	\$ 778,948	\$ 100,055	14.74%
Property Taxes Paid in 2012 (\$1,000)	\$ 131,712		

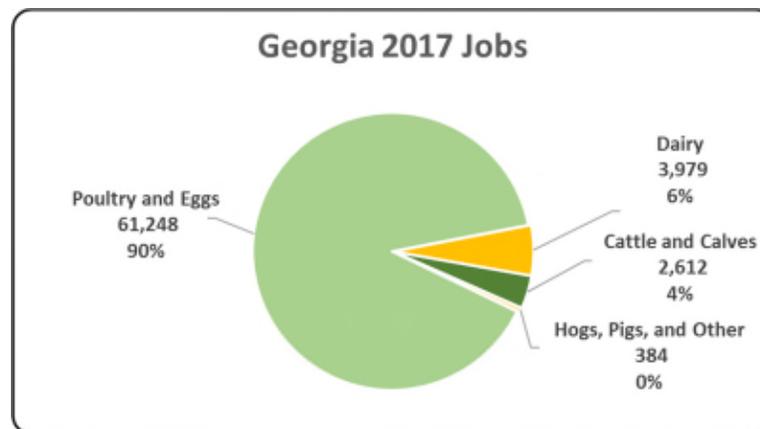
Georgia Output

“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 \$15.2 billion.



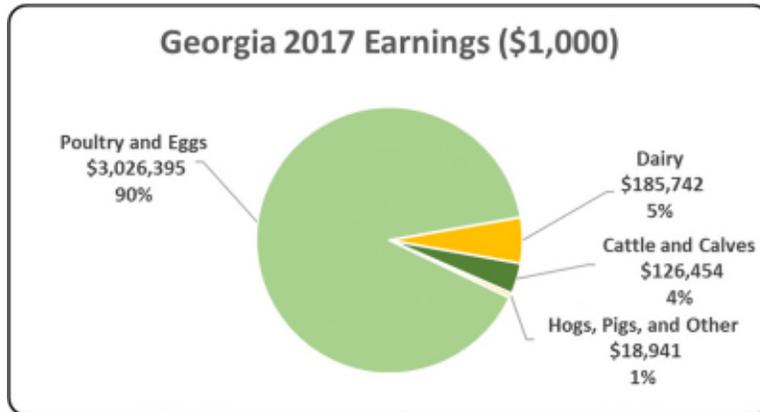
Georgia Jobs

“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 68,222 jobs within and outside of animal agriculture.



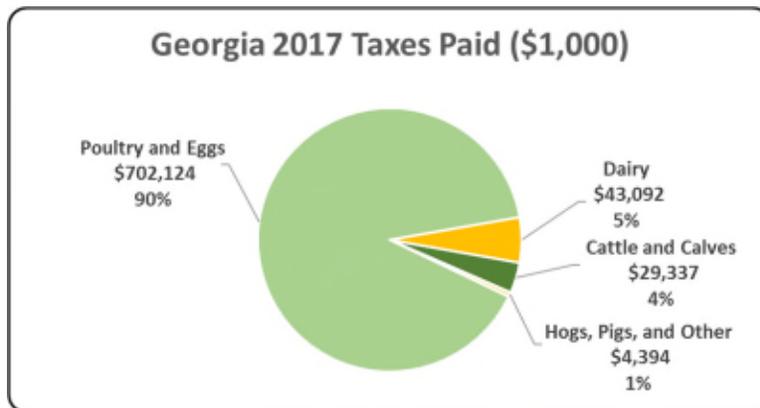
Georgia Earnings

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 \$3.4 billion to household earnings in 2017.



Georgia Taxes Paid by Animal Agriculture

Georgia’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$778.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$131.7 million in property taxes paid by all of Georgia agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



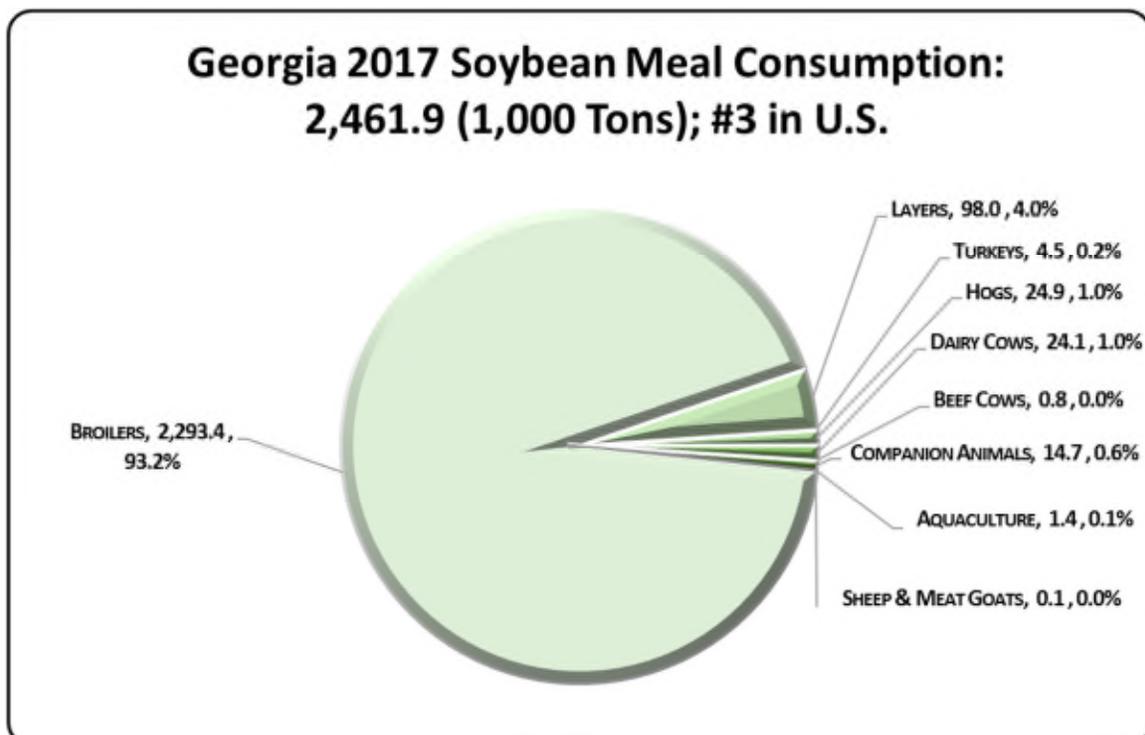
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Through in-depth conversations with many of the nation's top nutritionists and researchers from both private industry and public institutions, "bottom up" estimates of soybean meal usage by animal type were determined. Using the input from these conversations and additional analysis performed by Decision Innovation Solutions, the quantity of soybean meal used during the 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Georgia's animal agriculture consumed almost 2.5 million tons of soybean meal in 2017, placing the state as #3 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Georgia consumed 13,445 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

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- Egg-Laying Hens (98.0 thousand tons)
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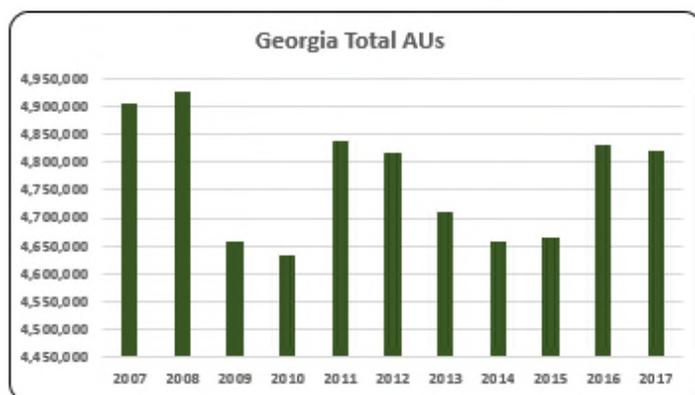
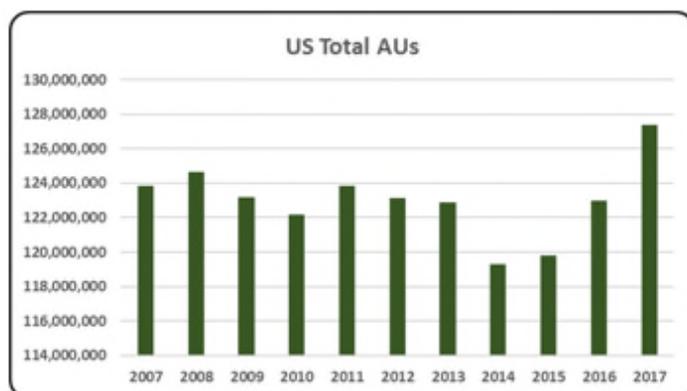


Georgia Animal Unit (AU) Trends

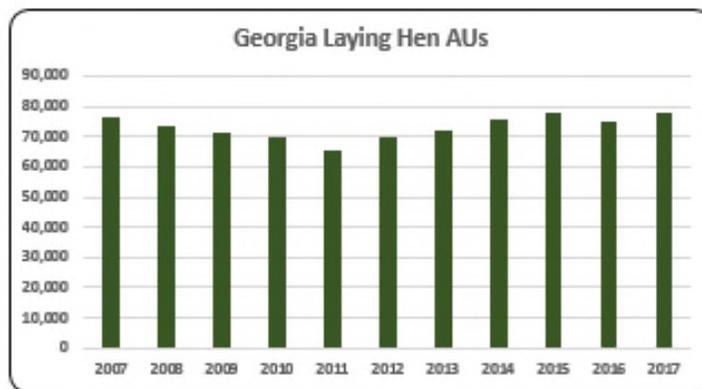
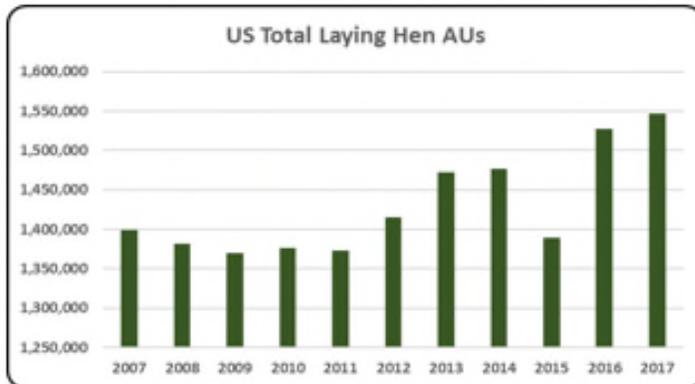
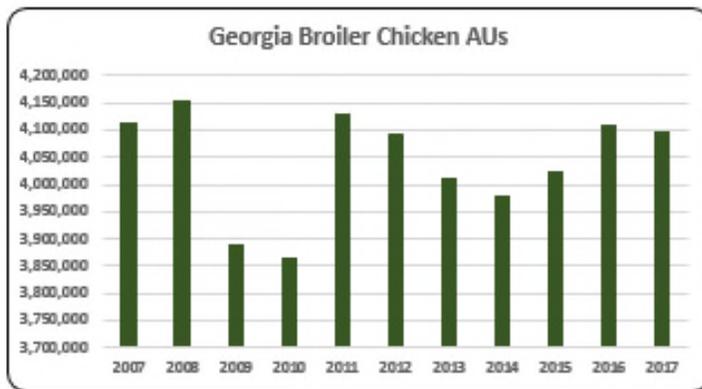
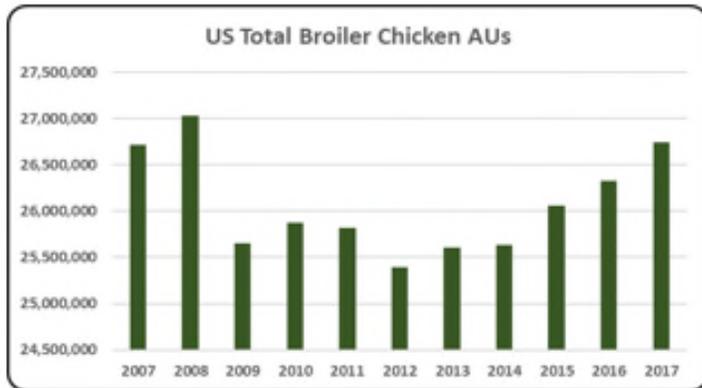
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Similar to using a single year to measure the presence and strength of a sector, in some circumstances AUs can be misleading. This is because AUs do not reflect important considerations like increased weights, improved livability, increased laying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

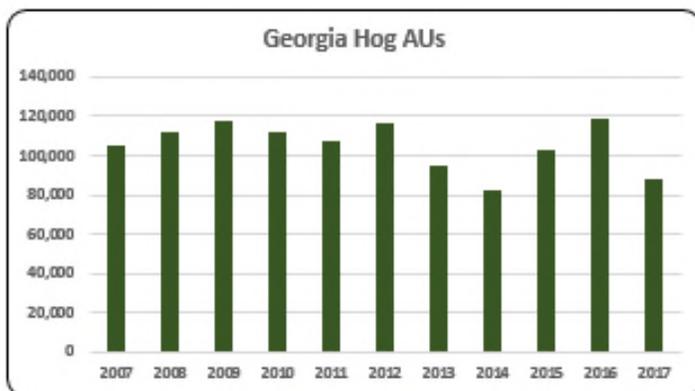
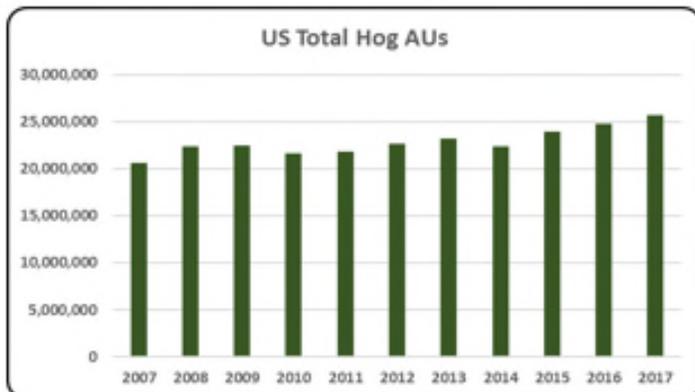
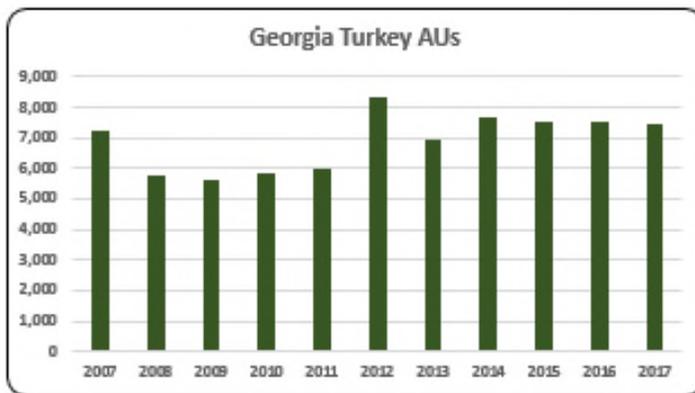
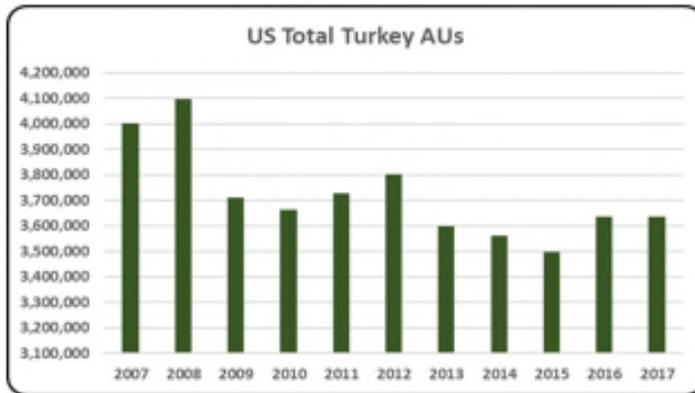
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Georgia, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (4.1 million AUs), Beef Cows (432,300 AUs), and Dairy Cows (116,200 AUs). Total animal units in Georgia during 2017 were 4.8 million AUs.



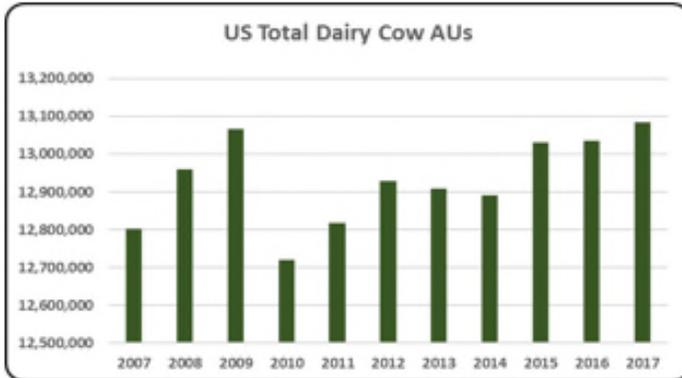
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- 2017 total AUs in Georgia were 4.82 million, comprising about 3.8% of all AUs in the U.S. As the number one broiler producer, Georgia's 2017 broiler AUs represented 15% of the U.S. total.



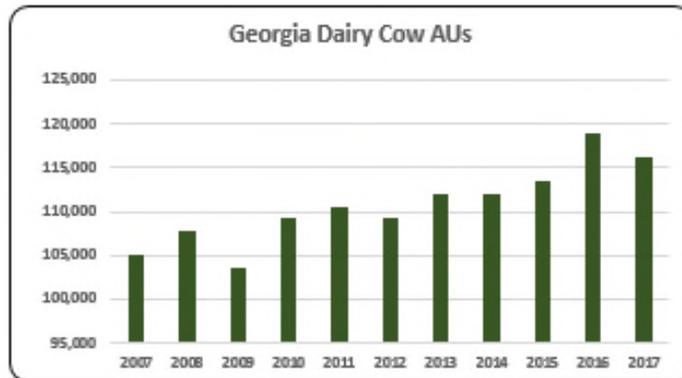
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- In 2017, broiler AUs accounted for about 85% (4.1 million) of all AUs in Georgia. Broiler AUs have seen fluctuation in the last decade.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 2017 laying hen AUs increased to 78,148.



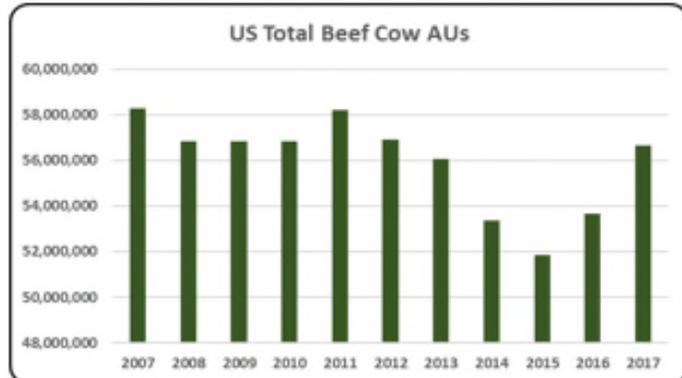
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Georgia’s turkey industry is the smallest of all animal sectors reporting in at 7,446 of all AUs in the state in 2017.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs have varied over the years, numbers declined in 2014 (82,500) but increased in 2016 (118,425). However, again in 2017 they dropped to 87,645.



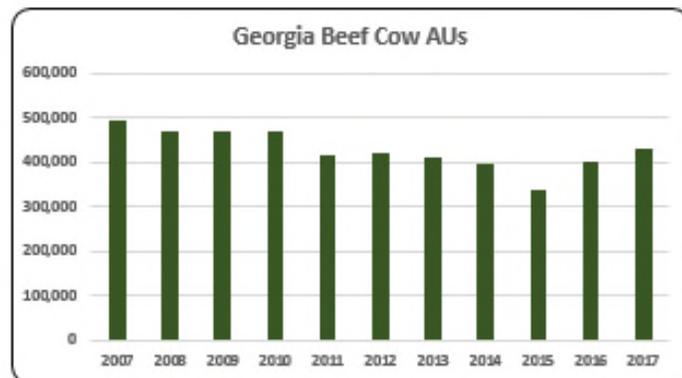
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cow AUs in Georgia have grown 11% since 2007 to a total of 116,200 AUs in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Even though beef is the second largest animal unit sector in the state, there has been a downward trend with a 13% reduction in the number beef cow AUs from 2007 to 2017 (432,300).

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	496,500	470,700	470,700	470,700	417,000	420,300	411,600	398,100	336,600	402,600	432,300
	Hog and Pig AUs	105,450	112,545	117,300	111,900	107,700	116,700	95,175	82,500	102,450	118,425	87,645
	Broiler AUs	4,113,958	4,155,154	3,889,866	3,865,378	4,131,825	4,092,980	4,011,338	3,979,927	4,026,271	4,109,095	4,097,673
	Turkey AUs	7,207	5,760	5,642	5,877	5,982	8,347	6,963	7,686	7,521	7,495	7,446
	Egg Layer AUs	76,736	73,504	71,520	70,012	65,080	69,613	72,327	76,015	77,504	74,737	78,148
	Dairy AUs	105,000	107,800	103,600	109,200	110,600	109,200	112,000	112,000	113,400	119,000	116,200
	Total Animal Units	4,904,850	4,925,464	4,658,629	4,633,067	4,838,187	4,817,140	4,709,402	4,656,228	4,663,746	4,831,352	4,819,413
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 261,954	\$ 253,379	\$ 249,687	\$ 272,727	\$ 336,853	\$ 382,348	\$ 382,907	\$ 521,993	\$ 519,004	\$ 336,222	\$ 331,378
	Hogs and Pigs (\$1,000)	\$ 52,744	\$ 52,730	\$ 45,534	\$ 43,517	\$ 58,427	\$ 64,807	\$ 55,922	\$ 55,943	\$ 60,590	\$ 65,659	\$ 40,707
	Broilers (\$1,000)	\$ 3,187,848	\$ 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
	Turkeys (\$1,000)	\$ 5,619	\$ 6,856	\$ 6,498	\$ 12,074	\$ 9,494	\$ 10,208	\$ 7,399	\$ 4,895	\$ 7,039	\$ 7,960	\$ 5,390
	Eggs (\$1,000)	\$ 437,491	\$ 564,244	\$ 468,599	\$ 442,065	\$ 488,812	\$ 532,576	\$ 585,797	\$ 666,920	\$ 764,192	\$ 597,102	\$ 578,298
	Milk (\$1,000)	\$ 283,997	\$ 283,195	\$ 204,400	\$ 256,680	\$ 319,000	\$ 304,669	\$ 338,688	\$ 446,424	\$ 359,400	\$ 320,250	\$ 349,600
	Other	\$ 14,238	\$ 17,471	\$ 20,740	\$ 24,100	\$ 27,303	\$ 30,594	\$ 33,925	\$ 37,167	\$ 40,466	\$ 43,708	\$ 6,835
	Sheep and Lambs (\$1,000)	\$ 240	\$ 226	\$ 247	\$ 359	\$ 315	\$ 357	\$ 441	\$ 435	\$ 486	\$ 481	\$ 458
	Aquaculture (\$1,000)	\$ 13,998	\$ 17,245	\$ 20,493	\$ 23,741	\$ 26,989	\$ 30,236	\$ 33,484	\$ 36,732	\$ 39,980	\$ 43,227	\$ 6,377
	Total (\$1,000)	\$ 4,243,891	\$ 4,613,524	\$ 4,137,059	\$ 4,368,624	\$ 4,648,469	\$ 5,137,951	\$ 6,022,208	\$ 6,541,354	\$ 6,002,828	\$ 5,226,401	\$ 5,688,198

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	15,967	18,799	15,796	12,858	
	Cattle feedlots (112112)	399	317	313	-	
	Dairy cattle and milk production (11212)	569	527	487	232	
	Hog and pig farming (1122)	760	493	384	247	
	Poultry and egg production (1123)	3,257	3,632	3,860	4,158	
	Sheep and goat farming (1124)	424	1,010	1,544	1,912	
	Animal aquaculture and other animal production (1125,1129)	2,364	6,197	6,301	4,027	
Value of Sales (\$1,000)	Cattle and Calves	234,379	240,070	342,392	403,172	
	Hogs and Pigs	109,855	65,384	68,369	56,386	
	Poultry and Eggs	2,602,734	2,780,214	4,246,765	4,773,837	
	Milk and Other Dairy Products	214,060	212,720	264,423	299,548	
	Aquaculture	2,943	5,310	14,075	26,858	
	Other (calculated)	23,301	28,458	34,572	16,560	
	Total	3,187,272	3,332,156	4,970,596	5,576,361	
Input Purchases	Livestock and poultry purchased	(Farms)	10,408	12,342	10,114	10,995
		\$1,000	396,933	372,108	871,341	927,465
	Breeding livestock purchased	(Farms)	n/a	3,460	4,907	5,728
		\$1,000	n/a	27,615	43,265	99,642
	Other livestock and poultry purchased	(Farms)	n/a	7,172	6,399	6,714
		\$1,000	n/a	344,493	828,076	827,823
	Feed purchased	(Farms)	21,119	32,119	26,287	26,118
		\$1,000	1,427,778	1,365,162	2,121,379	2,913,851

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 604,533	\$ 126,454	2,612	\$ 29,337
	Hogs, Pigs, and Other	\$ 80,441	\$ 18,941	384	\$ 4,394
	Poultry and Eggs	\$ 13,690,695	\$ 3,026,395	61,248	\$ 702,124
	Dairy	\$ 788,558	\$ 185,742	3,979	\$ 43,092
	Total	\$ 15,164,226	\$ 3,357,532	68,222	\$ 778,948

Change from 2007 to 2017	Cattle and Calves	\$ 43,631	\$ 9,127	188	\$ 2,117
	Hogs, Pigs, and Other	\$ (52,581)	\$ (12,381)	(251)	\$ (2,872)
	Poultry and Eggs	\$ 1,926,594	\$ 425,883	8,619	\$ 98,805
	Dairy	\$ 36,690	\$ 8,642	185	\$ 2,005
	Total	\$ 1,954,334	\$ 431,271	8,742	\$ 100,055

	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.5%
	Total	23.2%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 Animal Agriculture: HAWAII

Hawaii Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Hawaii'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 success in the State of Hawaii. The success of Hawaii animal agriculture in turn has a small impact on the rest of the state and regional economies. For example, in the State of Hawaii during 2017 animal agriculture contributed:

- \$133.6 million in economic output
- 865 jobs
- \$28.2 million in earnings
- \$6.9 million in income taxes paid at local, state, and federal levels
- \$11.6 million in the form of property taxes

Hawaii's animal agriculture consumed about 9,200 tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (2,600 tons)
- Egg-Laying Hens (2,500 tons)
- Companion Animals (1,400 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 minor 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 2017, Hawaii's animal agriculture contributed the following to the economy:

- About \$133.6 million in economic output
- \$28.2 million in household earnings
- 865 jobs
- \$6.9 million in income taxes

During the last decade Hawaii's animal agriculture has:

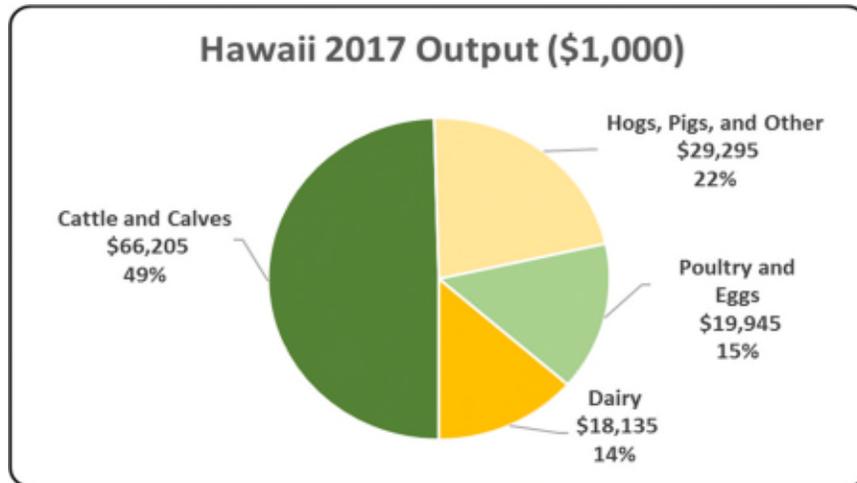
- Increased economic output by \$4.9 million
- Boosted household earnings by \$0.3 million
- Added 7 jobs
- Paid an additional \$0.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 133,580	\$ 4,889	3.80%
Earnings (\$1,000)	\$ 28,237	\$ 273	0.98%
Employment (Jobs)	865	7	0.76%
Income Taxes Paid (\$1,000)	\$ 6,925	\$ 67	0.98%
Property Taxes Paid in 2012 (\$1,000)	\$ 11,633		

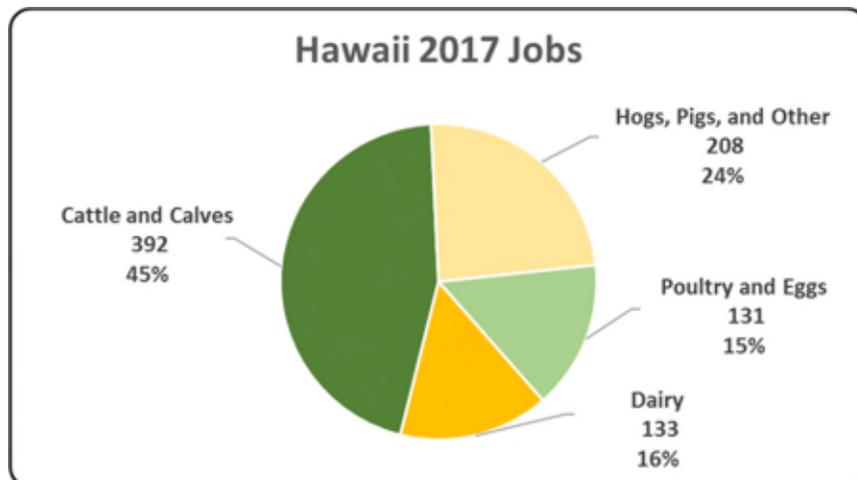
Hawaii Output

“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 \$133.6 million.



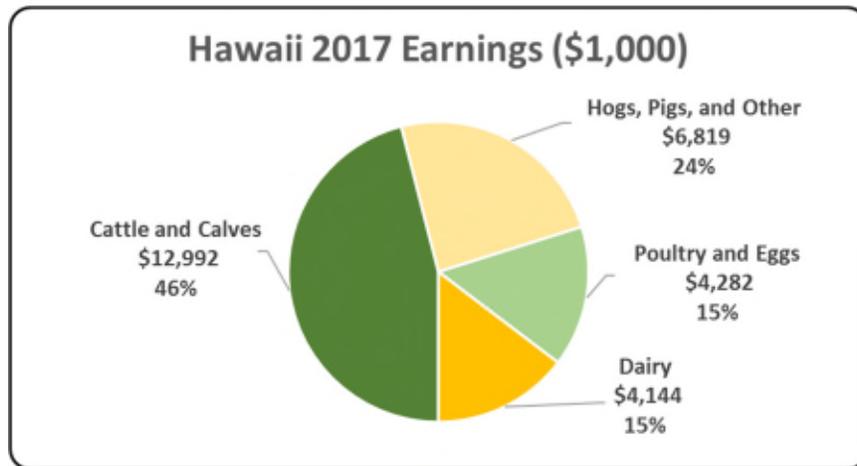
Hawaii Jobs

“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 865 jobs within and outside of animal agriculture.



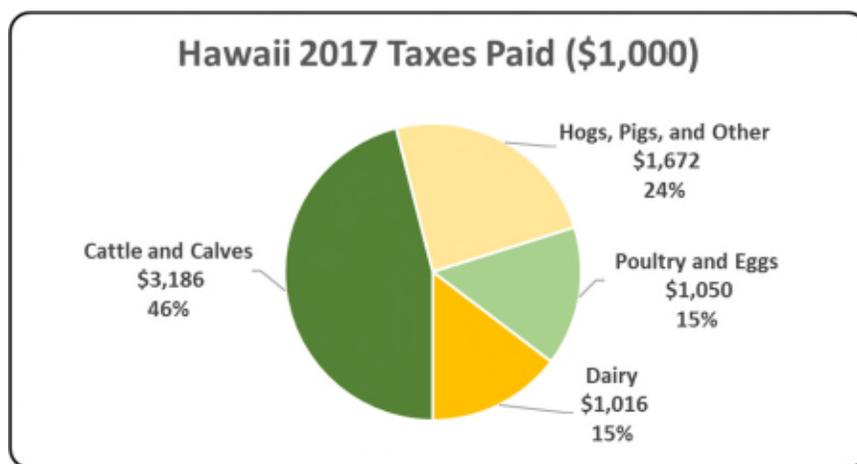
Hawaii Earnings

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 \$28.2 million to household earnings in 2017.



Hawaii Taxes Paid by Animal Agriculture

Hawaii’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$6.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$11.6 million in property taxes paid by all of Hawaii agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



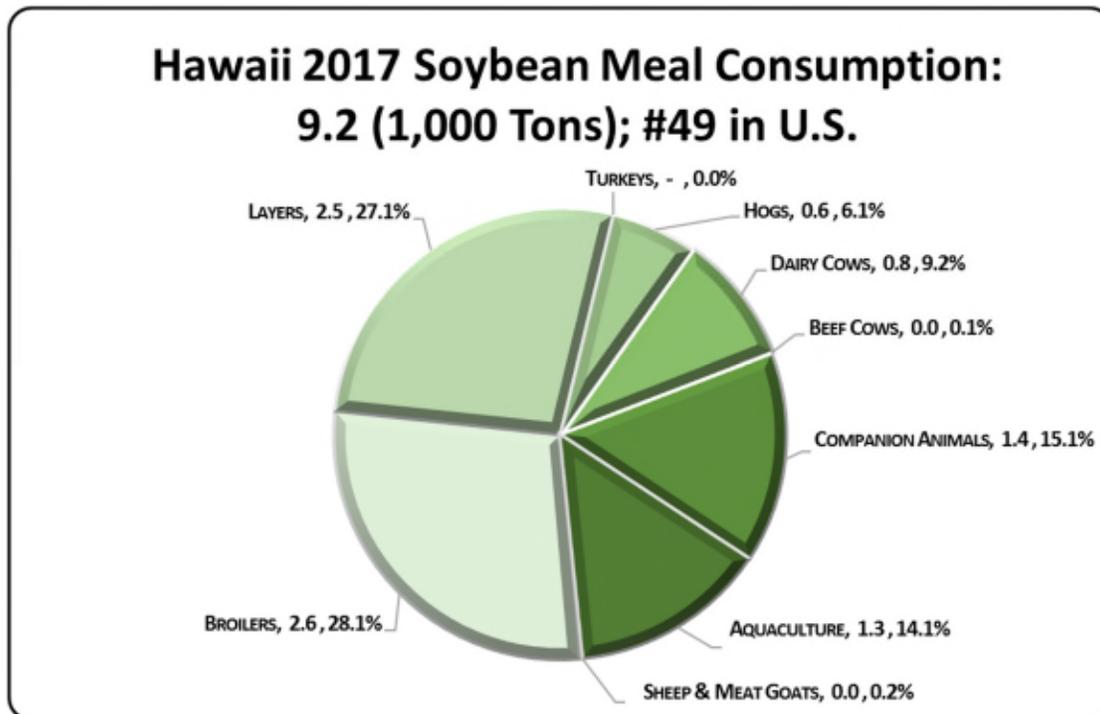
Hawaii Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Hawaii's animal agriculture consumed about 9,200 tons of soybean meal in 2017, 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:

- Broilers (2,600 tons)
- Egg-Laying Hens (2,500 tons)
- Companion Animals (1,400 tons)

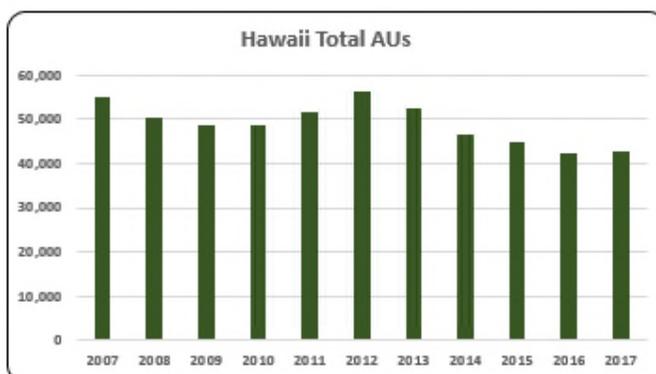
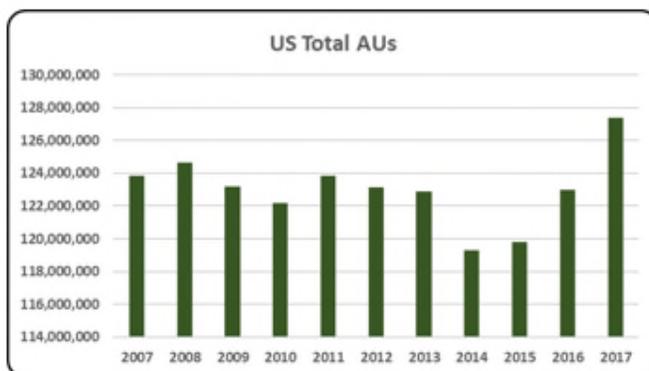


Hawaii Animal Unit (AU) Trends

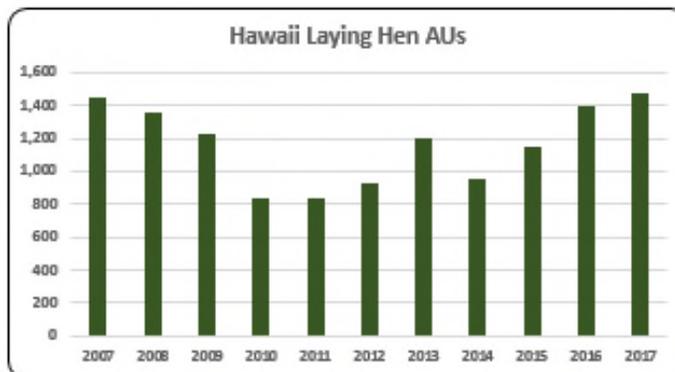
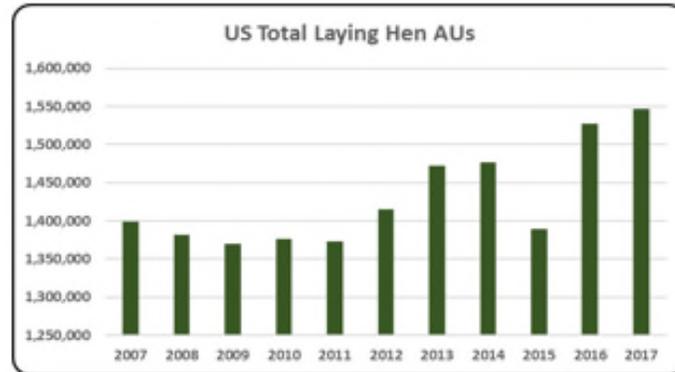
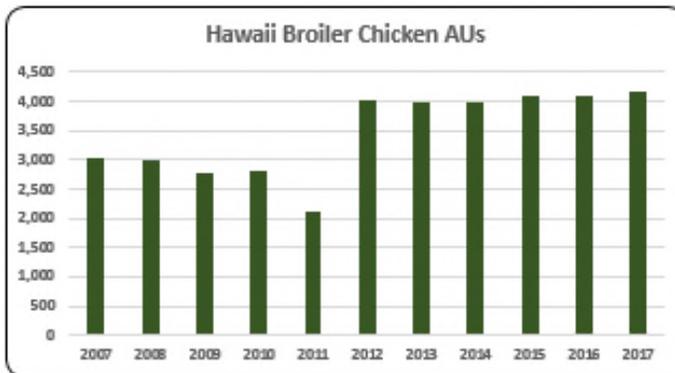
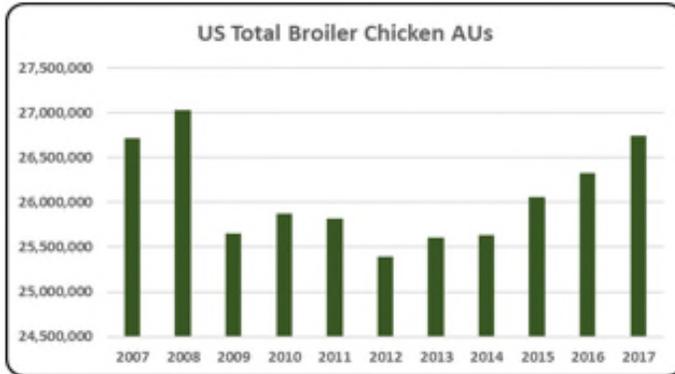
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Hawaii. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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 Hawaii and to give perspective on Hawaii'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 Hawaii, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (32,460 AUs), Broiler Chickens (4,169 AUs), and Dairy Cows (3,360 AUs). Total animal units in Hawaii during 2017 were 42,751 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Overall AUs in Hawaii were small for all species included in this study from 2007 to 2017 and there was a decrease of 22% during this period for all AUs. Hawaii AUs in 2017 were 42,751.

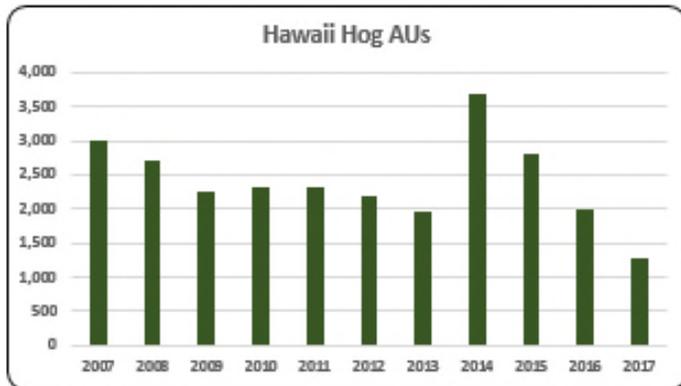
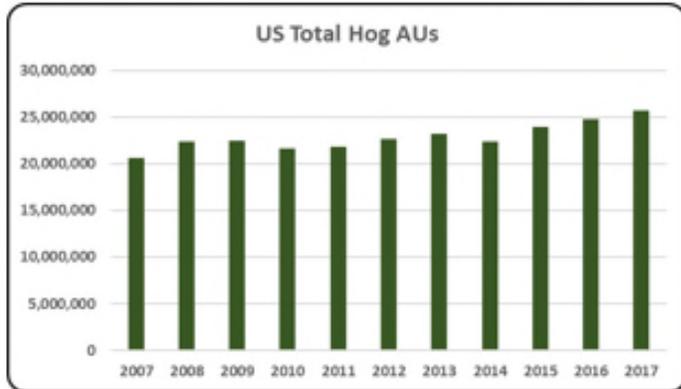
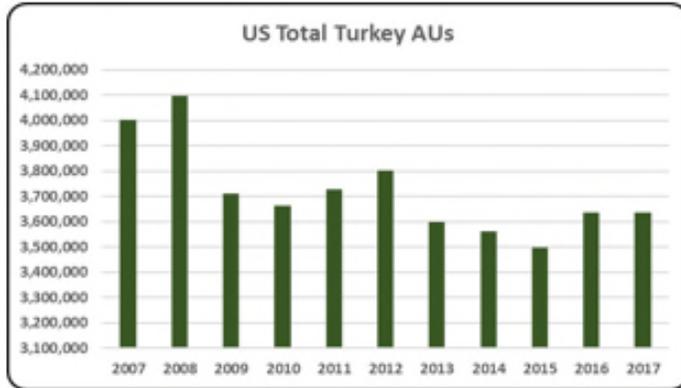


- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).

- There were 4,169 broiler AUs in 2017 in Hawaii. Broiler chickens made up 9.75% of total Hawaii AUs in 2017.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

- Layer AUs in Hawaii followed a descending trend from the highest numbers in 2007 (1,448) to the lowest numbers in 2010 (832). Layer AUs have risen since the 2010 levels; however, layer AUs in 2017 were only at 1,473 AUs.

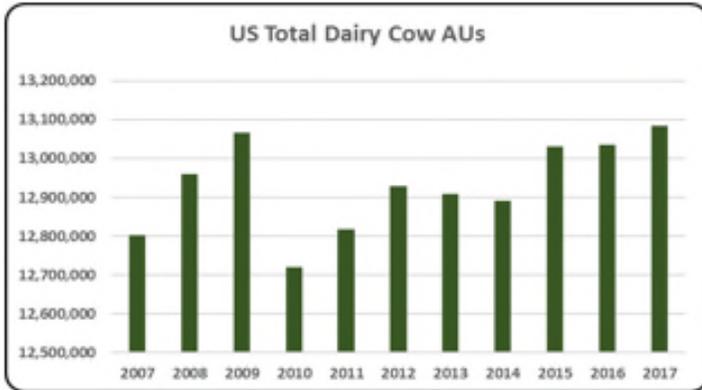


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

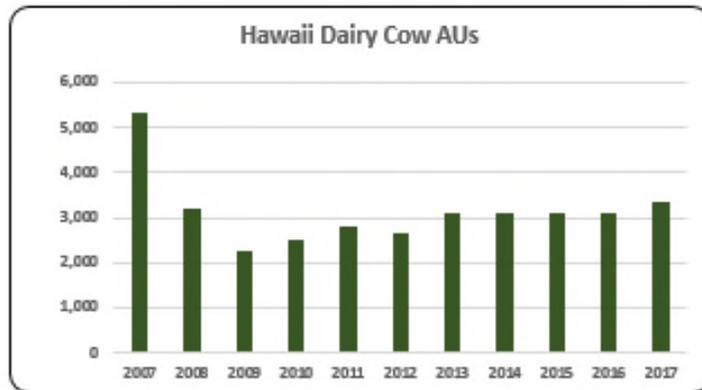
- Turkey production in Hawaii is non-existent since 2006.

- 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.

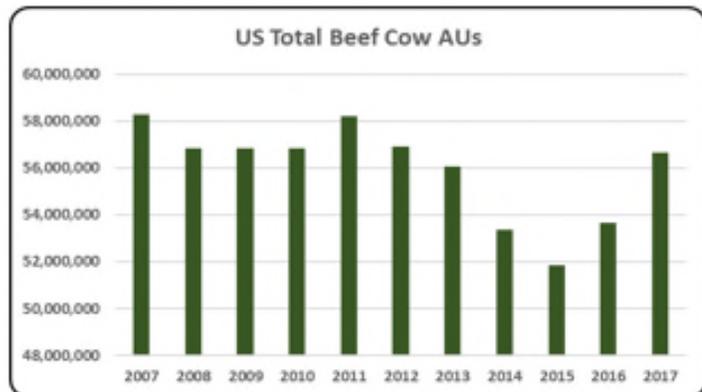
- 2017 hog AUs were at 1,290, overall hog AUs have fallen from a record number in 2005 (3,900) to the lowest number (1,290) in 2017.



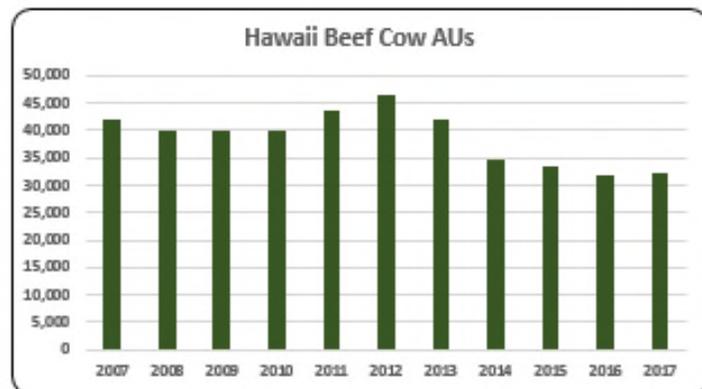
- From 2007 to 2017 dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy AUs in Hawaii declined from 2007 reaching the lowest number in 2009 (2,240). Numbers have been rebuilding since then but remained well below dairy cow AUs in 2007 (5,320). In 2017 dairy AUs were at 3,360.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- There were 32,460 beef cow AUs in Hawaii in 2017. AU numbers have been consistently declining since the 2012 record number of 46,650 beef cow AUs.

Hawaii Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 soybean marketing year for up to sixteen specific animal species has been estimated.

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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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	42,000	40,050	40,050	40,050	43,500	46,650	42,150	34,860	33,510	31,710	32,460	
	Hog and Pig AUs	3,000	2,700	2,265	2,325	2,325	2,190	1,965	3,690	2,820	1,995	1,290	
	Broiler AUs	3,049	3,001	2,791	2,828	2,131	4,013	3,999	3,977	4,079	4,110	4,169	
	Turkey AUs	-	-	-	-	-	-	-	-	-	-	-	-
	Egg Layer AUs	1,448	1,360	1,228	832	837	927	1,200	956	1,150	1,397	1,473	
	Dairy AUs	5,320	3,220	2,240	2,520	2,800	2,660	3,080	3,080	3,080	3,080	3,080	3,360
	Total Animal Units	54,817	50,331	48,574	48,555	51,593	56,440	52,394	46,563	44,640	42,292	42,751	
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 24,700	\$ 24,898	\$ 29,891	\$ 28,499	\$ 46,848	\$ 49,601	\$ 48,877	\$ 63,298	\$ 68,251	\$ 45,209	\$ 43,891	
	Hogs and Pigs (\$1,000)	\$ 3,605	\$ 3,299	\$ 3,216	\$ 3,935	\$ 2,789	\$ 2,941	\$ 2,831	\$ 4,232	\$ 3,315	\$ 2,364	\$ 1,534	
	Broilers (\$1,000)	\$ 2,353	\$ 2,404	\$ 2,074	\$ 2,167	\$ 1,898	\$ 3,999	\$ 4,873	\$ 5,112	\$ 4,460	\$ 3,965	\$ 4,656	
	Turkeys (\$1,000)	\$ 161	\$ 196	\$ 186	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
	Eggs (\$1,000)	\$ 7,428	\$ 8,678	\$ 8,759	\$ 8,128	\$ 4,913	\$ 5,510	\$ 6,225	\$ 9,964	\$ 16,610	\$ 6,532	\$ 8,832	
	Milk (\$1,000)	\$ 10,011	\$ 5,643	\$ 7,562	\$ 8,855	\$ 9,617	\$ 9,713	\$ 10,148	\$ 10,585	\$ 10,080	\$ 9,214	\$ 11,125	
	Other	\$ 25,060	\$ 30,669	\$ 36,288	\$ 41,935	\$ 47,535	\$ 53,161	\$ 58,799	\$ 64,410	\$ 70,039	\$ 75,650	\$ 18,766	
	Sheep and Lambs (\$1,000)	\$ 73	\$ 69	\$ 75	\$ 109	\$ 96	\$ 109	\$ 134	\$ 132	\$ 148	\$ 146	\$ 140	
	Aquaculture (\$1,000)	\$ 24,987	\$ 30,600	\$ 36,213	\$ 41,826	\$ 47,439	\$ 53,052	\$ 58,665	\$ 64,278	\$ 69,891	\$ 75,504	\$ 18,627	
	Total (\$1,000)	\$ 73,318	\$ 75,787	\$ 87,976	\$ 93,520	\$ 113,599	\$ 124,924	\$ 131,753	\$ 157,601	\$ 172,755	\$ 142,935	\$ 88,804	

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	561	526	860	976	
	Cattle feedlots (112112)	22	30	30	-	
	Dairy cattle and milk production (11212)	14	13	6	9	
	Hog and pig farming (1122)	152	115	116	91	
	Poultry and egg production (1123)	39	51	107	97	
	Sheep and goat farming (1124)	54	65	190	238	
	Animal aquaculture and other animal production (1125,1129)	149	167	359	257	
Value of Sales (\$1,000)	Cattle and Calves	27,895	30,719	44,011	37,825	
	Hogs and Pigs	6,336	4,612	withheld	-	
	Poultry and Eggs	17,999	12,545	withheld	6,429	
	Milk and Other Dairy Products	29,058	21,745	7,018	-	
	Aquaculture	n/a	14,005	14,057	56,450	
	Other (calculated)	14,236	4,441	18,625	8,119	
	Total	95,524	88,067	83,711	108,823	
Input Purchases	Livestock and poultry purchased	(Farms) 479	329	547	741	
		\$1,000	6,471	6,025	3,343	3,880
	Breeding livestock purchased	(Farms) n/a	179	267	354	
		\$1,000	n/a	873	1,135	1,509
	Other livestock and poultry purchased	(Farms) n/a	193	345	491	
		\$1,000	n/a	5,152	2,208	2,371
Feed purchased	(Farms) 845	1,267	1,939	2,028		
	\$1,000	35,749	27,997	24,678	43,811	

	Animal Type		Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves		\$ 66,205	\$ 12,992	392	\$ 3,186
	Hogs, Pigs, and Other		\$ 29,295	\$ 6,819	208	\$ 1,672
	Poultry and Eggs		\$ 19,945	\$ 4,282	131	\$ 1,050
	Dairy		\$ 18,135	\$ 4,144	133	\$ 1,016
	Total		\$ 133,580	\$ 28,237	865	\$ 6,925
Change from 2007 to 2017	Cattle and Calves		\$ 22,475	\$ 4,410	133	\$ 1,082
	Hogs, Pigs, and Other		\$ (19,258)	\$ (4,483)	(137)	\$ (1,099)
	Poultry and Eggs		\$ 2,690	\$ 578	18	\$ 142
	Dairy		\$ (1,019)	\$ (233)	(7)	\$ (57)
	Total		\$ 4,889	\$ 273	7	\$ 67
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				13.5%	
	Federal Social Security tax rate				6.2%	
	State Effective Rate				4.8%	
	Total				24.5%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$9.0 billion in economic output
- 43,358 jobs
- \$2.0 billion in earnings
- \$482.6 million in income taxes paid at local, state, and federal levels
- \$78.9 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Idaho has increased economic output by over \$984.0 million, boosted household earnings by \$208.5 million, contributed 4,454 additional jobs and paid \$50.5 million in additional tax revenues.

Idaho's animal agriculture consumed almost 214.2 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (154.3 thousand tons)
- Broilers (23.8 thousand tons)
- Egg-Laying Hens (14.4 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 contributor to the economic well-being of the people of Idaho and beyond.

Idaho Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Idaho's economy. In 2017, Idaho's animal agriculture contributed the following to the economy:

- About \$9.0 billion in economic output
- \$2.0 billion in household earnings
- 43,358 jobs
- \$482.6 million in income taxes

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

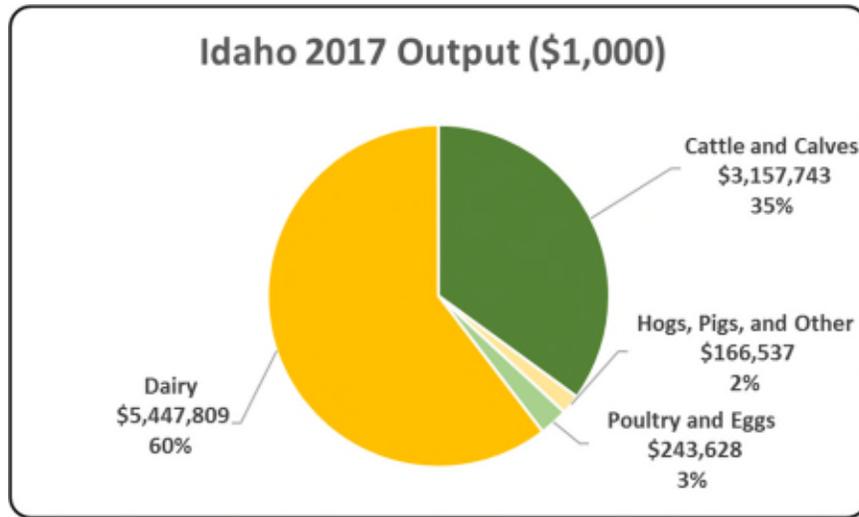
- Increased economic output by \$984.0 million
- Boosted household earnings by \$208.5 million
- Added 4,454 jobs
- Paid an additional \$50.5 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 9,015,718	\$ 983,960	12.25%
Earnings (\$1,000)	\$ 1,994,154	\$ 208,505	11.68%
Employment (Jobs)	43,358	4,454	11.45%
Income Taxes Paid (\$1,000)	\$ 482,585	\$ 50,458	11.68%
Property Taxes Paid in 2012 (\$1,000)	\$ 78,925		

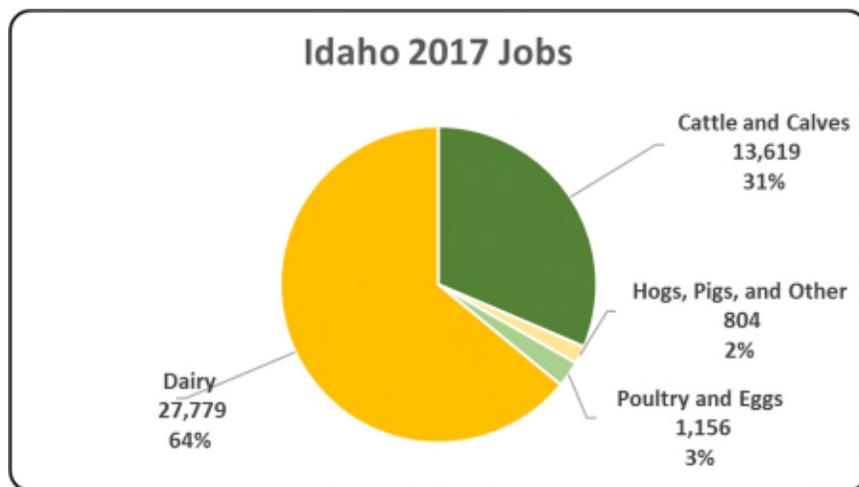
Idaho Output

“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.



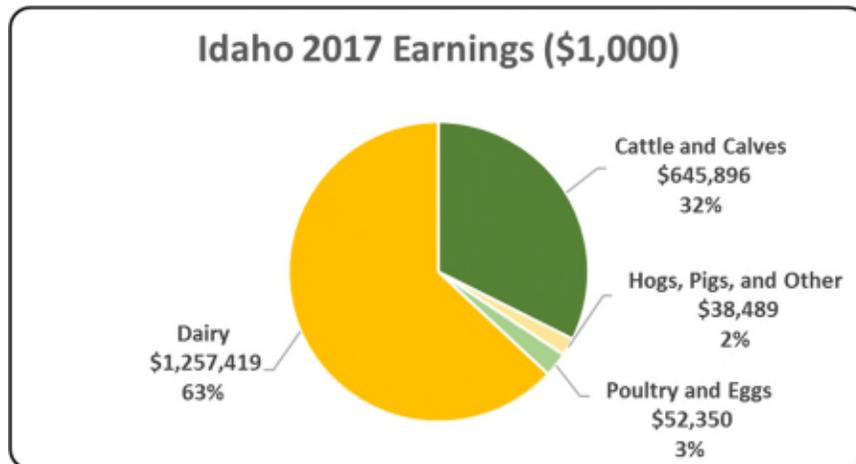
Idaho Jobs

“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 significantly to Idaho total jobs, contributing 43,358 jobs within and outside of animal agriculture.



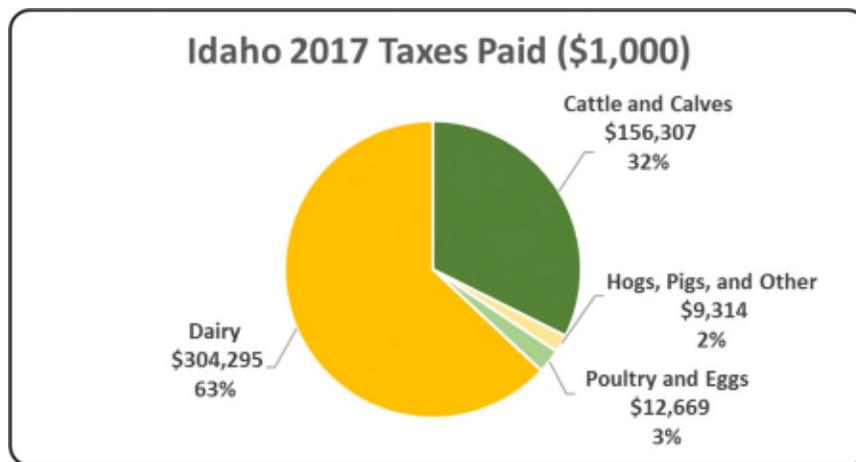
Idaho Earnings

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 2017.



Idaho Taxes Paid by Animal Agriculture

Idaho’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$482.6 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$78.9 million in property taxes paid by all of Idaho agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



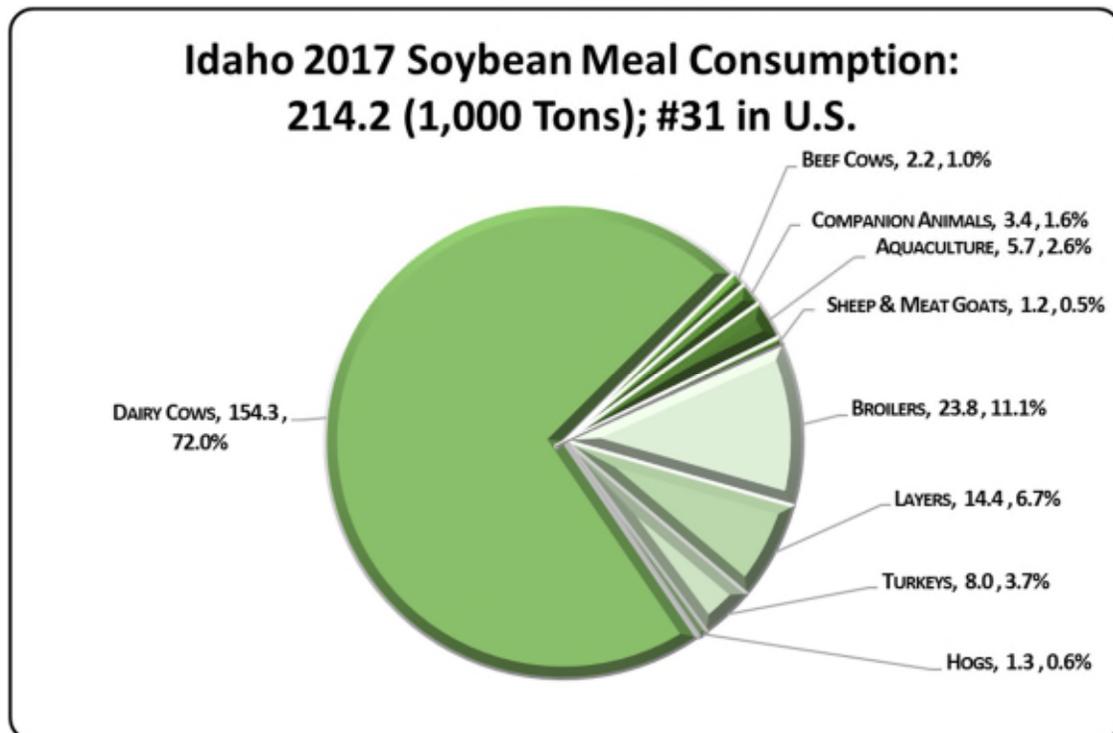
Idaho Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Idaho's animal agriculture consumed almost 214.2 thousand tons of soybean meal in 2017, placing the state as #31 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Idaho consumed 31,956 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (154.3 thousand tons)
- Broilers (23.8 thousand tons)
- Egg-Laying Hens (14.4 thousand tons)

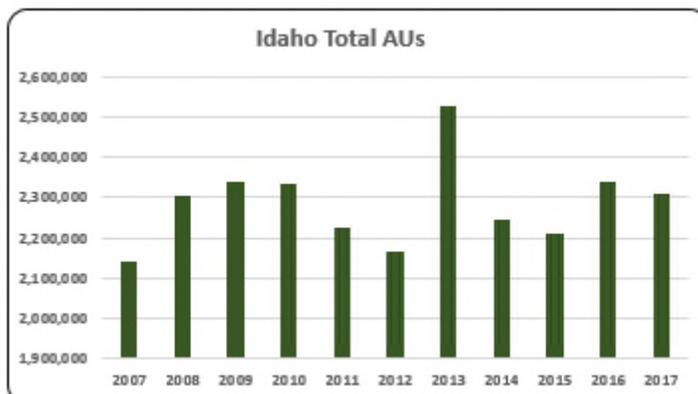
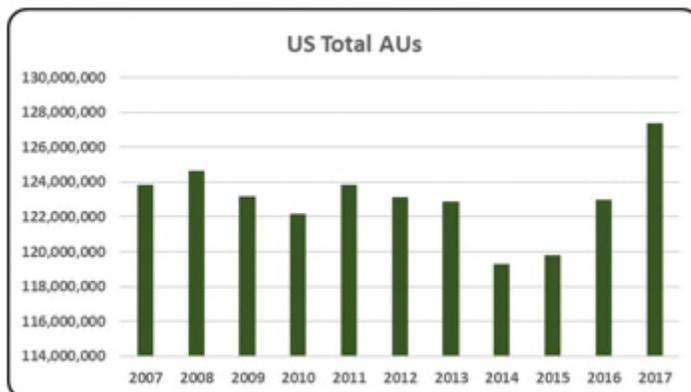


Idaho Animal Unit (AU) Trends

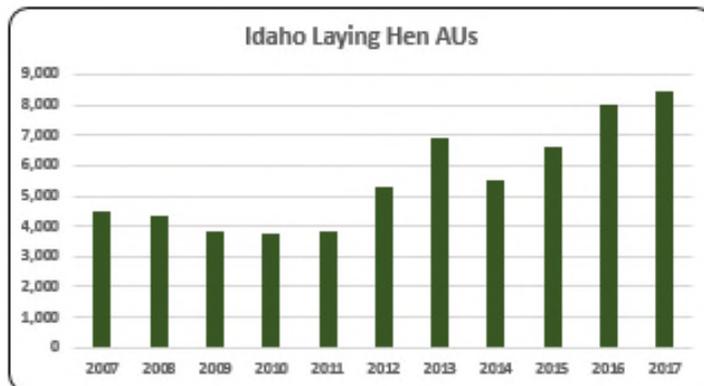
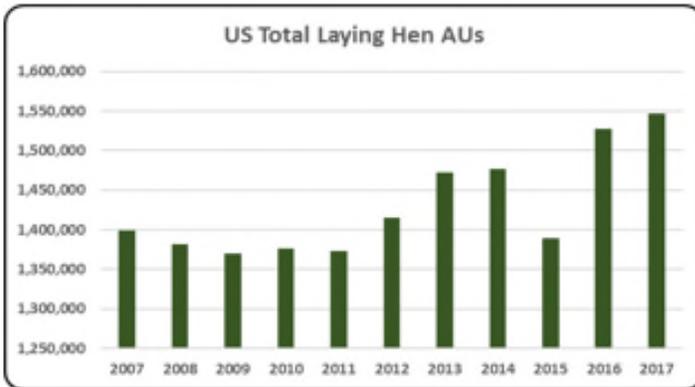
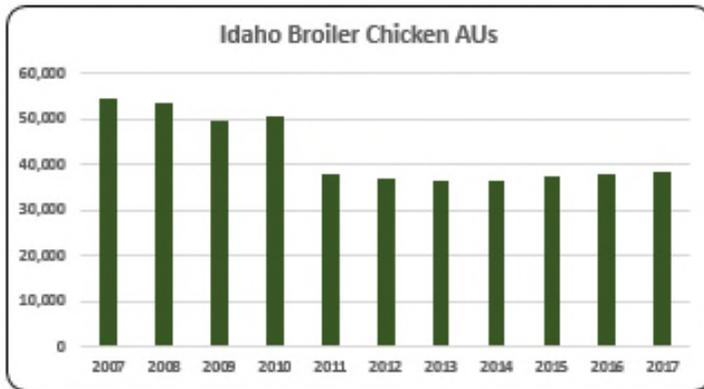
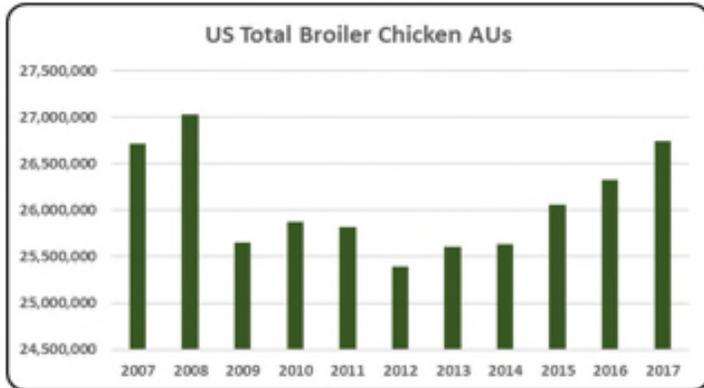
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Idaho. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

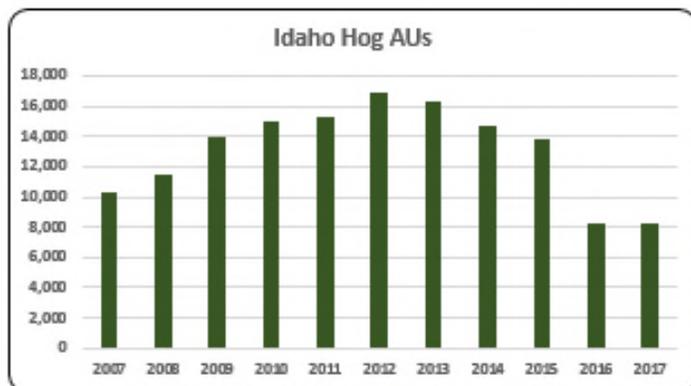
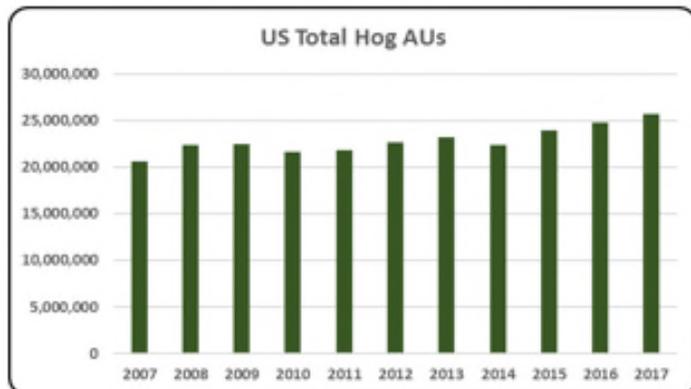
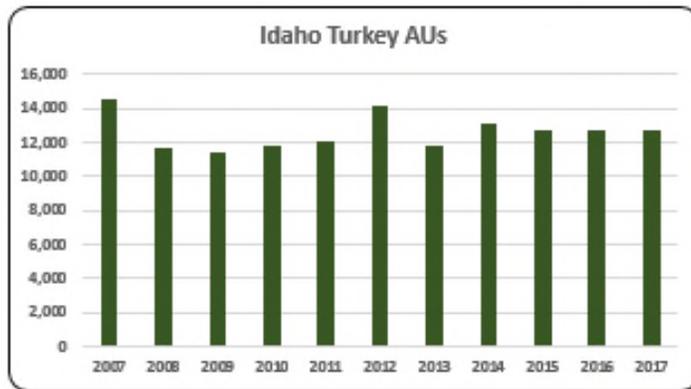
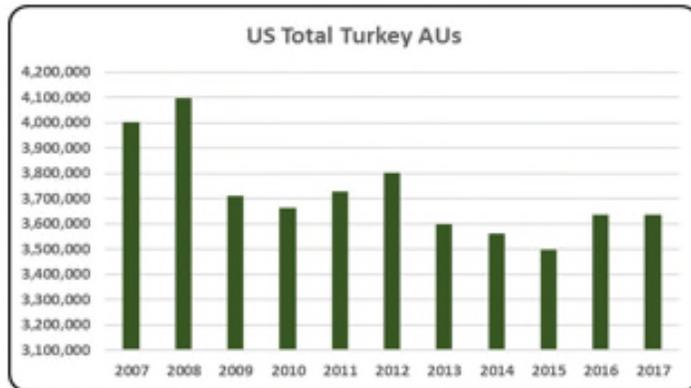
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Idaho, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (1.4 million AUs), Dairy Cows (840,000 AUs), and Broiler Chickens (38,276 AUs). Total animal units in Idaho during 2017 were 2.3 million AUs.



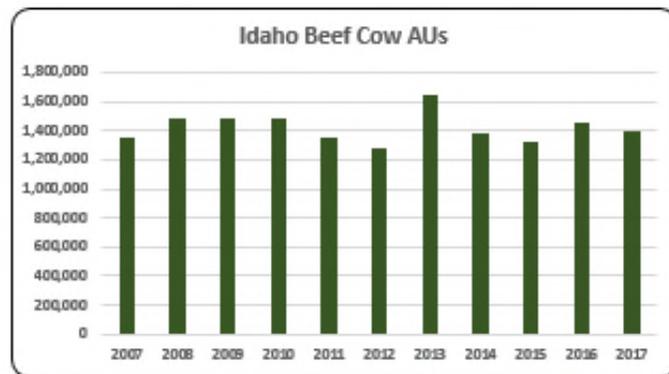
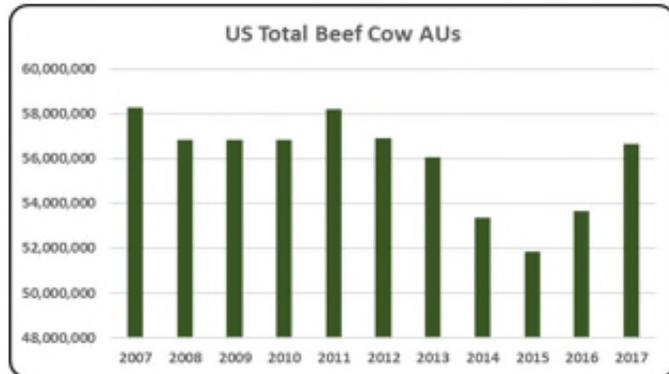
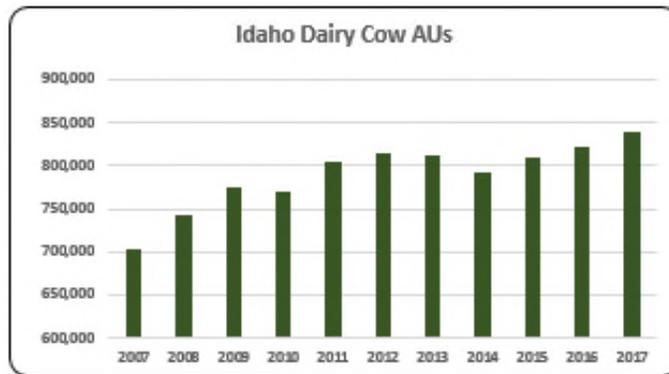
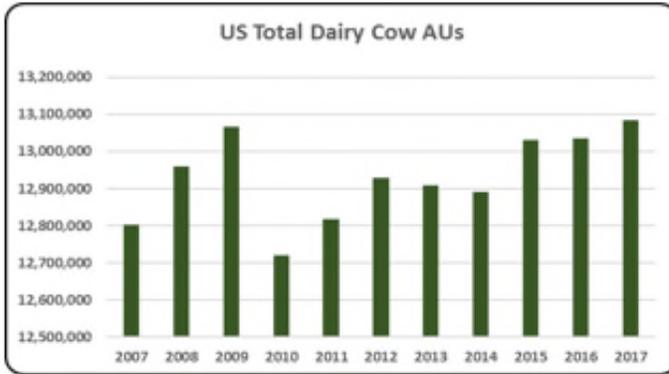
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 2.3 million AUs in Idaho in 2017. Beef is the largest animal sector in Idaho in terms of animal units with 61% of all AUs in the state in 2017.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There were 38,276 AUs in Idaho that were in the broiler industry. Idaho’s broiler AUs have declined 29% over the 2007-2017 decade.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 8,462 AUs in 2017.



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- In 2017, 12,668 AUs in Idaho came from turkey. 2017 turkey AUs were 13% below the turkey AUs in 2007.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hogs AUs decreased to 8,250 in 2017. Hog AUs are down 20% compared to 2007.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.

- In 2017, 36.4% of all AUs in the state were dairy cow AUs. In 2017 dairy cow AUs increased to 840,000 AUs. Overall, the trend in the Idaho dairy cow industry has been positive.

- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.

- There were 1.4 million beef cow AUs in Idaho in 2017 representing 61% of all AUs in the state. Beef cow AUs in 2017 were 15% below the record numbers from 2013 (1.64 million).

Idaho Additional Information and Methodology

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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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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,353,000	1,483,500	1,483,500	1,483,500	1,355,100	1,279,050	1,642,500	1,382,400	1,328,100	1,448,100	1,399,350
	Hog and Pig AUs	10,335	11,430	13,935	14,949	15,245	16,888	16,241	14,697	13,805	8,231	8,250
	Broiler AUs	54,445	53,596	49,832	50,502	38,054	36,850	36,721	36,513	37,455	37,737	38,276
	Turkey AUs	14,570	11,646	11,408	11,882	12,094	14,200	11,846	13,077	12,795	12,751	12,668
	Egg Layer AUs	4,483	4,355	3,809	3,784	3,806	5,325	6,895	5,494	6,610	8,029	8,462
	Dairy AUs	702,800	742,000	775,600	770,000	803,600	813,400	812,000	791,000	810,600	821,800	840,000
	Total Animal Units	2,139,633	2,306,527	2,338,083	2,334,617	2,227,899	2,165,713	2,526,203	2,243,180	2,209,366	2,336,649	2,307,006
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 917,671	\$ 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
	Hogs and Pigs (\$1,000)	\$ 8,319	\$ 9,513	\$ 10,366	\$ 13,982	\$ 17,589	\$ 19,411	\$ 17,768	\$ 18,486	\$ 13,906	\$ 7,626	\$ 7,763
	Broilers (\$1,000)	\$ 42,018	\$ 42,927	\$ 37,037	\$ 38,705	\$ 33,886	\$ 36,718	\$ 44,740	\$ 46,935	\$ 40,947	\$ 36,407	\$ 42,751
	Turkeys (\$1,000)	\$ 19,587	\$ 23,900	\$ 22,650	\$ 24,410	\$ 19,194	\$ 20,637	\$ 14,959	\$ 9,896	\$ 11,976	\$ 13,543	\$ 9,170
	Eggs (\$1,000)	\$ 13,354	\$ 32,952	\$ 23,453	\$ 25,745	\$ 28,227	\$ 31,656	\$ 35,765	\$ 57,248	\$ 95,437	\$ 37,531	\$ 50,746
	Milk (\$1,000)	\$ 2,055,722	\$ 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
	Other	\$ 57,164	\$ 58,830	\$ 59,418	\$ 67,764	\$ 70,448	\$ 80,197	\$ 71,896	\$ 77,405	\$ 84,805	\$ 82,274	\$ 92,235
	Sheep and Lambs (\$1,000)	\$ 17,012	\$ 17,445	\$ 16,800	\$ 23,913	\$ 25,364	\$ 33,879	\$ 24,345	\$ 28,620	\$ 34,788	\$ 31,023	\$ 29,062
	Aquaculture (\$1,000)	\$ 40,152	\$ 41,385	\$ 42,618	\$ 43,851	\$ 45,085	\$ 46,318	\$ 47,551	\$ 48,784	\$ 50,018	\$ 51,251	\$ 63,174
	Total (\$1,000)	\$ 3,113,834	\$ 3,191,181	\$ 2,393,574	\$ 3,094,258	\$ 3,721,199	\$ 3,855,521	\$ 4,148,203	\$ 5,120,841	\$ 4,287,859	\$ 3,922,828	\$ 4,095,392

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,697	7,027	7,712	7,505	
	Cattle feedlots (112112)	443	686	517	150	
	Dairy cattle and milk production (11212)	926	748	677	589	
	Hog and pig farming (1122)	180	340	250	217	
	Poultry and egg production (1123)	84	143	267	345	
	Sheep and goat farming (1124)	465	653	835	815	
	Animal aquaculture and other animal production (1125,1129)	2,153	5,345	3,468	3,112	
Value of Sales (\$1,000)	Cattle and Calves	907,428	1,149,407	1,383,742	1,808,929	
	Hogs and Pigs	5,188	3,260	6,757	withheld	
	Poultry and Eggs	15,111	12,636	12,673	49,733	
	Milk and Other Dairy Products	556,225	869,526	1,843,788	2,333,364	
	Aquaculture	35,919	39,840	56,219	52,582	
	Other (calculated)	51,655	46,421	60,797	75,765	
	Total	1,571,526	2,121,090	3,363,976	4,320,373	
Input Purchases	Livestock and poultry purchased	(Farms) 7,820	7,350	6,598	7,669	
		\$1,000	469,600	616,224	584,795	633,046
	Breeding livestock purchased	(Farms) n/a	3,871	3,473	4,155	
		\$1,000	n/a	93,697	128,710	102,481
	Other livestock and poultry purchased	(Farms) n/a	4,439	4,074	4,718	
		\$1,000	n/a	522,527	456,085	530,564
Feed purchased	(Farms)	11,438	14,692	13,075	14,615	
	\$1,000	450,829	646,250	1,137,906	1,921,092	

	2017 Animal Agriculture		Change from 2007 to 2017		
	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 3,157,743	\$ 645,896	13,619	\$ 156,307
	Hogs, Pigs, and Other	\$ 166,537	\$ 38,489	804	\$ 9,314
	Poultry and Eggs	\$ 243,628	\$ 52,350	1,156	\$ 12,669
	Dairy	\$ 5,447,809	\$ 1,257,419	27,779	\$ 304,295
	Total	\$ 9,015,718	\$ 1,994,154	43,358	\$ 482,585
Change from 2007 to 2017	Cattle and Calves	\$ 687,543	\$ 140,632	2,965	\$ 34,033
	Hogs, Pigs, and Other	\$ 38,538	\$ 8,907	186	\$ 2,155
	Poultry and Eggs	\$ 34,850	\$ 7,489	165	\$ 1,812
	Dairy	\$ 223,029	\$ 51,478	1,137	\$ 12,458
	Total	\$ 983,960	\$ 208,505	4,454	\$ 50,458
	RIMS II Multipliers				
	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	
Tax Rates	Federal effective income tax rate			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			4.5%	
	Total			24.2%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$5.1 billion in economic output
- 22,272 jobs
- \$1.1 billion in earnings
- \$266.9 million in income taxes paid at local, state, and federal levels
- \$321.3 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Illinois has increased economic output by over \$187.1 million, boosted household earnings by \$48.5 million, contributed 911 additional jobs and paid \$11.4 million in additional tax revenues.

Illinois's animal agriculture consumed almost 697.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (548.0 thousand tons)
- Broilers (46.1 thousand tons)
- Dairy Cows (35.9 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 integral part of Illinois's economy. In 2017, Illinois's animal agriculture contributed the following to the economy:

- About \$5.1 billion in economic output
- \$1.1 billion in household earnings
- 22,272 jobs
- \$266.9 million in income taxes

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

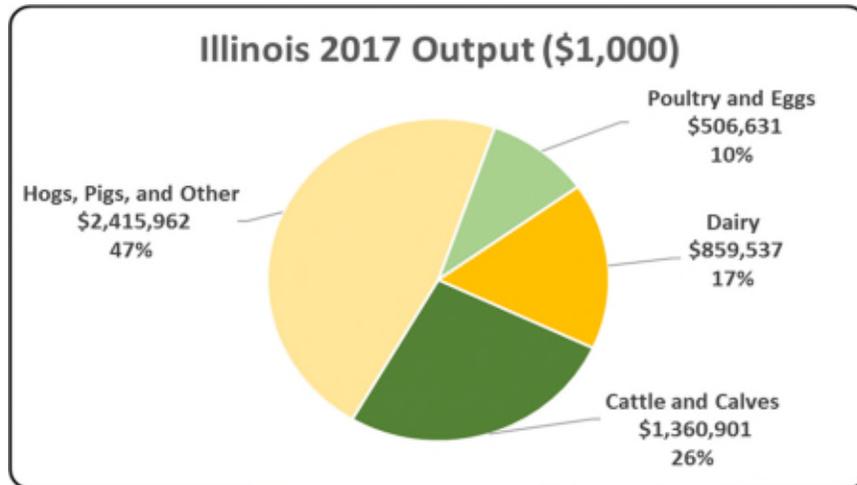
- Increased economic output by \$187.1 million
- Boosted household earnings by \$48.5 million
- Added 911 jobs
- Paid an additional \$11.4 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 5,143,031	\$ 187,127	3.78%
Earnings (\$1,000)	\$ 1,137,997	\$ 48,472	4.45%
Employment (Jobs)	22,272	911	4.27%
Income Taxes Paid (\$1,000)	\$ 266,860	\$ 11,367	4.45%
Property Taxes Paid in 2012 (\$1,000)	\$ 321,273		

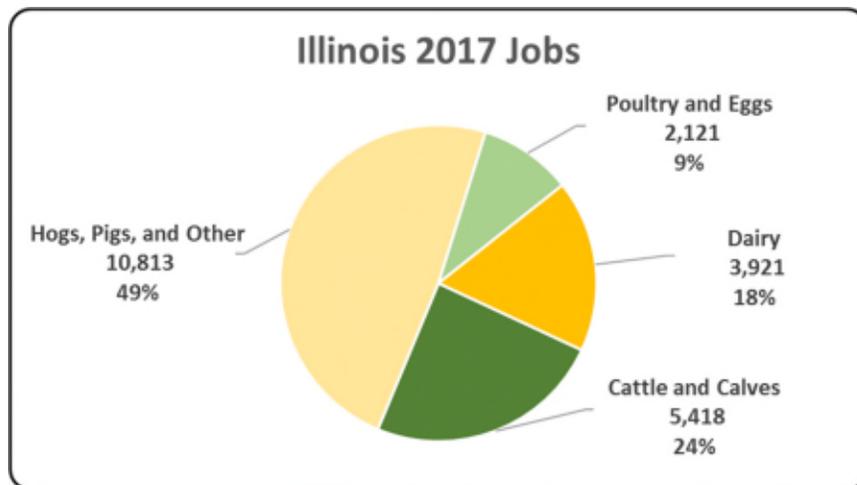
Illinois Output

“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 \$5.1 billion.



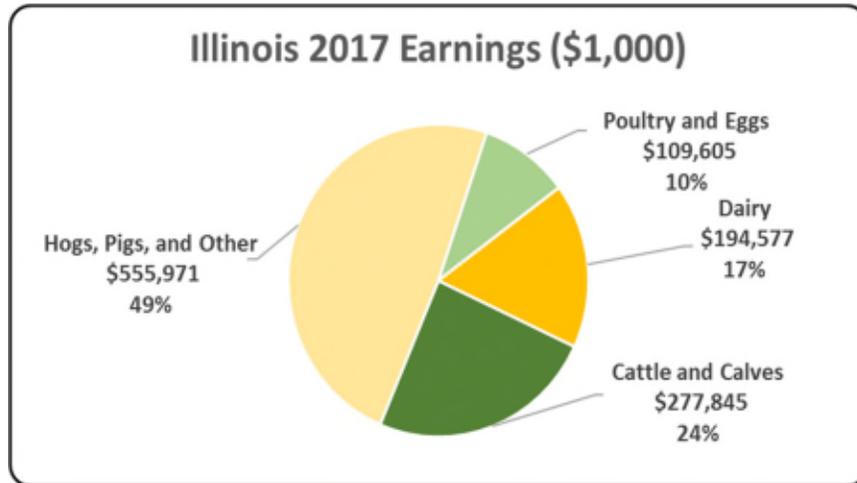
Illinois Jobs

“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 significantly to Illinois total jobs, contributing 22,272 jobs within and outside of animal agriculture.



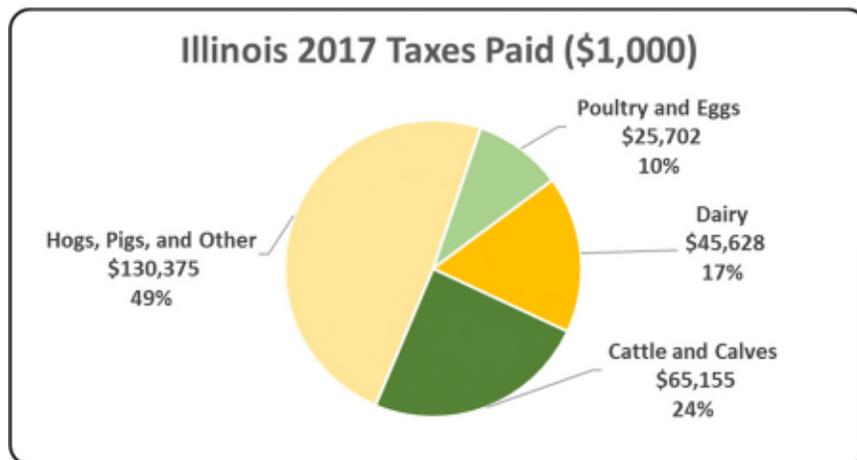
Illinois Earnings

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 \$1.1 billion to household earnings in 2017.



Illinois Taxes Paid by Animal Agriculture

Illinois’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$266.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$321.3 million in property taxes paid by all of Illinois agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



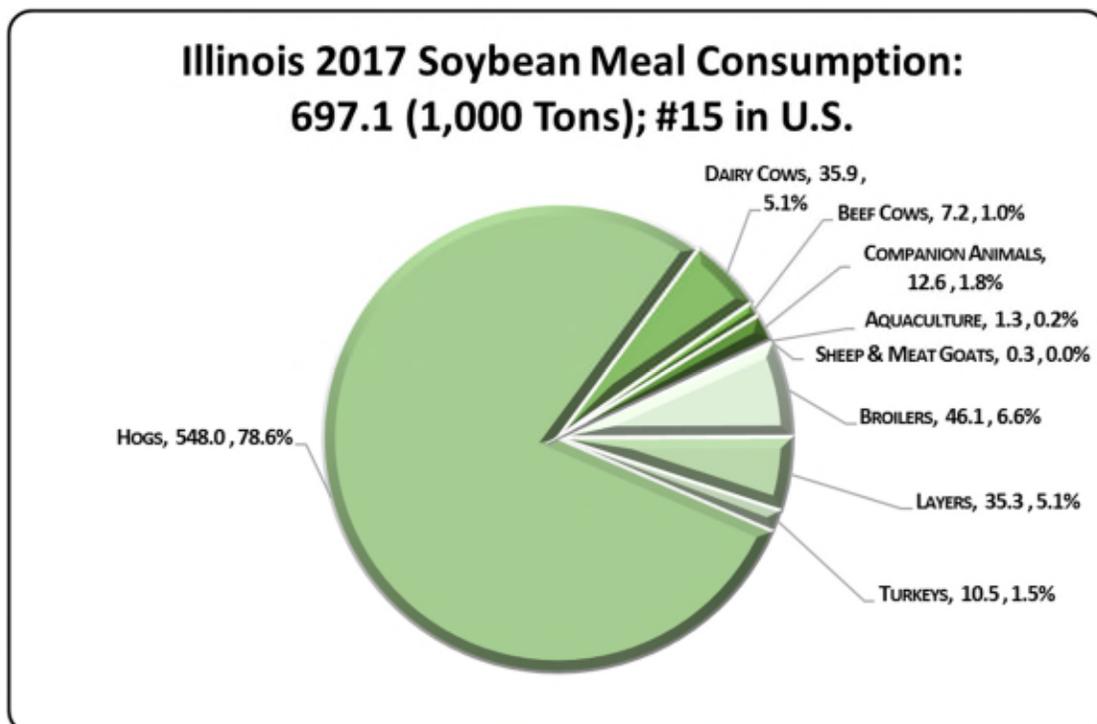
Illinois Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Illinois's animal agriculture consumed almost 697.1 thousand tons of soybean meal in 2017, placing the state as #15 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Illinois consumed 68,748 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (548.0 thousand tons)
- Broilers (46.1 thousand tons)
- Dairy Cows (35.9 thousand tons)

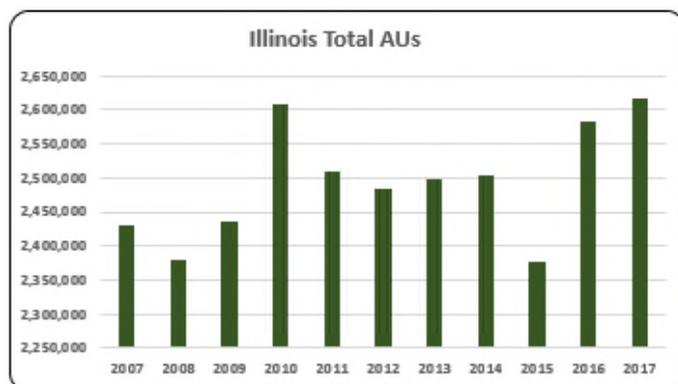
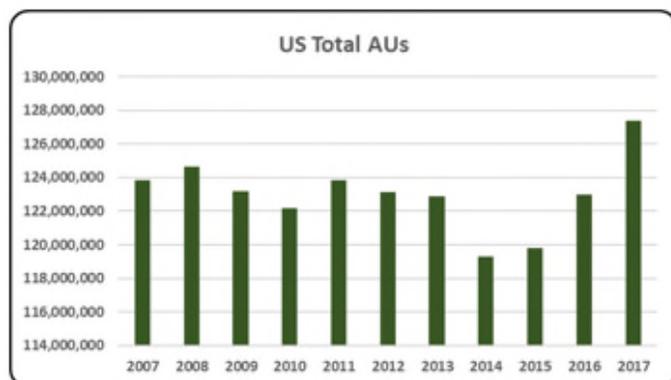


Illinois Animal Unit (AU) Trends

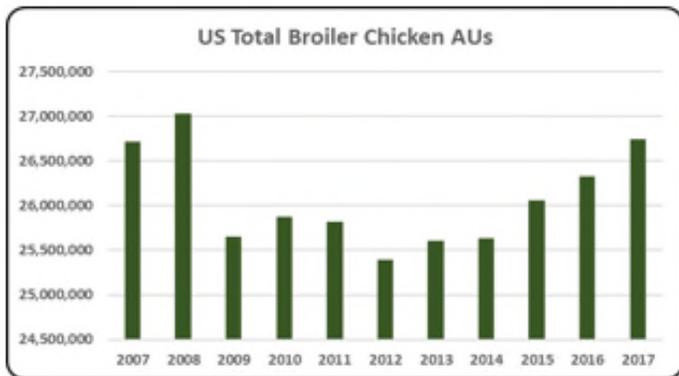
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Illinois. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

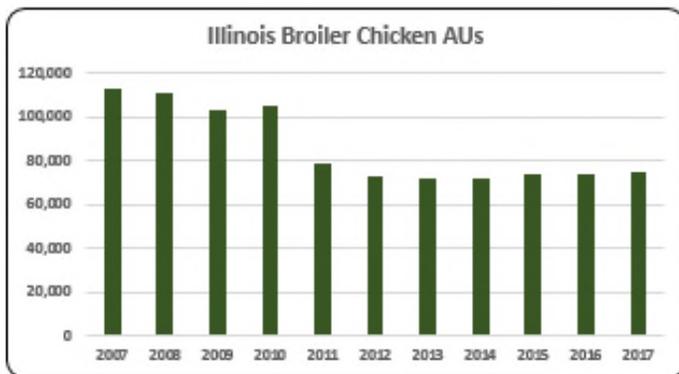
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Illinois, the largest three segments of animal agriculture in terms of AUs during 2017 were: Hogs (1.8 million AUs), Beef Cows (591,300 AUs), and Dairy Cows (130,200 AUs). Total animal units in Illinois during 2017 were 2.6 million AUs.



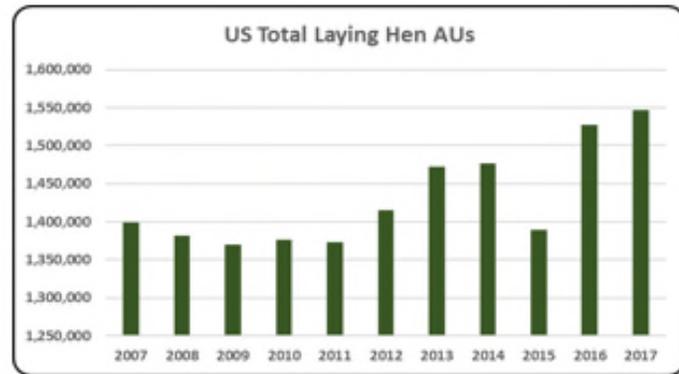
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The number of AUs in Illinois in 2017 reached 2.6 million comprising 2% of all AUs in the U.S. On average, there were 2.5 million between 2007 and 2017.



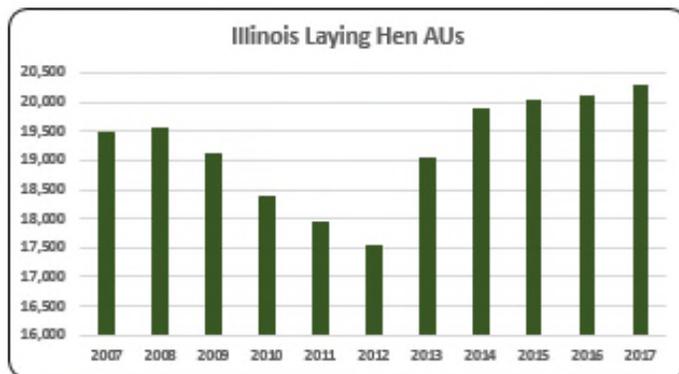
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).



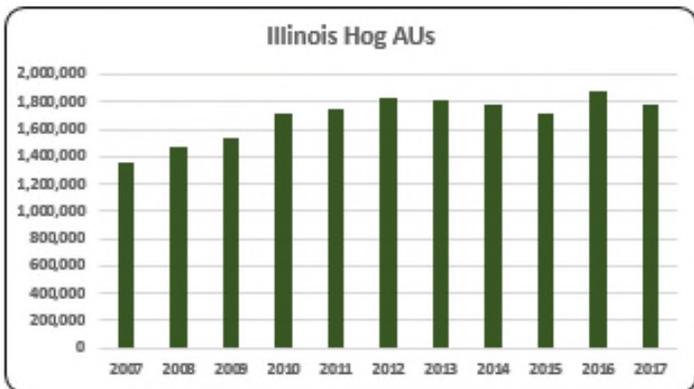
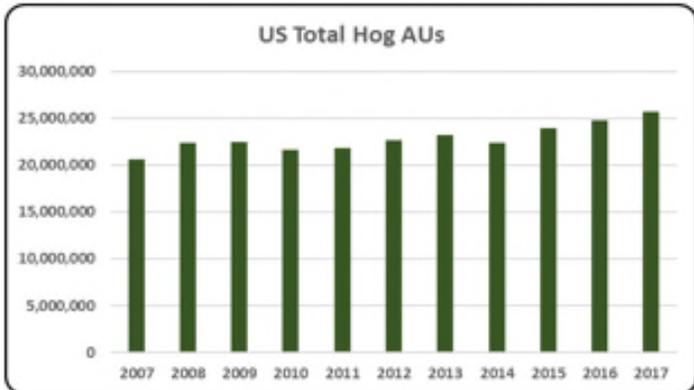
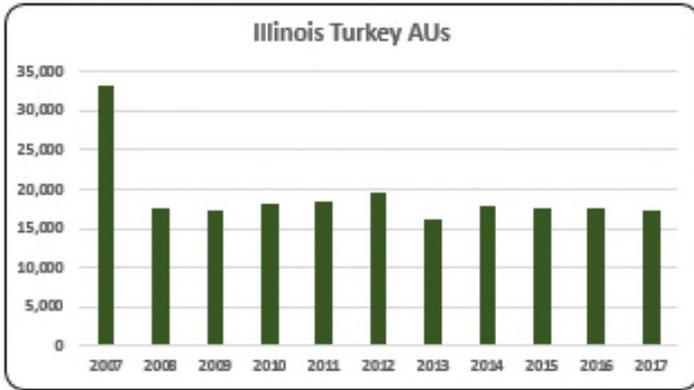
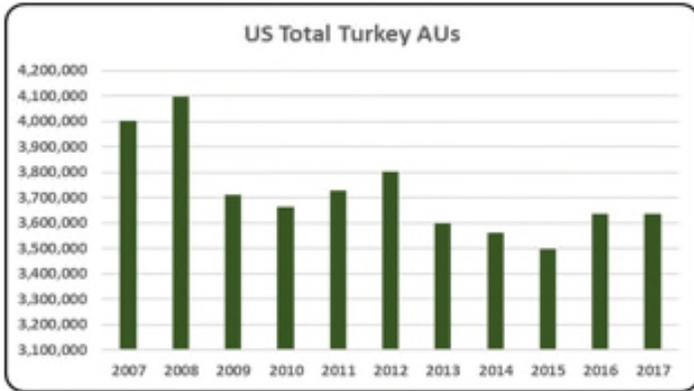
- There were 75,415 broiler AUs in Illinois in 2017 representing 2.88% of all AUs in the state of Illinois. Overall numbers have decreased since 2007 (113,246).



- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.



- There were 20,288 laying hen AUs in Illinois in 2017 or 0.78% of all AUs in the state. The average laying hen AUs in the 2007-2017 period was at 19,227 AUs.

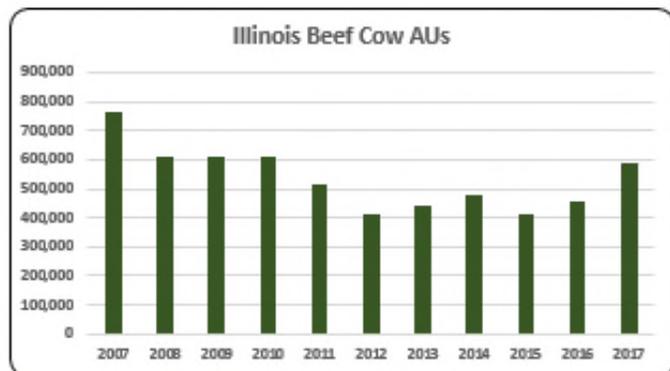
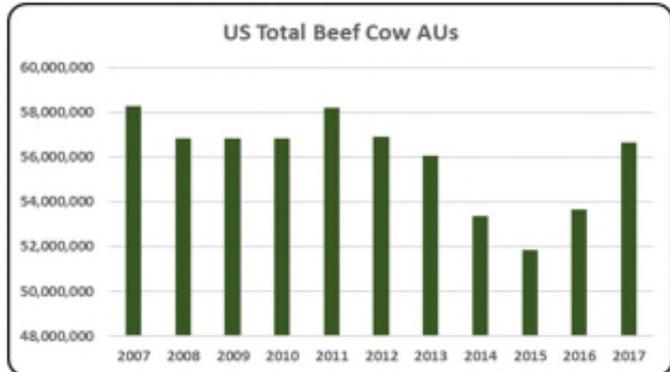
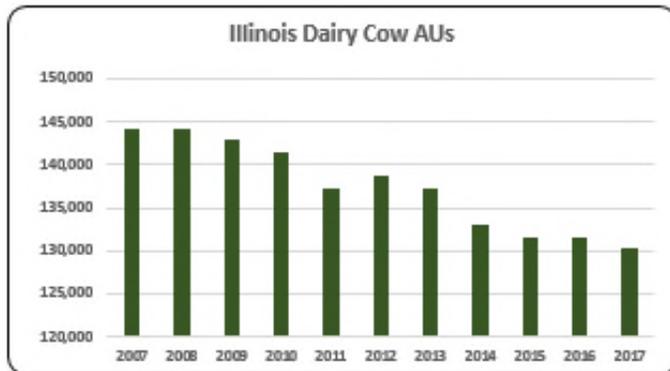
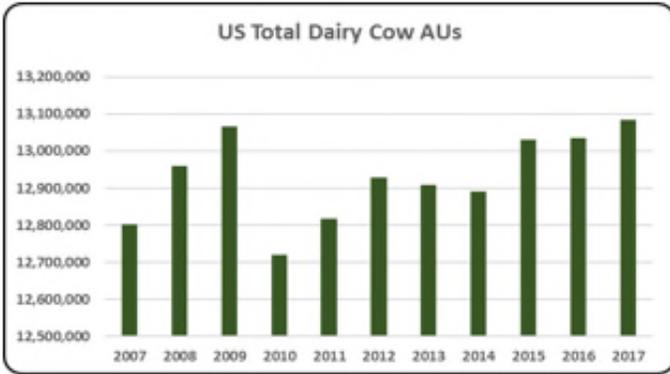


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

- The turkey industry in Illinois declined 48% from 2007 (33,218 AUs) to 2017 (17,406 AUs).

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

- About 68.1% (1.78 million) of all AUs in Illinois were hog AUs in 2017. This represented 7% of all hog AUs in the US.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- Illinois had an average of 137,455 dairy cow AUs from 2007 to 2017. Numbers have consistently decreased from 144,200 in 2007 to 130,200 in 2017, which is the lowest during this period.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- The second largest animal sector in terms of animal units in Illinois is beef cows with 591,300 AUs in 2017. However, beef cow AUs decreased 23% since 2007 (763,800).

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	763,800	612,600	612,600	612,600	512,280	413,100	443,400	481,650	413,250	455,250	591,300
	Hog and Pig AUs	1,357,350	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
	Broiler AUs	113,246	111,480	103,650	105,044	79,152	72,605	72,351	71,941	73,798	74,354	75,415
	Turkey AUs	33,218	17,657	17,295	18,015	18,337	19,512	16,276	17,968	17,580	17,521	17,406
	Egg Layer AUs	19,504	19,564	19,128	18,400	17,952	17,547	19,041	19,904	20,054	20,113	20,288
	Dairy AUs	144,200	144,200	142,800	141,400	137,200	138,600	137,200	133,000	131,600	131,600	130,200
	Total Animal Units	2,431,318	2,379,251	2,436,574	2,609,359	2,509,570	2,483,864	2,498,619	2,504,363	2,375,583	2,581,743	2,616,609
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 587,362	\$ 500,092	\$ 421,683	\$ 489,657	\$ 521,986	\$ 539,376	\$ 570,135	\$ 737,102	\$ 684,767	\$ 593,113	\$ 655,603
	Hogs and Pigs (\$1,000)	\$ 785,810	\$ 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
	Broilers (\$1,000)	\$ 87,397	\$ 89,288	\$ 77,036	\$ 80,505	\$ 70,482	\$ 72,345	\$ 88,151	\$ 92,477	\$ 80,678	\$ 71,733	\$ 84,231
	Turkeys (\$1,000)	\$ 42,997	\$ 38,391	\$ 32,906	\$ 30,429	\$ 29,100	\$ 31,289	\$ 22,680	\$ 15,004	\$ 16,456	\$ 18,609	\$ 12,599
	Eggs (\$1,000)	\$ 87,034	\$ 109,290	\$ 71,103	\$ 73,893	\$ 82,016	\$ 88,598	\$ 92,194	\$ 124,361	\$ 180,895	\$ 72,534	\$ 85,996
	Milk (\$1,000)	\$ 377,649	\$ 364,952	\$ 247,646	\$ 314,640	\$ 380,940	\$ 362,392	\$ 378,810	\$ 456,950	\$ 335,238	\$ 317,392	\$ 353,007
	Other	\$ 5,536	\$ 5,472	\$ 6,032	\$ 6,660	\$ 6,037	\$ 6,727	\$ 5,683	\$ 5,793	\$ 5,906	\$ 5,929	\$ 7,448
	Sheep and Lambs (\$1,000)	\$ 2,439	\$ 2,414	\$ 3,013	\$ 3,681	\$ 3,098	\$ 3,827	\$ 2,822	\$ 2,971	\$ 3,124	\$ 3,186	\$ 2,999
	Aquaculture (\$1,000)	\$ 3,097	\$ 3,058	\$ 3,019	\$ 2,979	\$ 2,940	\$ 2,900	\$ 2,861	\$ 2,822	\$ 2,782	\$ 2,743	\$ 4,449
	Total (\$1,000)	\$ 1,973,785	\$ 2,017,869	\$ 1,758,174	\$ 2,111,681	\$ 2,412,804	\$ 2,461,264	\$ 2,612,693	\$ 3,032,708	\$ 2,564,958	\$ 2,291,271	\$ 2,482,291

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,391	6,178	7,296	6,600	
	Cattle feedlots (112112)	1,990	2,217	1,133	662	
	Dairy cattle and milk production (11212)	1,452	1,226	900	742	
	Hog and pig farming (1122)	3,369	1,693	1,259	871	
	Poultry and egg production (1123)	301	334	938	603	
	Sheep and goat farming (1124)	611	645	1,078	1,090	
	Animal aquaculture and other animal production (1125,1129)	2,567	3,295	4,186	4,150	
Value of Sales (\$1,000)	Cattle and Calves	584,737	624,976	808,487	984,466	
	Hogs and Pigs	1,067,018	844,360	1,105,271	1,519,514	
	Poultry and Eggs	98,025	83,807	163,507	136,876	
	Milk and Other Dairy Products	252,838	226,761	340,336	347,339	
	Aquaculture	2,871	2,282	4,011	5,425	
	Other (calculated)	26,424	22,511	31,080	24,054	
	Total	2,031,913	1,804,697	2,452,692	3,017,674	
Input Purchases	Livestock and poultry purchased	(Farms) 15,984	12,734	11,350	12,350	
		\$1,000	334,161	411,546	588,949	689,855
	Breeding livestock purchased	(Farms) <i>n/a</i>	6,918	6,443	6,746	
		\$1,000	<i>n/a</i>	40,328	57,009	81,200
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	7,362	6,404	7,350	
		\$1,000	<i>n/a</i>	371,218	531,940	608,656
	Feed purchased	(Farms) 27,101	24,652	23,374	24,338	
	\$1,000	567,098	528,144	705,155	1,246,112	

2017 Animal Agriculture	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 1,360,901	\$ 277,845	5,418	\$ 65,155
Hogs, Pigs, and Other	\$ 2,415,962	\$ 555,971	10,813	\$ 130,375	
Poultry and Eggs	\$ 506,631	\$ 109,605	2,121	\$ 25,702	
Dairy	\$ 859,537	\$ 194,577	3,921	\$ 45,628	
Total	\$ 5,143,031	\$ 1,137,997	22,272	\$ 266,860	

Change from 2007 to 2017	Cattle and Calves	\$ (70,156)	\$ (14,323)	(279)	\$ (3,359)
	Hogs, Pigs, and Other	\$ 677,581	\$ 155,928	3,032	\$ 36,565
	Poultry and Eggs	\$ (200,553)	\$ (43,388)	(840)	\$ (10,174)
	Dairy	\$ (219,745)	\$ (49,745)	(1,002)	\$ (11,665)
	Total	\$ 187,127	\$ 48,472	911	\$ 11,367

RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.8%
	Total	23.5%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$8.1 billion in economic output
- 36,273 jobs
- \$1.8 billion in earnings
- \$405.4 million in income taxes paid at local, state, and federal levels
- \$260.7 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Indiana has increased economic output by over \$1.3 billion, boosted household earnings by \$293.0 million, contributed 5,947 additional jobs and paid \$67.4 million in additional tax revenues.

Indiana's animal agriculture consumed about 1.0 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (419.3 thousand tons)
- Egg-Laying Hens (241.8 thousand tons)
- Turkeys (175.3 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 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 2017, Indiana's animal agriculture contributed the following to the economy:

- About \$8.1 billion in economic output
- \$1.8 billion in household earnings
- 36,273 jobs
- \$405.4 million in income taxes

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

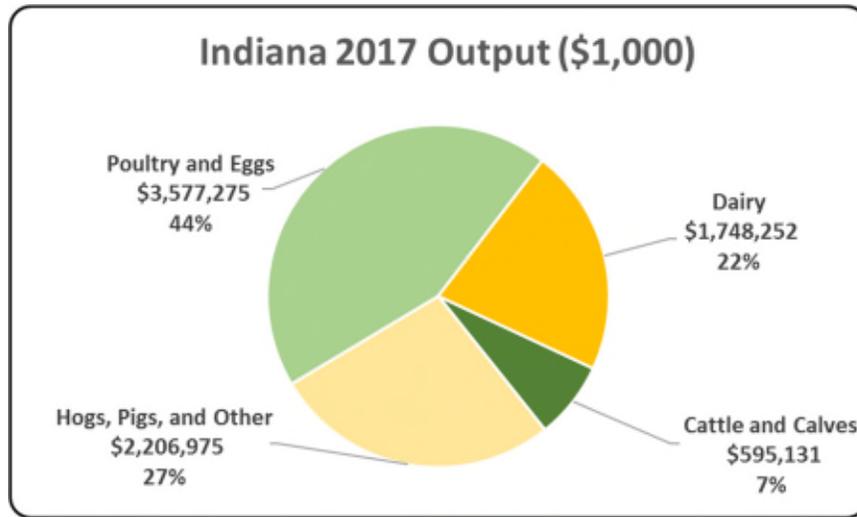
- Increased economic output by \$1.3 billion
- Boosted household earnings by \$293.0 million
- Added 5,947 jobs
- Paid an additional \$67.4 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 8,127,632	\$ 1,340,843	19.76%
Earnings (\$1,000)	\$ 1,762,544	\$ 292,971	19.94%
Employment (Jobs)	36,273	5,947	19.61%
Income Taxes Paid (\$1,000)	\$ 405,385	\$ 67,383	19.94%
Property Taxes Paid in 2012 (\$1,000)	\$ 260,733		

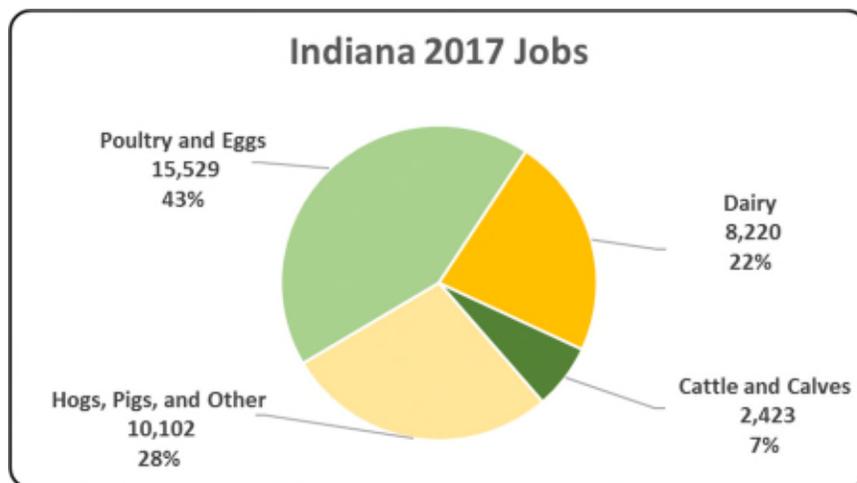
Indiana Output

“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.



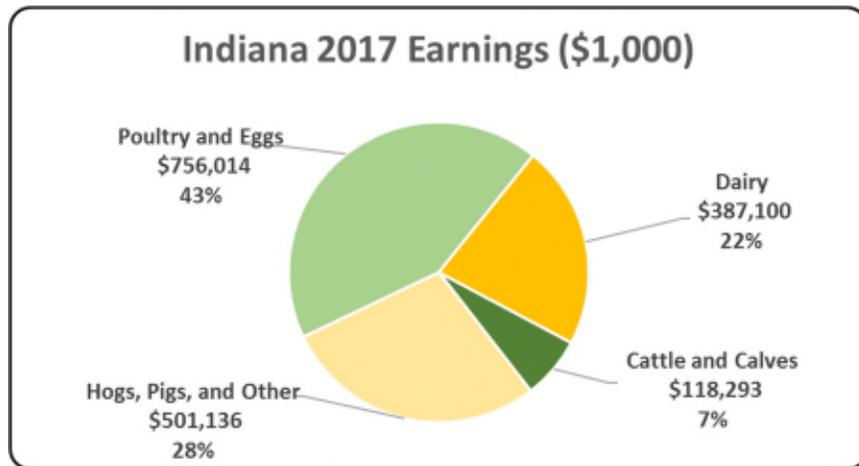
Indiana Jobs

“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 36,273 jobs within and outside of animal agriculture.



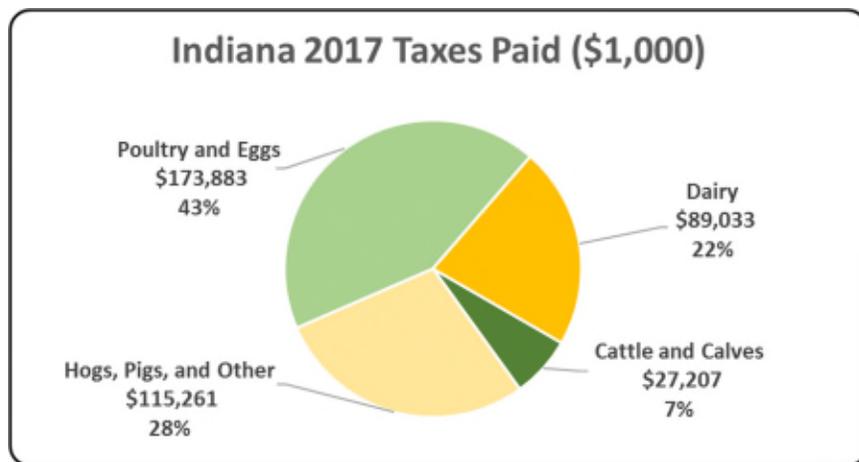
Indiana Earnings

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 \$1.8 billion to household earnings in 2017.



Indiana Taxes Paid by Animal Agriculture

Indiana’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$405.4 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$260.7 million in property taxes paid by all of Indiana agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



Indiana Animal Agriculture Soybean Meal Consumption

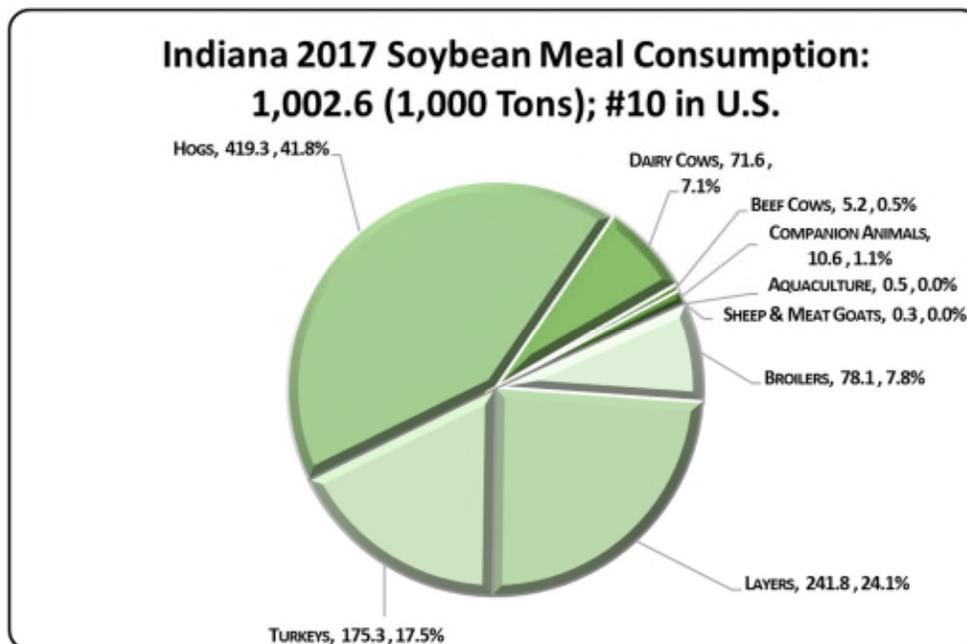
The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with soybean meal (from both a nutritional and price standpoint), 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 2015-16 soybean marketing year by up to sixteen specific animal species has been estimated.

Indiana's animal agriculture consumed about 1.0 million tons of soybean meal in 2017, placing the state as #10 in the nation in terms of soybean meal consumption (see figure below).

Additionally, animal agriculture in Indiana consumed 98,206 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (419.3 thousand tons)
- Egg-Laying Hens (241.8 thousand tons)
- Turkeys (175.3 thousand tons)

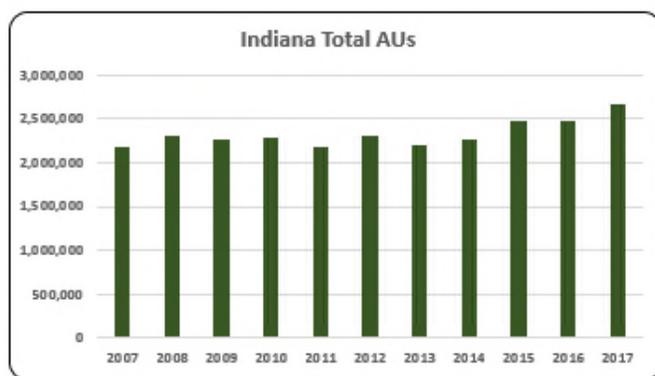
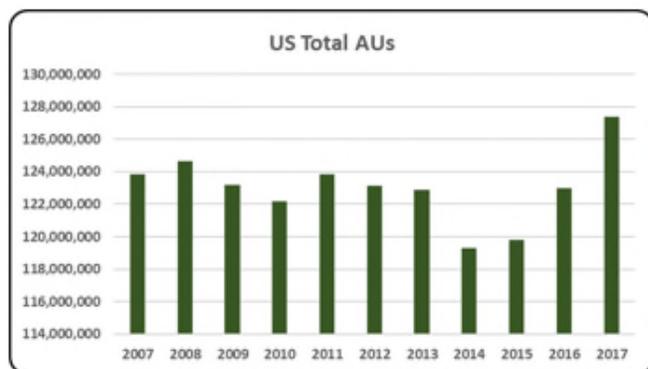


Indiana Animal Unit (AU) Trends

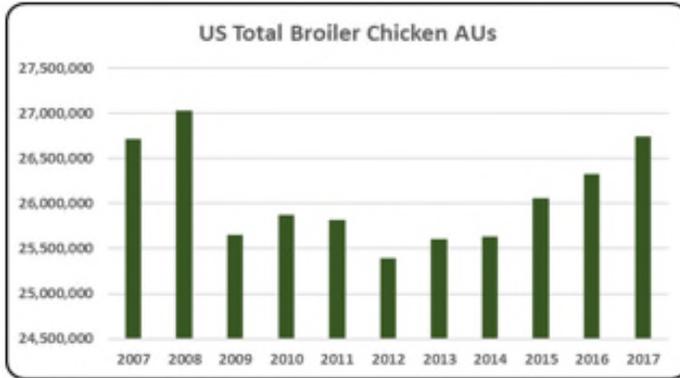
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Indiana. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

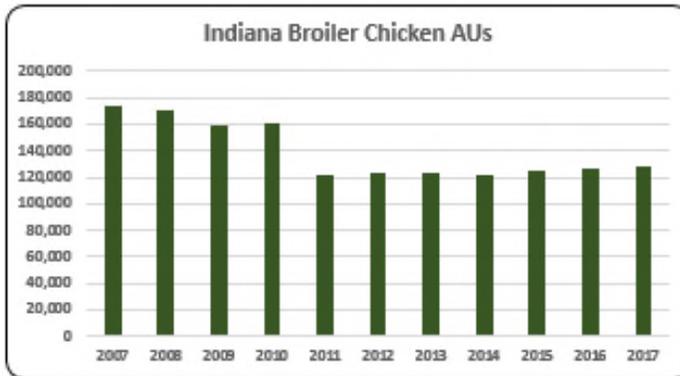
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Indiana, the largest three segments of animal agriculture in terms of AUs during 2017 were: Hogs (1.4 million AUs), Beef Cows (433,050 AUs), and Turkeys (286,188 AUs). Total animal units in Indiana during 2017 were 2.7 million AUs.



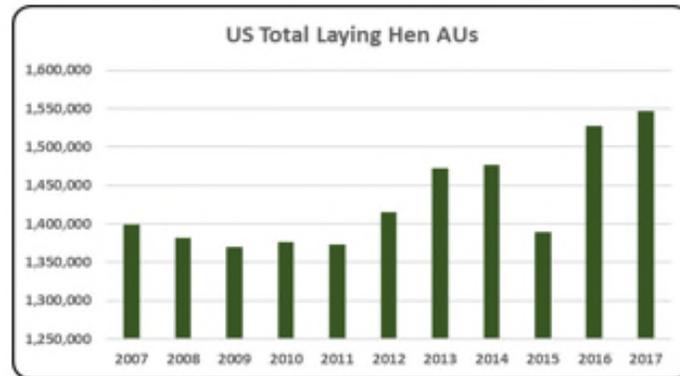
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- In 2017 there were 2.7 million AUs in the state of Indiana and 48% (1.43 million) were hog AUs. In general, from 2007 to 2017, AUs have hovered between 2 and 2.6 million AUs in Indiana.



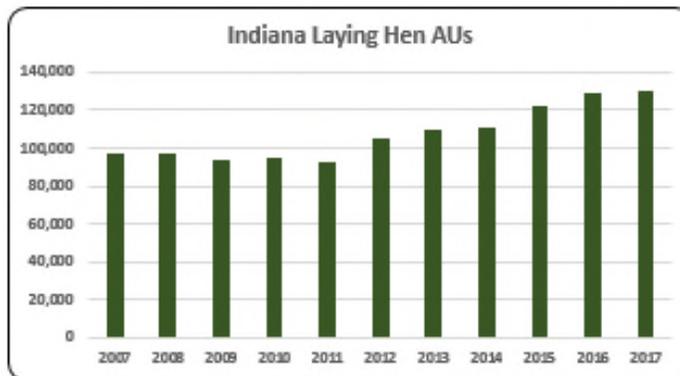
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).



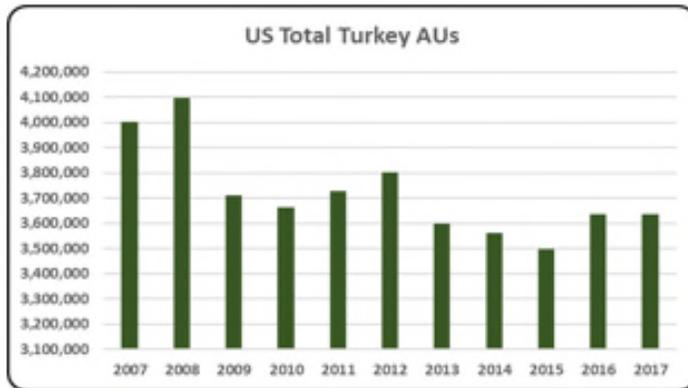
- Broiler AUs were 127,712 in 2017 and experienced a decrease of 27% from a decade earlier.



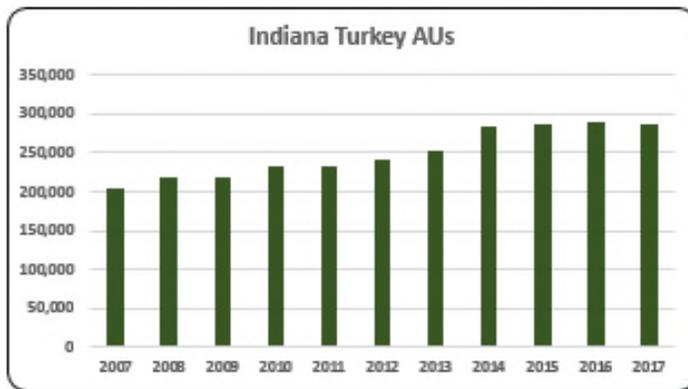
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.



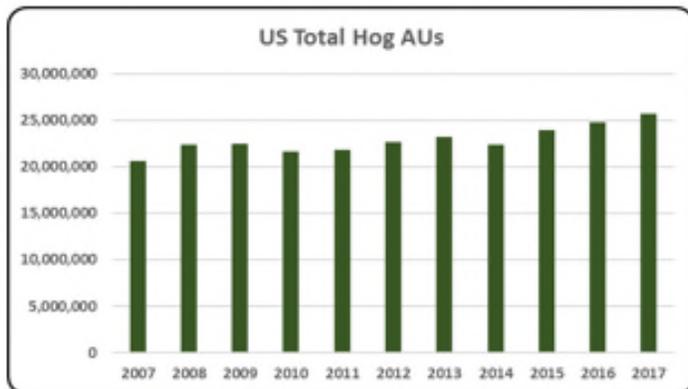
- Layers AUs have increased since 2012. In 2017, layer AUs (130,144) represented 4.89% of all AUs in Indiana.



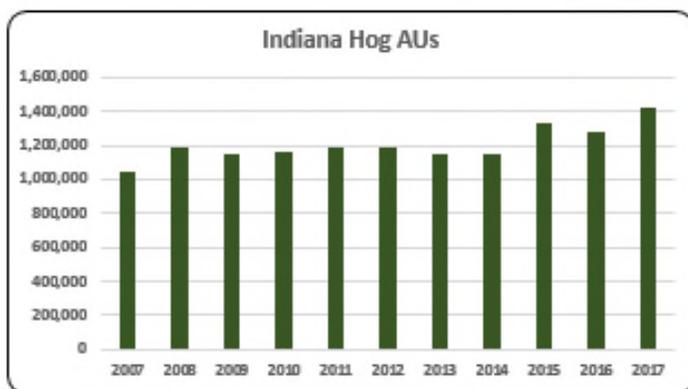
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.



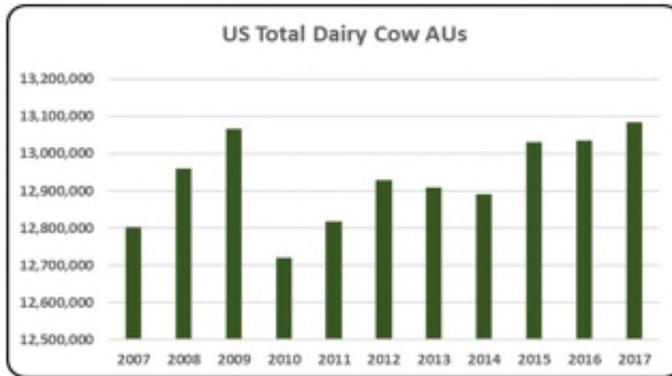
- Turkey AUs in 2017 (286,188) represented 10.8% of all AUs in Indiana. Those numbers represented 7.9% of all turkey AUs in the U.S.



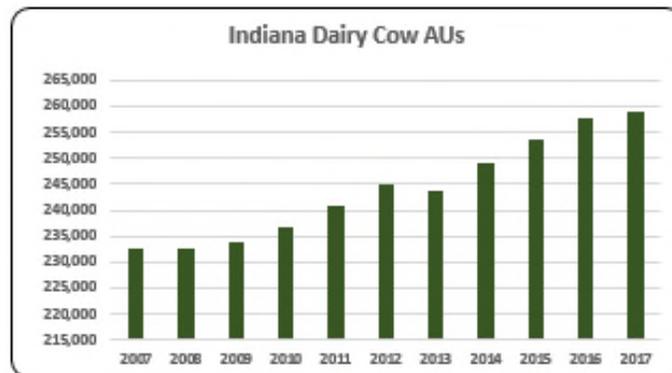
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.



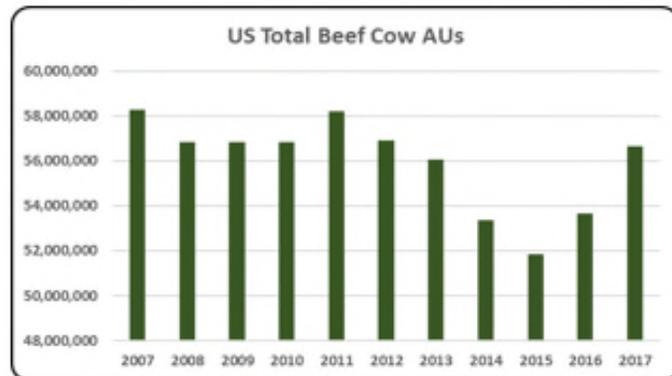
- In 2017, 53.6% (1.4 million) of AUs in Indiana were hog AUs. From 2007 to 2017 hog AUs have averaged about 1.2 million.



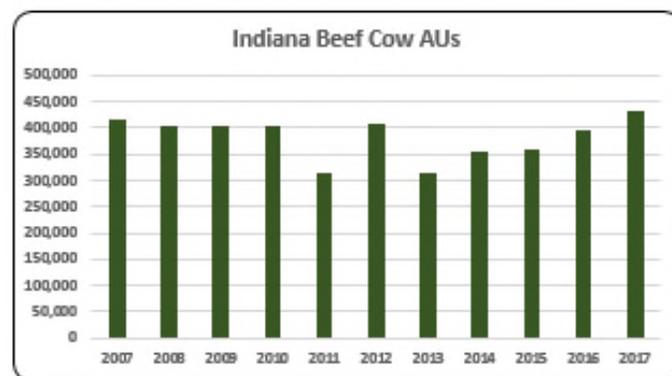
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- From 2007 to 2017, on average, there were 243,982 dairy cow AUs. Dairy AUs have steadily increased throughout the decade to 243,982 in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- In terms of animal units, beef is the second largest animal sector in Indiana in terms of animal unit numbers. There were 433,050 beef cow AUs in 2017.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	417,150	403,800	403,800	403,800	314,250	406,350	313,500	354,000	360,000	396,000	433,050
	Hog and Pig AUs	1,046,850	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
	Broiler AUs	173,789	171,079	159,063	161,202	121,468	122,954	122,525	121,829	124,974	125,916	127,712
	Turkey AUs	205,349	218,908	219,798	234,058	233,709	241,028	253,450	283,069	286,977	289,605	286,188
	Egg Layer AUs	97,404	96,988	94,156	94,384	93,172	105,047	110,093	110,446	121,917	129,166	130,144
	Dairy AUs	232,400	232,400	233,800	236,600	240,800	245,000	243,600	249,200	253,400	257,600	259,000
	Total Animal Units	2,172,942	2,310,575	2,262,317	2,292,995	2,187,798	2,312,429	2,196,968	2,262,294	2,477,317	2,478,836	2,662,744
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 221,007	\$ 183,082	\$ 200,726	\$ 215,539	\$ 206,130	\$ 289,984	\$ 275,856	\$ 371,119	\$ 363,481	\$ 294,269	\$ 293,240
	Hogs and Pigs (\$1,000)	\$ 712,960	\$ 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
	Broilers (\$1,000)	\$ 134,120	\$ 137,022	\$ 118,221	\$ 123,545	\$ 108,163	\$ 122,513	\$ 149,280	\$ 156,606	\$ 136,625	\$ 121,477	\$ 142,643
	Turkeys (\$1,000)	\$ 269,606	\$ 294,851	\$ 243,054	\$ 316,963	\$ 375,618	\$ 426,202	\$ 423,883	\$ 557,941	\$ 613,074	\$ 624,788	\$ 504,923
	Eggs (\$1,000)	\$ 422,640	\$ 535,571	\$ 353,020	\$ 373,592	\$ 420,152	\$ 474,014	\$ 545,130	\$ 676,030	\$ 1,066,159	\$ 403,938	\$ 528,743
	Milk (\$1,000)	\$ 664,087	\$ 644,252	\$ 453,322	\$ 590,968	\$ 746,130	\$ 716,632	\$ 796,640	\$ 945,756	\$ 692,300	\$ 672,786	\$ 754,728
	Other	\$ 4,260	\$ 4,239	\$ 4,791	\$ 5,641	\$ 5,269	\$ 5,875	\$ 5,627	\$ 5,498	\$ 5,601	\$ 5,512	\$ 6,513
	Sheep and Lambs (\$1,000)	\$ 2,406	\$ 2,330	\$ 2,827	\$ 3,622	\$ 3,196	\$ 3,747	\$ 3,444	\$ 3,260	\$ 3,309	\$ 3,164	\$ 3,417
	Aquaculture (\$1,000)	\$ 1,854	\$ 1,909	\$ 1,964	\$ 2,019	\$ 2,073	\$ 2,128	\$ 2,183	\$ 2,238	\$ 2,293	\$ 2,347	\$ 3,097
	Total (\$1,000)	\$ 2,428,680	\$ 2,617,200	\$ 2,095,569	\$ 2,526,871	\$ 2,943,329	\$ 3,116,261	\$ 3,253,110	\$ 3,906,635	\$ 3,974,613	\$ 3,134,374	\$ 3,458,604

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	8,831	8,248	8,676	8,394	
	Cattle feedlots (112112)	1,986	2,493	1,114	319	
	Dairy cattle and milk production (11212)	1,921	1,875	1,462	1,459	
	Hog and pig farming (1122)	3,432	2,221	1,959	1,301	
	Poultry and egg production (1123)	673	705	1,442	1,336	
	Sheep and goat farming (1124)	663	980	1,547	1,719	
	Animal aquaculture and other animal production (1125,1129)	2,881	6,570	5,616	6,645	
Value of Sales (\$1,000)	Cattle and Calves	357,904	324,054	456,657	522,694	
	Hogs and Pigs	843,326	633,112	974,290	1,273,099	
	Poultry and Eggs	516,328	455,153	887,196	1,164,199	
	Milk and Other Dairy Products	262,007	333,339	583,212	659,314	
	Aquaculture	2,678	3,151	2,567	5,120	
	Other (calculated)	43,561	41,602	48,350	32,396	
	Total	2,025,804	1,790,411	2,952,272	3,656,822	
Input Purchases	Livestock and poultry purchased	(Farms) 14,780	14,613	11,645	14,009	
		\$1,000	282,253	307,156	511,239	508,824
	Breeding livestock purchased	(Farms) <i>n/a</i>	6,852	5,669	6,826	
		\$1,000	<i>n/a</i>	39,425	57,350	84,804
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	9,431	7,398	9,346	
		\$1,000	<i>n/a</i>	267,731	453,890	424,019
	Feed purchased	(Farms) 25,765	29,682	24,908	28,754	
	\$1,000	818,113	660,587	1,092,067	1,592,005	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 595,131	\$ 118,293	2,423	\$ 27,207
	Hogs, Pigs, and Other	\$ 2,206,975	\$ 501,136	10,102	\$ 115,261
	Poultry and Eggs	\$ 3,577,275	\$ 756,014	15,529	\$ 173,883
	Dairy	\$ 1,748,252	\$ 387,100	8,220	\$ 89,033
	Total	\$ 8,127,632	\$ 1,762,544	36,273	\$ 405,385

Change from 2007 to 2017	Cattle and Calves	\$ 68,676	\$ 13,651	280	\$ 3,140
	Hogs, Pigs, and Other	\$ 701,806	\$ 159,359	3,212	\$ 36,652
	Poultry and Eggs	\$ 627,636	\$ 132,643	2,725	\$ 30,508
	Dairy	\$ (57,275)	\$ (12,682)	(269)	\$ (2,917)
	Total	\$ 1,340,843	\$ 292,971	5,947	\$ 67,383

	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.3%
	Total	23.0%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$24.2 billion in economic output
- 109,822 jobs
- \$5.3 billion in earnings
- \$1.3 billion in income taxes paid at local, state, and federal levels
- \$437.3 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Iowa has increased economic output by almost \$6.8 billion, boosted household earnings by \$1.5 billion, contributed 30,705 additional jobs and paid \$363.7 million in additional tax revenues.

Iowa's animal agriculture consumed over 2.9 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (2.2 million tons)
- Egg-Laying Hens (412.2 thousand tons)
- Turkeys (105.0 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 2017, Iowa's animal agriculture contributed the following to the economy:

- About \$24.2 billion in economic output
- \$5.3 billion in household earnings
- 109,822 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:

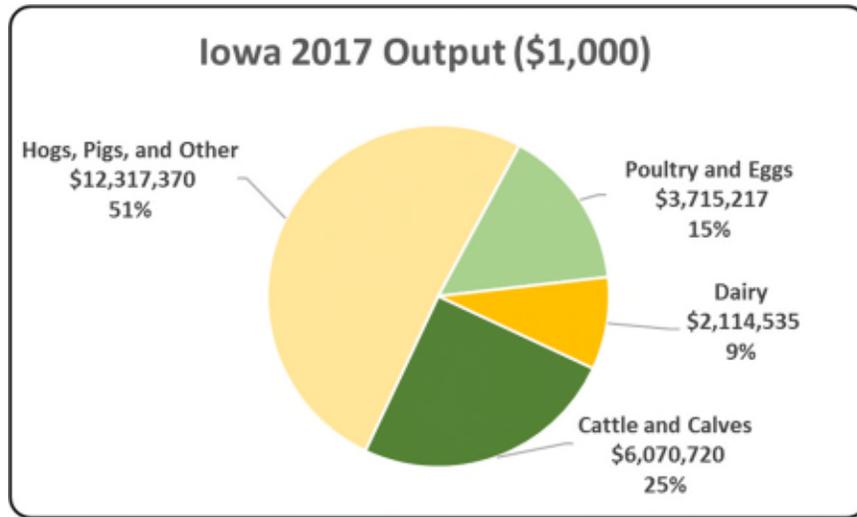
- Increased economic output by \$6.8 billion
- Boosted household earnings by \$1.5 billion
- Added 30,705 jobs
- Paid an additional \$363.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 24,217,841	\$ 6,778,116	38.87%
Earnings (\$1,000)	\$ 5,295,195	\$ 1,492,400	39.24%
Employment (Jobs)	109,822	30,705	38.81%
Income Taxes Paid (\$1,000)	\$ 1,290,439	\$ 363,698	39.24%
Property Taxes Paid in 2012 (\$1,000)	\$ 437,312		

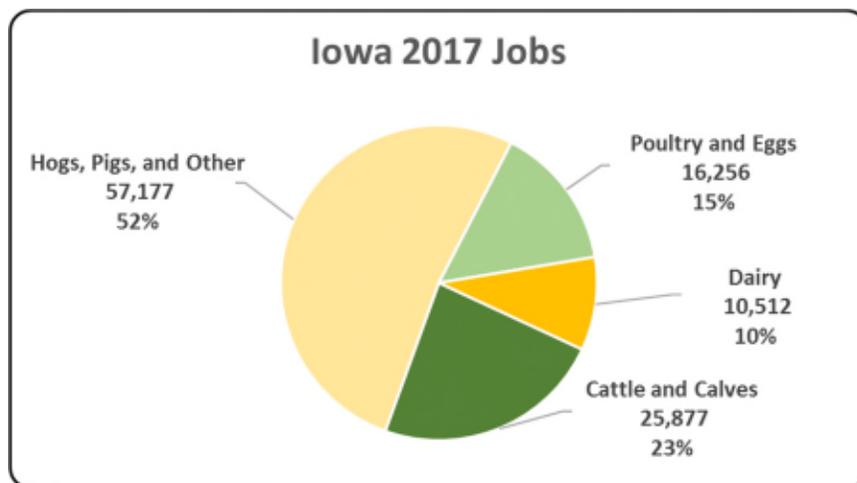
Iowa Output

“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 \$24.2 billion.



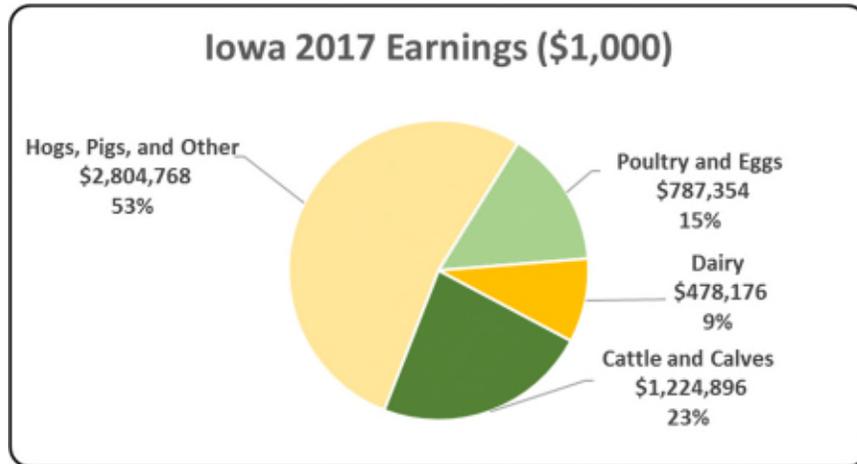
Iowa Jobs

“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 109,822 jobs within and outside of animal agriculture.



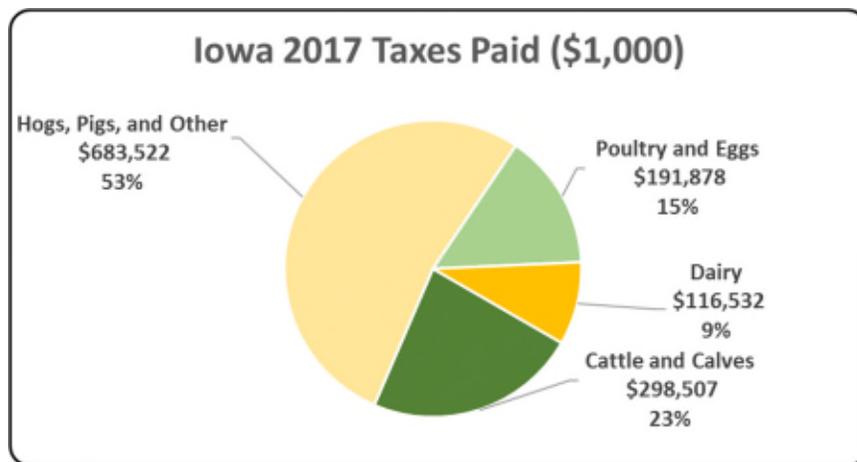
Iowa Earnings

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 \$5.3 billion to household earnings in 2017.



Iowa Taxes Paid by Animal Agriculture

Iowa’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$1.3 billion in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$437.3 million in property taxes paid by all of Iowa agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



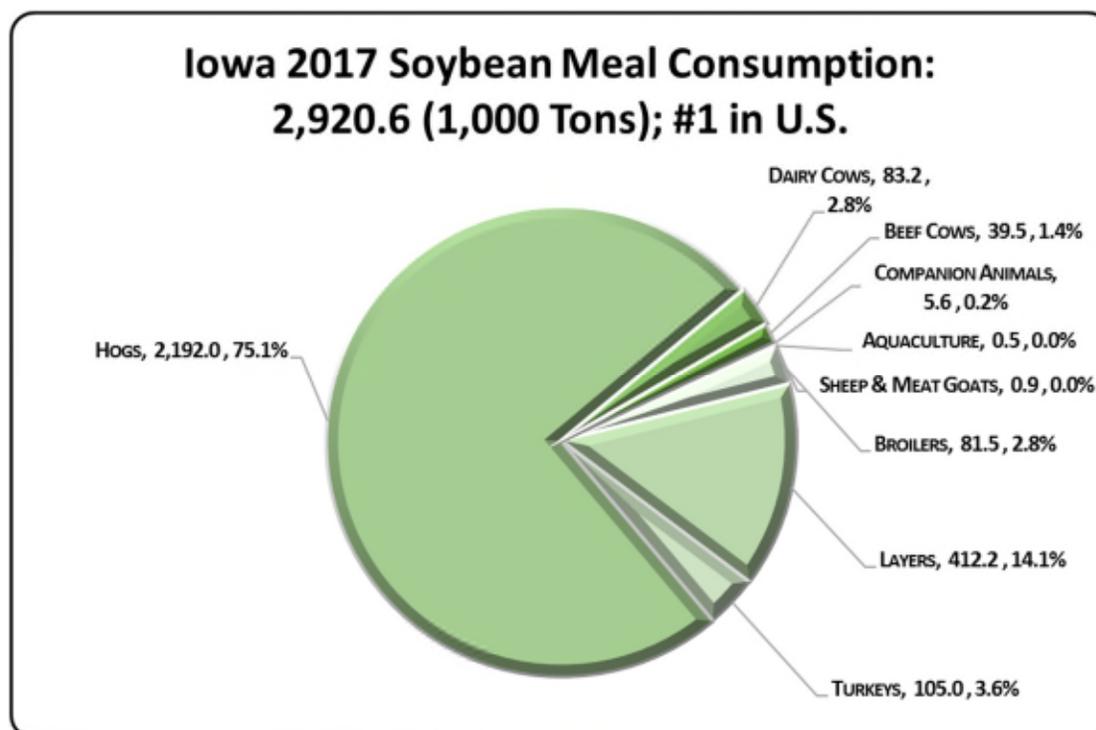
Iowa Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Iowa's animal agriculture consumed over 2.9 million tons of soybean meal in 2017, placing the state as #1 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Iowa consumed 229,720 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (2.2 million tons)
- Egg-Laying Hens (412.2 thousand tons)
- Turkeys (105.0 thousand tons)

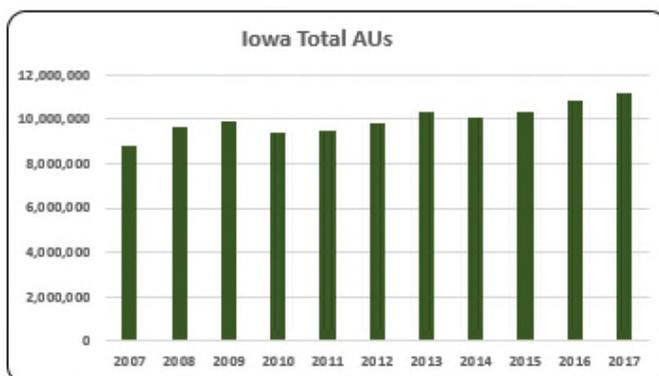
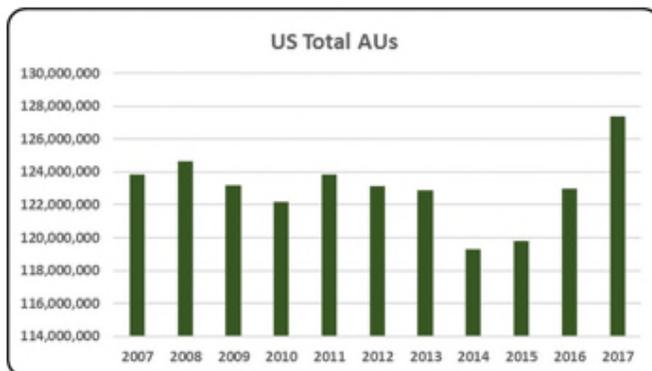


Iowa Animal Unit (AU) Trends

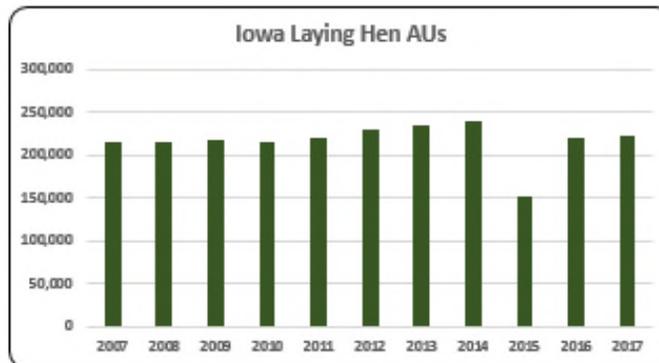
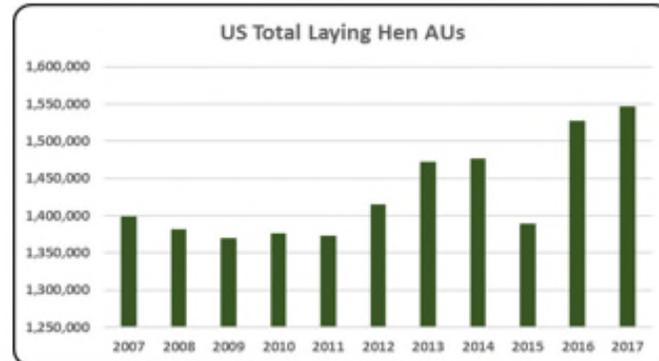
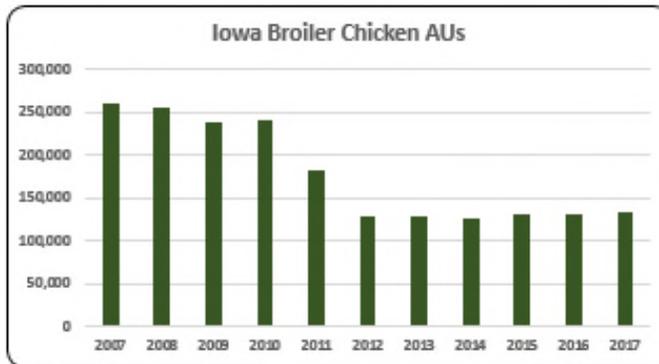
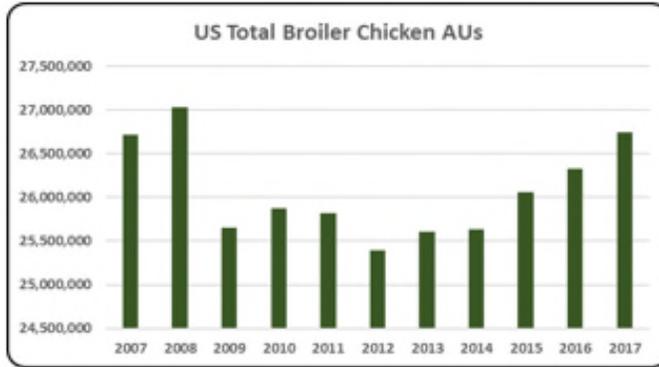
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Iowa. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. 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.

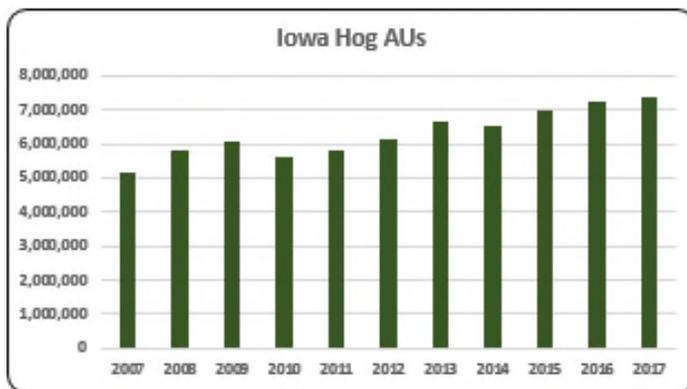
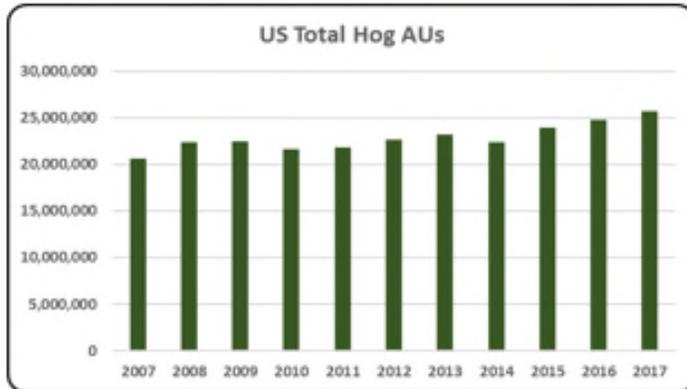
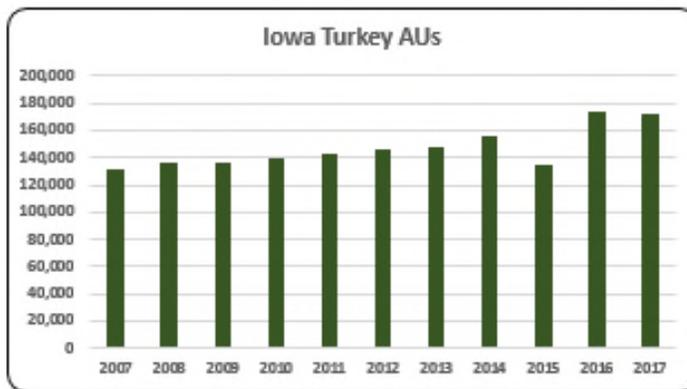
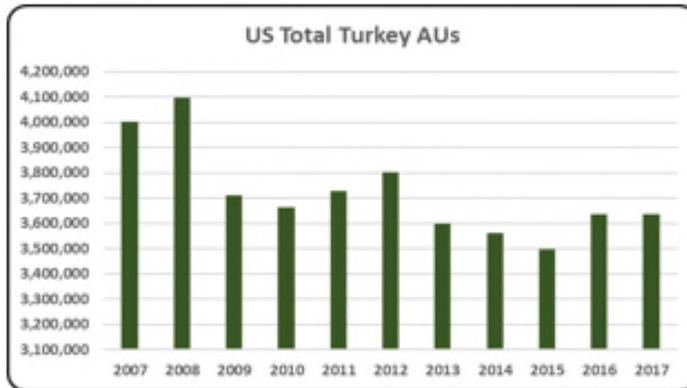
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Iowa, the largest three segments of animal agriculture in terms of AUs during 2017 were: Hogs (7.4 million AUs), Beef Cows (2.9 million AUs), and Dairy Cows (301,000 AUs). Total animal units in Iowa during 2017 were 11.1 million AUs.



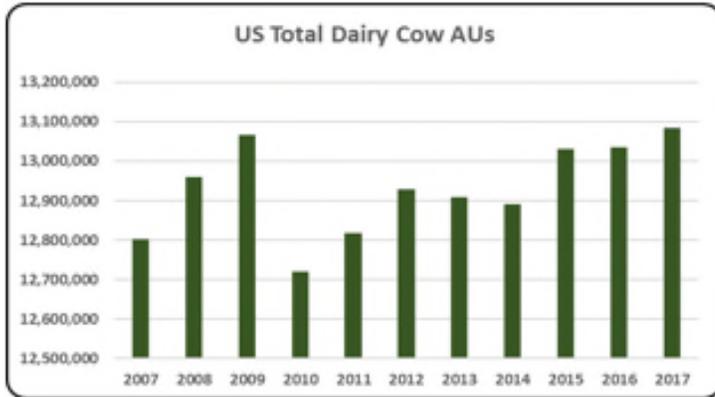
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 11.1 million AUs in the state of Iowa in 2017 which accounted for 8.7% of all AUs in the U.S.



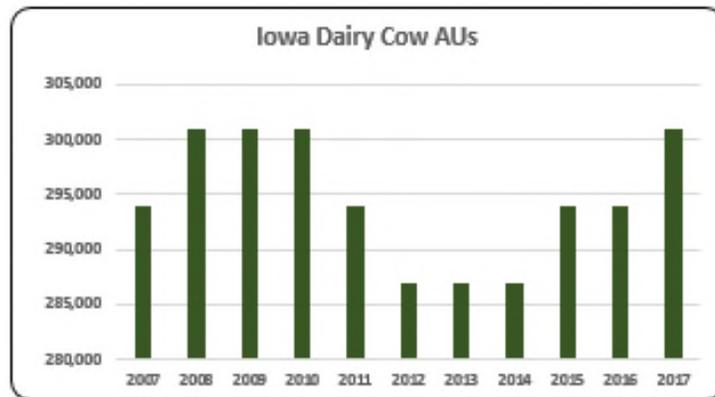
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler numbers have been decreasing in Iowa from 260,465 AUs in 2007 to 133,397 AUs in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Iowa housed 14.38% (222,491) of all layer AUs in the country in 2017. Layers AUs have increased 2.8% from the previous year due to continued recovery from the avian influenza outbreak.



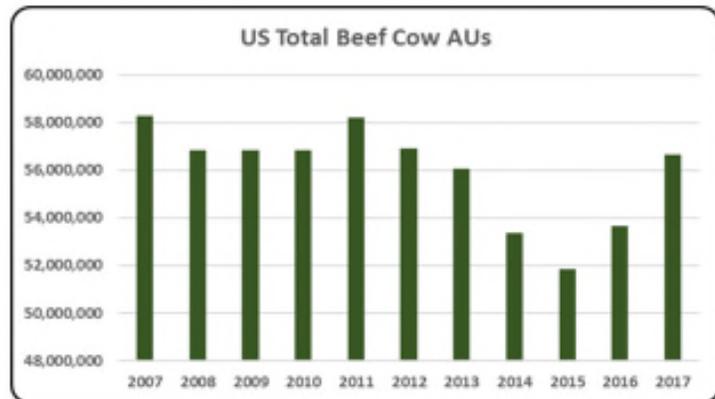
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- 4.7% of all turkey AUs in the U.S. in 2017 were in Iowa. In 2017 Iowa's turkey AUs were at 171,713 which was up significantly from 2015 due to the continuing recovery from avian influenza.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Iowa is the number one hog producer in the country with 7.3 million hog AUs in 2017, a 43% increase from 2007. About 28.7% of all hog AUs in the U.S. in 2017 were in Iowa.



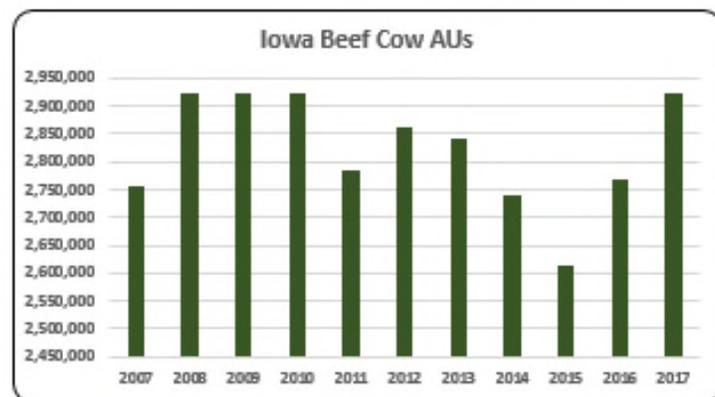
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Iowa's dairy cow AUs averaged 294,636 from 2007-2017. 2017 is equal to the high of the decade 301,000 AUs.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow AUs make up 26% of all AUs in Iowa. In 2017 there were 2.9 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	2,756,700	2,924,700	2,924,700	2,924,700	2,785,500	2,861,100	2,841,900	2,740,875	2,613,225	2,767,425	2,921,475
	Hog and Pig AUs	5,134,950	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
	Broiler AUs	260,465	256,404	238,395	241,602	182,049	128,427	127,978	127,252	130,537	131,520	133,397
	Turkey AUs	131,363	135,874	135,542	138,972	142,416	146,077	148,450	156,433	135,310	173,763	171,713
	Egg Layer AUs	216,536	214,872	218,700	214,856	221,652	230,832	234,519	239,577	152,194	220,641	222,491
	Dairy AUs	294,000	301,000	301,000	301,000	294,000	287,000	287,000	287,000	294,000	294,000	301,000
	Total Animal Units	8,794,015	9,653,149	9,887,487	9,428,130	9,449,067	9,808,687	10,322,647	10,081,387	10,317,666	10,817,349	11,127,526
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,445,594	\$ 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
	Hogs and Pigs (\$1,000)	\$ 3,632,366	\$ 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
	Broilers (\$1,000)	\$ 201,012	\$ 205,362	\$ 177,184	\$ 185,162	\$ 162,108	\$ 127,967	\$ 155,925	\$ 163,577	\$ 142,706	\$ 126,884	\$ 148,992
	Turkeys (\$1,000)	\$ 143,167	\$ 194,084	\$ 198,185	\$ 218,156	\$ 248,813	\$ 270,347	\$ 288,793	\$ 322,315	\$ 288,325	\$ 379,691	\$ 309,074
	Eggs (\$1,000)	\$ 824,806	\$ 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
	Milk (\$1,000)	\$ 817,098	\$ 783,660	\$ 567,732	\$ 716,430	\$ 886,215	\$ 866,496	\$ 944,435	\$ 1,143,162	\$ 836,974	\$ 835,644	\$ 936,132
	Other	\$ 28,369	\$ 26,363	\$ 23,436	\$ 27,044	\$ 32,514	\$ 38,581	\$ 27,629	\$ 26,470	\$ 33,131	\$ 32,944	\$ 33,839
	Sheep and Lambs (\$1,000)	\$ 26,564	\$ 24,391	\$ 21,296	\$ 24,736	\$ 30,038	\$ 35,938	\$ 24,818	\$ 23,491	\$ 29,985	\$ 29,629	\$ 30,369
	Aquaculture (\$1,000)	\$ 1,805	\$ 1,972	\$ 2,140	\$ 2,308	\$ 2,476	\$ 2,643	\$ 2,811	\$ 2,979	\$ 3,147	\$ 3,314	\$ 3,469
	Total (\$1,000)	\$ 7,092,412	\$ 7,958,140	\$ 6,721,465	\$ 8,175,090	\$ 10,145,592	\$ 10,742,088	\$ 11,747,490	\$ 13,895,897	\$ 12,832,961	\$ 10,902,534	\$ 11,979,809

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	11,392	10,065	10,673	9,697	
	Cattle feedlots (112112)	3,914	4,259	3,119	2,129	
	Dairy cattle and milk production (11212)	2,675	2,306	1,686	1,224	
	Hog and pig farming (1122)	9,388	5,742	4,970	3,310	
	Poultry and egg production (1123)	448	442	775	732	
	Sheep and goat farming (1124)	1,251	1,098	1,434	1,621	
	Animal aquaculture and other animal production (1125,1129)	3,098	4,162	4,308	3,941	
Value of Sales (\$1,000)	Cattle and Calves	1,886,416	2,119,935	3,606,633	4,504,373	
	Hogs and Pigs	3,012,764	3,078,455	4,827,224	6,767,424	
	Poultry and Eggs	414,587	511,949	872,263	1,291,808	
	Milk and Other Dairy Products	407,897	442,431	689,680	799,467	
	Aquaculture	1,628	2,308	3,507	7,690	
	Other (calculated)	57,197	47,284	75,204	69,206	
	Total	5,780,489	6,202,362	10,074,511	13,439,968	
Input Purchases	Livestock and poultry purchased	(Farms)	30,572	25,756	22,679	24,040
		\$1,000	1,260,448	1,854,227	3,290,203	3,435,345
	Breeding livestock purchased	(Farms)	n/a	13,436	10,743	12,791
		\$1,000	n/a	100,883	180,644	239,793
	Other livestock and poultry purchased	(Farms)	n/a	16,372	15,086	15,123
		\$1,000	n/a	1,753,344	3,109,559	3,195,553
Feed purchased	(Farms)	46,733	41,037	35,808	38,194	
	\$1,000	1,585,107	1,922,817	3,058,988	5,377,863	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 6,070,720	\$ 1,224,896	25,877	\$ 298,507
	Hogs, Pigs, and Other	\$ 12,317,370	\$ 2,804,768	57,177	\$ 683,522
	Poultry and Eggs	\$ 3,715,217	\$ 787,354	16,256	\$ 191,878
	Dairy	\$ 2,114,535	\$ 478,176	10,512	\$ 116,532
	Total	\$ 24,217,841	\$ 5,295,195	109,822	\$ 1,290,439

Change from 2007 to 2017	Cattle and Calves	\$ 2,066,276	\$ 416,915	8,808	\$ 101,602
	Hogs, Pigs, and Other	\$ 4,920,623	\$ 1,120,467	22,842	\$ 273,058
	Poultry and Eggs	\$ (157,024)	\$ (33,278)	(687)	\$ (8,110)
	Dairy	\$ (51,759)	\$ (11,705)	(257)	\$ (2,852)
	Total	\$ 6,778,116	\$ 1,492,400	30,705	\$ 363,698

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.7%
	Total	24.4%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$14.1 billion in economic output
- 56,473 jobs
- \$2.8 billion in earnings
- \$662.2 million in income taxes paid at local, state, and federal levels
- \$227.6 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Kansas has increased economic output by nearly \$2.0 billion, boosted household earnings by \$394.4 million, contributed 8,027 additional jobs and paid \$93.7 million in additional tax revenues.

Kansas's animal agriculture consumed almost 325.8 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (198.9 thousand tons)
- Dairy Cows (45.1 thousand tons)
- Broilers (30.5 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 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 2017, Kansas's animal agriculture contributed the following to the economy:

- About \$14.1 billion in economic output
- \$2.8 billion in household earnings
- 56,473 jobs
- \$662.2 million in income taxes

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

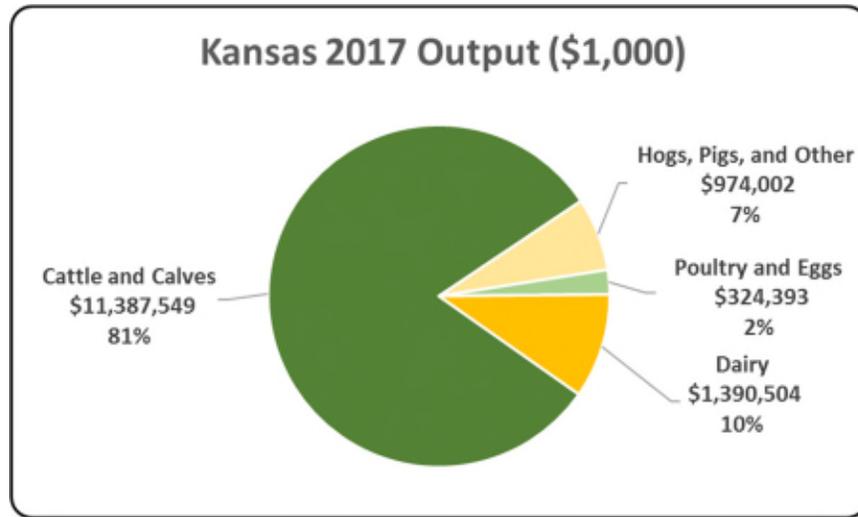
- Increased economic output by nearly \$2.0 billion
- Boosted household earnings by \$394.4 million
- Added 8,027 jobs
- Paid an additional \$93.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 14,076,448	\$ 1,978,710	16.36%
Earnings (\$1,000)	\$ 2,788,290	\$ 394,372	16.47%
Employment (Jobs)	56,473	8,027	16.57%
Income Taxes Paid (\$1,000)	\$ 662,219	\$ 93,663	16.47%
Property Taxes Paid in 2012 (\$1,000)	\$ 227,644		

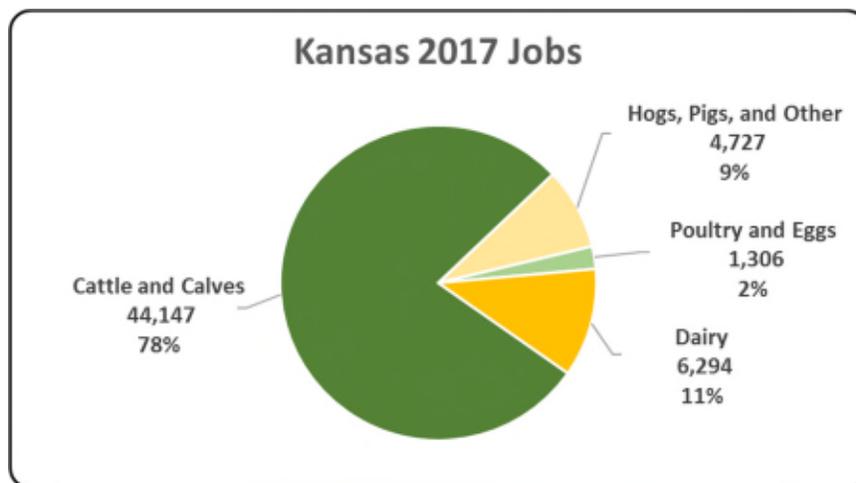
Kansas Output

“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 \$14.1 billion.



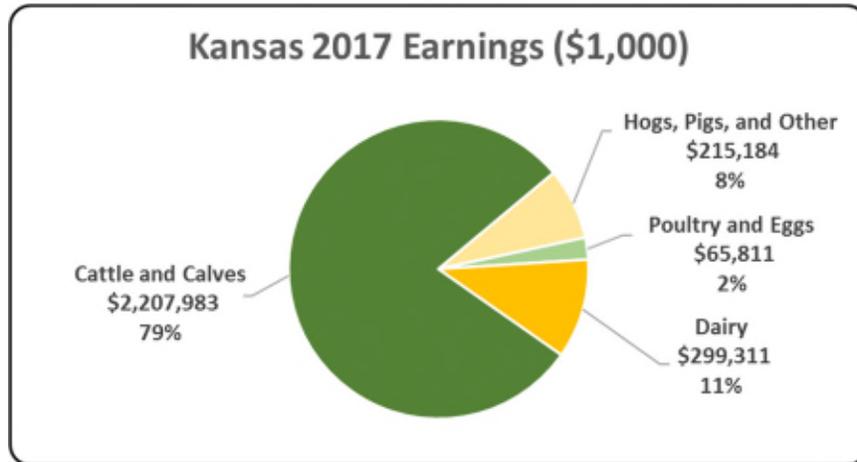
Kansas Jobs

“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 56,473 jobs within and outside of animal agriculture.



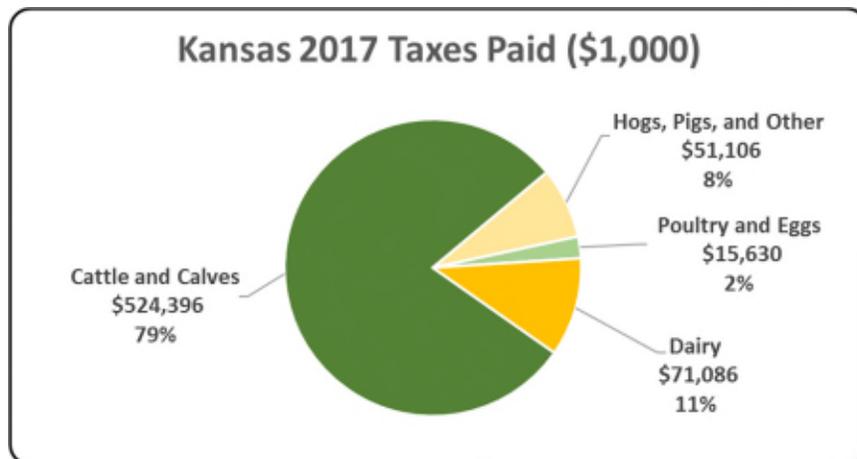
Kansas Earnings

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 \$2.8 billion to household earnings in 2017.



Kansas Taxes Paid by Animal Agriculture

Kansas’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$662.2 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$227.6 million in property taxes paid by all of Kansas agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



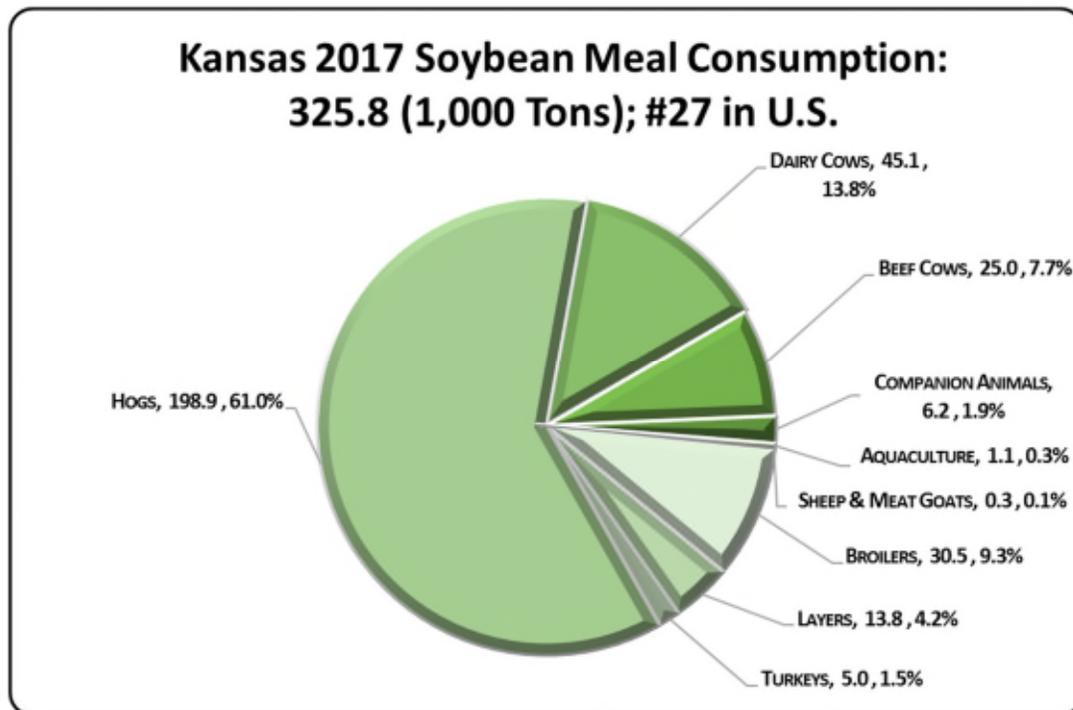
Kansas Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Kansas's animal agriculture consumed almost 325.8 thousand tons of soybean meal in 2017, placing the state as #27 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Kansas consumed 190,901 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (198.9 thousand tons)
- Dairy Cows (45.1 thousand tons)
- Broilers (30.5 thousand tons)

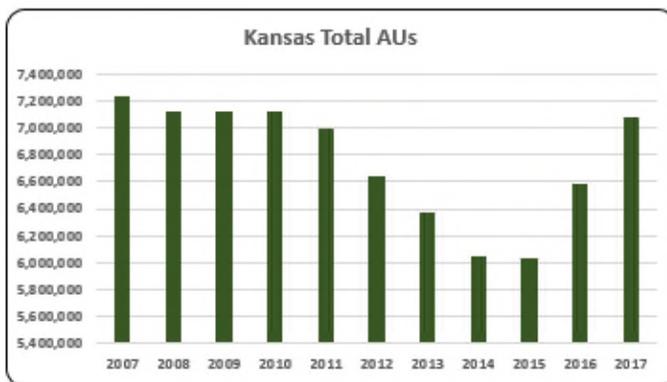
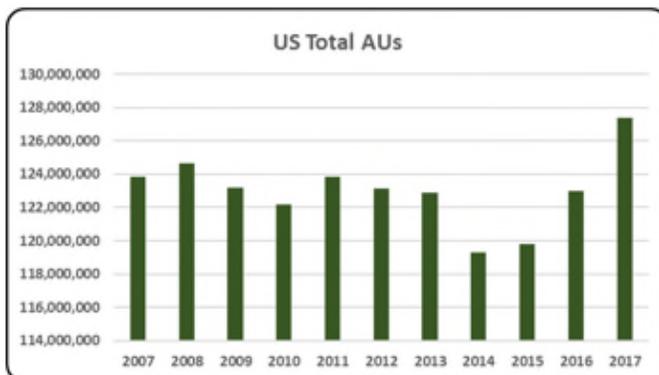


Kansas Animal Unit (AU) Trends

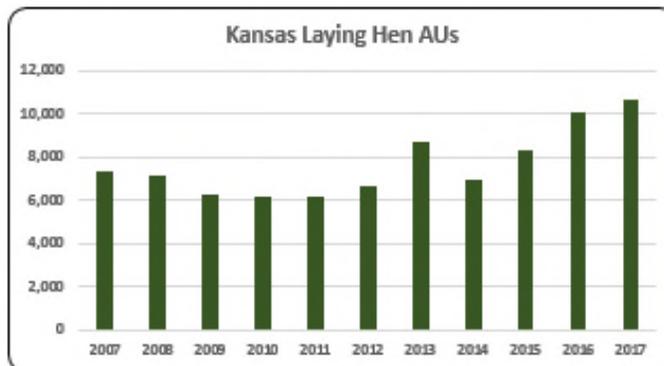
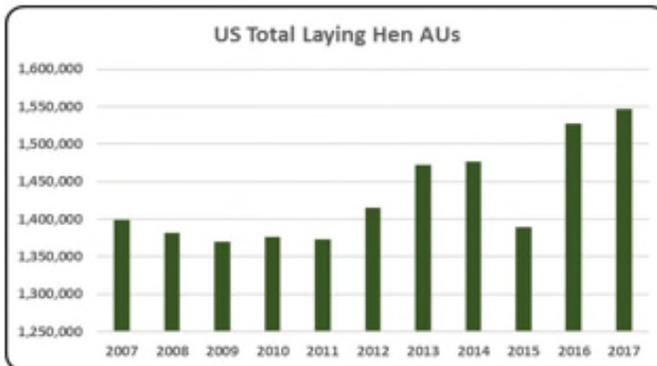
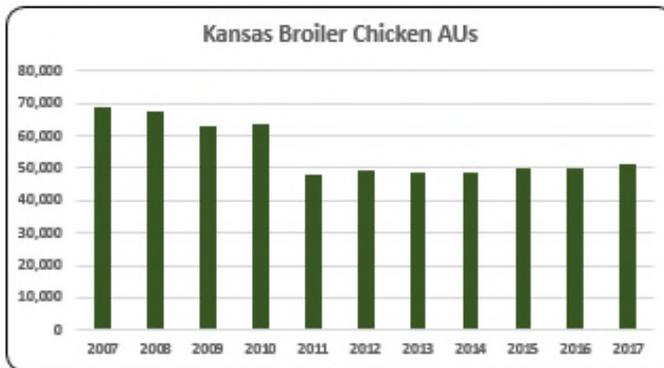
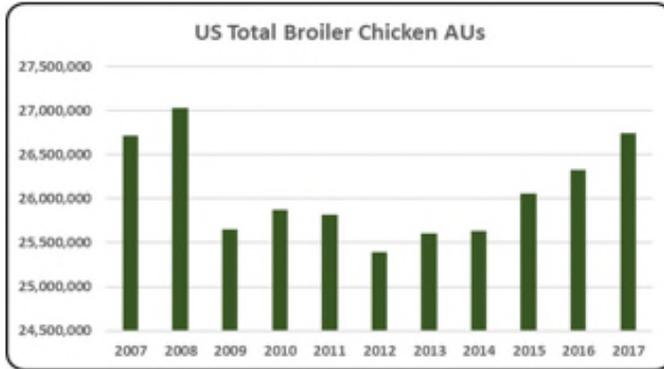
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Kansas. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

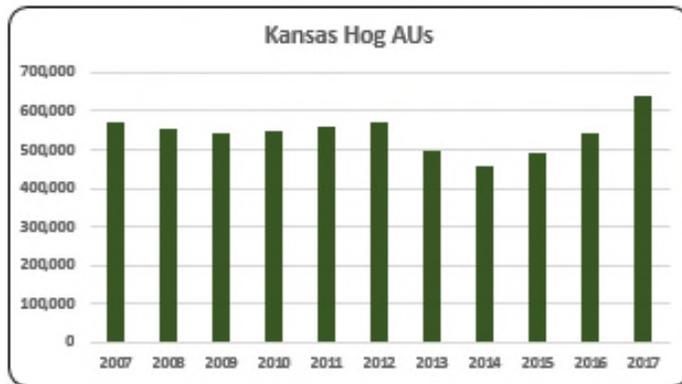
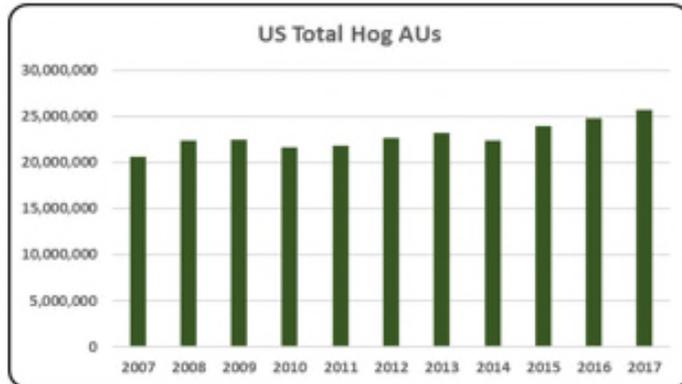
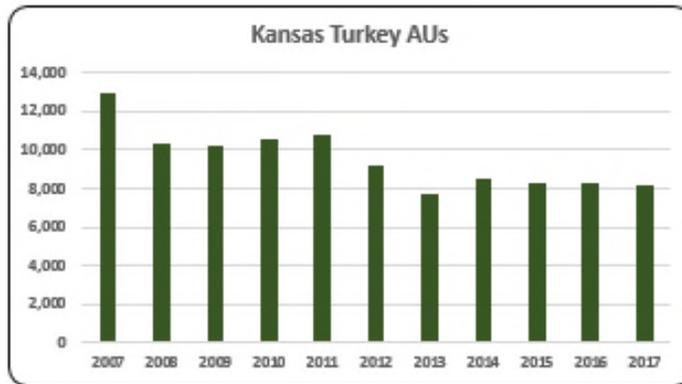
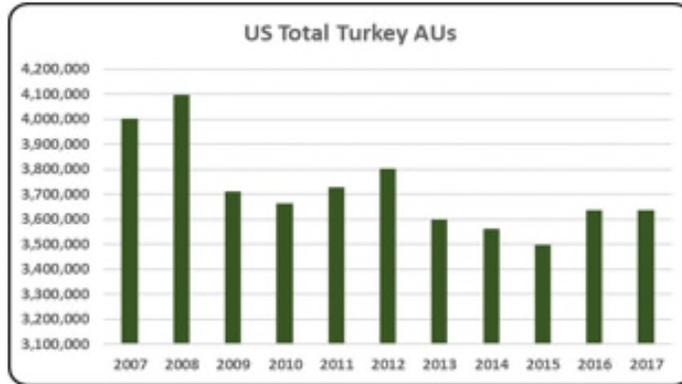
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Kansas, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (6.2 million AUs), Hogs (642,600 AUs), and Dairy Cows (210,000 AUs). Total animal units in Kansas during 2017 were 7.1 million AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 7.1 million AUs in Kansas in 2017. AUs have been declining during the past decade, however since 2014 AUs have increased 17% (1.04 million AUs).



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler numbers in Kansas have shrunk since the beginning of the decade by 26% to 50,971 AUs in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- On average there were 7,678 layer AUs in the state in the 2007 to 2017 decade.

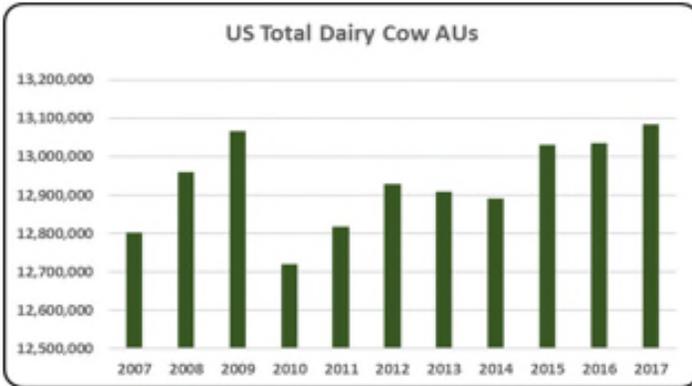


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

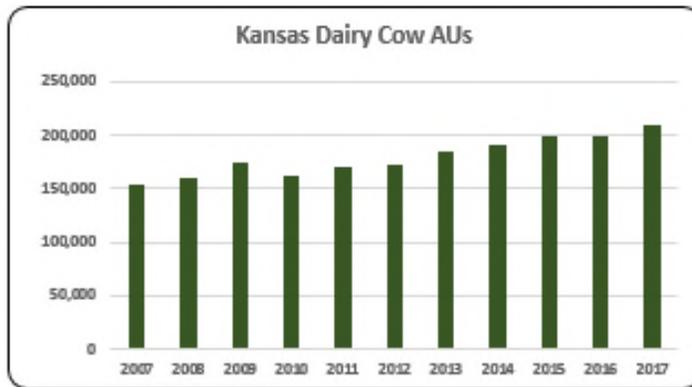
- Despite the decreasing trend in turkey AUs in Kansas, last year turkey AUs were at 8,220.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

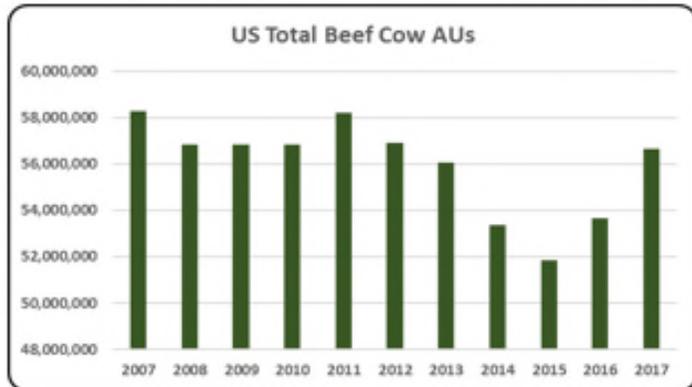
- Hog AUs in 2017 (642,600) represent about 9% of all AUs present in the state. Hog AUs have rebounded since the 2013-2014 decrease.



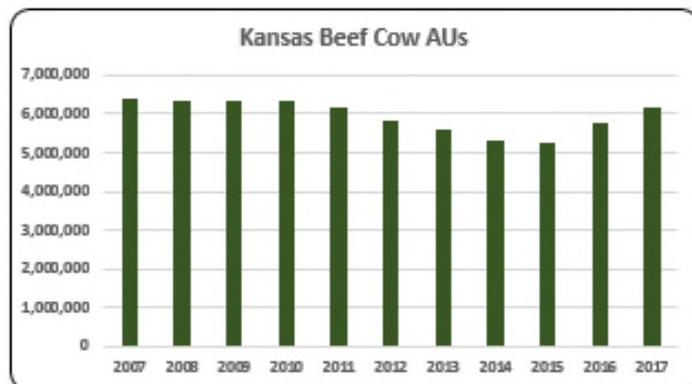
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Kansas' dairy cow numbers have shown consistent growth during this decade with an increase from 154,000 dairy cow AUs in 2007 to 210,000 dairy cow AUs in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- About 87% of all AUs in Kansas were beef cow AUs in 2017. Beef cow AUs have declined over the past decade in part due to long term drought. This decrease has reversed starting in 2014.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Animal Units (AUs)	Beef Cattle AUs	6,419,475	6,323,475	6,323,475	6,323,475	6,192,150	5,832,150	5,628,150	5,340,150	5,279,850	5,773,050	6,156,600
	Hog and Pig AUs	569,550	555,450	544,200	546,750	558,000	572,250	497,250	458,400	489,600	540,600	642,600
	Broiler AUs	68,819	67,745	62,987	63,835	48,100	49,072	48,901	48,623	49,878	50,254	50,971
	Turkey AUs	13,003	10,394	10,181	10,605	10,794	9,214	7,686	8,485	8,302	8,274	8,220
	Egg Layer AUs	7,334	7,124	6,231	6,190	6,226	6,700	8,675	6,912	8,317	10,102	10,648
	Dairy AUs	154,000	161,000	175,000	162,400	170,800	172,200	184,800	190,400	200,200	198,800	210,000
	Total Animal Units	7,232,181	7,125,189	7,122,075	7,113,254	6,986,070	6,641,586	6,375,462	6,052,971	6,036,148	6,581,080	7,079,038
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 3,328,059	\$ 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
	Hogs and Pigs (\$1,000)	\$ 361,160	\$ 350,741	\$ 325,010	\$ 438,565	\$ 599,038	\$ 568,278	\$ 567,739	\$ 606,292	\$ 472,255	\$ 474,582	\$ 542,318
	Broilers (\$1,000)	\$ 53,110	\$ 54,260	\$ 46,814	\$ 48,922	\$ 42,831	\$ 48,896	\$ 59,579	\$ 62,503	\$ 54,528	\$ 48,483	\$ 56,930
	Turkeys (\$1,000)	\$ 13,807	\$ 16,847	\$ 15,967	\$ 21,785	\$ 17,130	\$ 18,418	\$ 13,351	\$ 8,832	\$ 7,771	\$ 8,788	\$ 5,950
	Eggs (\$1,000)	\$ 34,403	\$ 41,461	\$ 29,509	\$ 32,393	\$ 35,517	\$ 39,831	\$ 45,001	\$ 72,032	\$ 120,082	\$ 47,223	\$ 63,851
	Milk (\$1,000)	\$ 422,091	\$ 456,435	\$ 348,320	\$ 431,981	\$ 542,850	\$ 519,080	\$ 592,264	\$ 747,360	\$ 536,744	\$ 532,640	\$ 590,824
	Other	\$ 5,960	\$ 5,319	\$ 5,820	\$ 6,375	\$ 6,121	\$ 7,291	\$ 6,214	\$ 7,122	\$ 7,676	\$ 7,484	\$ 8,588
	Sheep and Lambs (\$1,000)	\$ 5,560	\$ 4,891	\$ 5,363	\$ 5,889	\$ 5,607	\$ 6,747	\$ 5,642	\$ 6,522	\$ 7,047	\$ 6,826	\$ 7,260
	Aquaculture (\$1,000)	\$ 400	\$ 428	\$ 457	\$ 486	\$ 515	\$ 543	\$ 572	\$ 601	\$ 630	\$ 658	\$ 1,328
	Total (\$1,000)	\$ 4,218,589	\$ 4,245,574	\$ 3,736,254	\$ 4,424,322	\$ 5,468,027	\$ 5,417,830	\$ 5,451,849	\$ 6,117,748	\$ 5,910,983	\$ 5,708,849	\$ 5,777,310

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	19,839	20,314	18,708	15,991	
	Cattle feedlots (112112)	1,331	1,506	894	492	
	Dairy cattle and milk production (11212)	764	608	523	398	
	Hog and pig farming (1122)	1,098	634	618	348	
	Poultry and egg production (1123)	256	299	691	385	
	Sheep and goat farming (1124)	437	497	782	946	
	Animal aquaculture and other animal production (1125,1129)	1,894	3,110	3,493	3,484	
Value of Sales (\$1,000)	Cattle and Calves	5,437,006	5,715,204	8,542,872	10,153,087	
	Hogs and Pigs	297,492	297,505	506,448	697,020	
	Poultry and Eggs	48,014	withheld	69,807	88,403	
	Milk and Other Dairy Products	155,047	248,542	376,511	482,765	
	Aquaculture	withheld	745	2,228	4,997	
	Other (calculated)	23,063	65,801	28,105	33,581	
	Total	5,960,622	6,327,797	9,525,971	11,459,853	
Input Purchases	Livestock and poultry purchased	(Farms) 19,518	16,103	15,145	16,190	
		\$1,000	2,687,621	3,554,091	5,192,954	5,440,898
	Breeding livestock purchased	(Farms) <i>n/a</i>	9,506	9,558	10,480	
		\$1,000	<i>n/a</i>	60,943	150,517	206,584
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	8,750	7,797	8,352	
		\$1,000	<i>n/a</i>	3,493,148	5,042,438	5,234,314
Feed purchased	(Farms)	32,955	33,531	29,672	32,131	
	\$1,000	1,506,407	1,410,837	2,237,287	4,207,051	

2017 Animal Agriculture	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 11,387,549	\$ 2,207,983	44,147	\$ 524,396
Hogs, Pigs, and Other	\$ 974,002	\$ 215,184	4,727	\$ 51,106	
Poultry and Eggs	\$ 324,393	\$ 65,811	1,306	\$ 15,630	
Dairy	\$ 1,390,504	\$ 299,311	6,294	\$ 71,086	
Total	\$ 14,076,448	\$ 2,788,290	56,473	\$ 662,219	

Change from 2007 to 2017	Cattle and Calves	\$ 1,522,005	\$ 295,108	5,900	\$ 70,088
	Hogs, Pigs, and Other	\$ 212,177	\$ 46,876	1,030	\$ 11,133
	Poultry and Eggs	\$ 19,990	\$ 4,055	80	\$ 963
	Dairy	\$ 224,539	\$ 48,333	1,016	\$ 11,479
	Total	\$ 1,978,710	\$ 394,372	8,027	\$ 93,663

RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.1%
	Total	23.8%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 key driver of animal agriculture 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 2017 animal agriculture contributed:

- \$6.1 billion in economic output
- 39,119 jobs
- \$1.3 billion in earnings
- \$300.7 million in income taxes paid at local, state, and federal levels
- \$113.7 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Kentucky has increased economic output by over \$460.8 million, boosted household earnings by \$93.0 million, contributed 2,646 additional jobs and paid \$22.1 million in additional tax revenues.

Kentucky's animal agriculture consumed almost 652.2 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (536.4 thousand tons)
- Hogs (50.3 thousand tons)
- Egg-Laying Hens (26.4 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 2017, Kentucky's animal agriculture contributed the following to the economy:

- About \$6.1 billion in economic output
- \$1.3 billion in household earnings
- 39,119 jobs
- \$300.7 million in income taxes

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

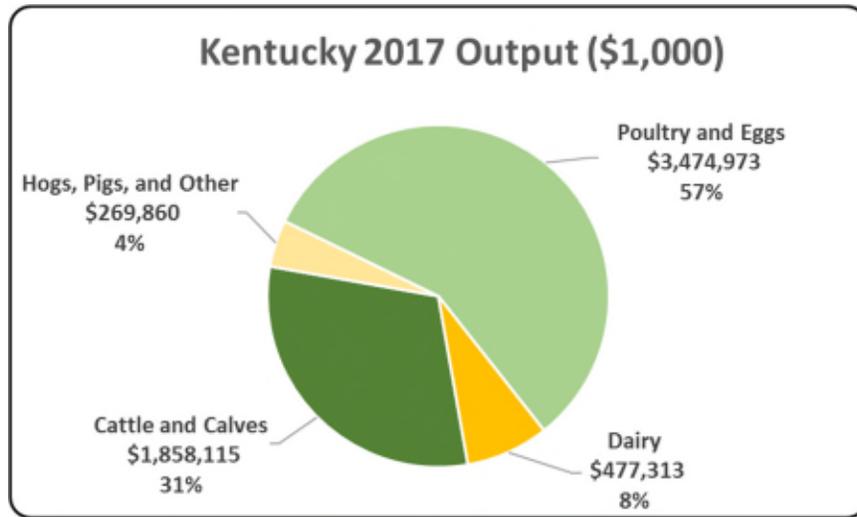
- Increased economic output by \$460.8 million
- Boosted household earnings by \$93.0 million
- Added 2,646 jobs
- Paid an additional \$22.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 6,080,262	\$ 460,807	8.20%
Earnings (\$1,000)	\$ 1,268,931	\$ 93,049	7.91%
Employment (Jobs)	39,119	2,646	7.26%
Income Taxes Paid (\$1,000)	\$ 300,737	\$ 22,053	7.91%
Property Taxes Paid in 2012 (\$1,000)	\$ 113,653		

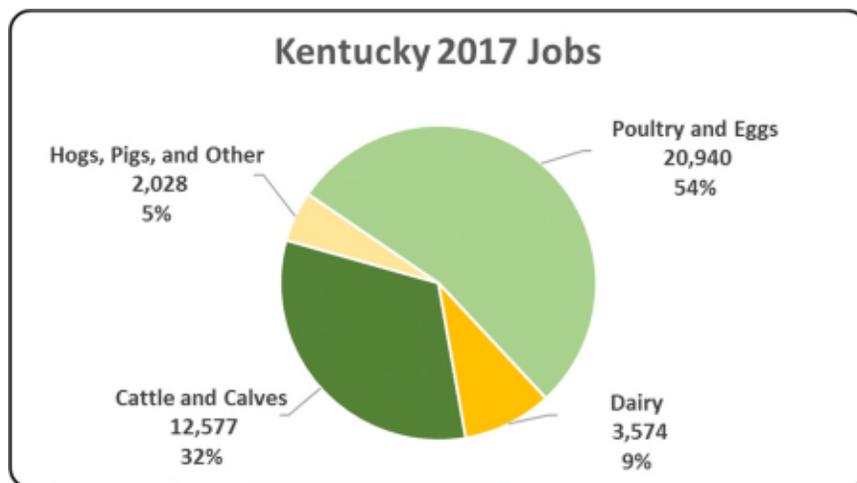
Kentucky Output

“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 \$6.1 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 39,119 jobs within and outside of animal agriculture in Kentucky.



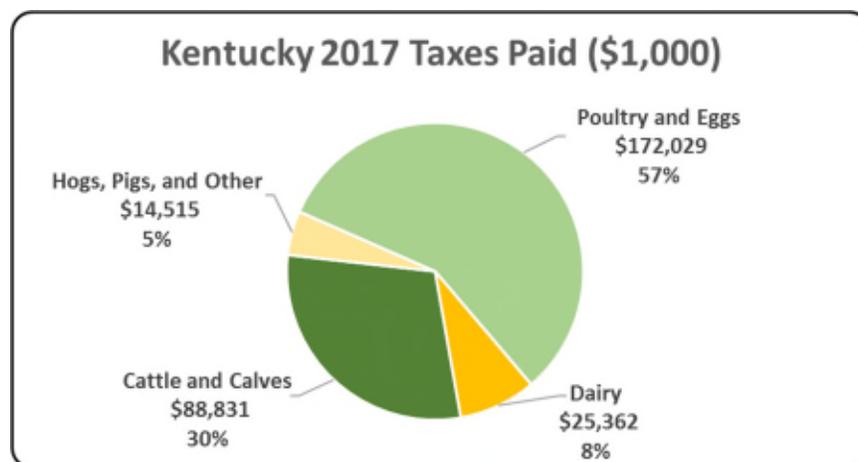
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Kentucky Taxes Paid by Animal Agriculture

Kentucky’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$300.7 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$113.7 million in property taxes paid by all of Kentucky agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



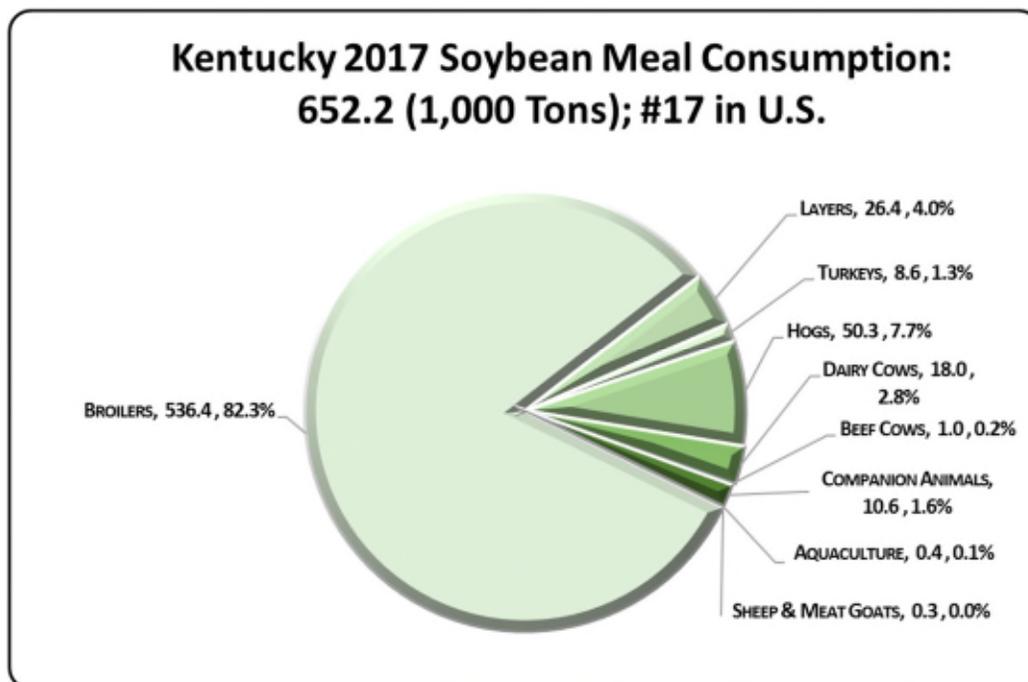
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Kentucky's animal agriculture consumed almost 652.2 thousand tons of soybean meal in 2017, placing the state as #17 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Kentucky consumed 21,228 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

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- Hogs (50.3 thousand tons)
- Egg-Laying Hens (26.4 thousand tons)

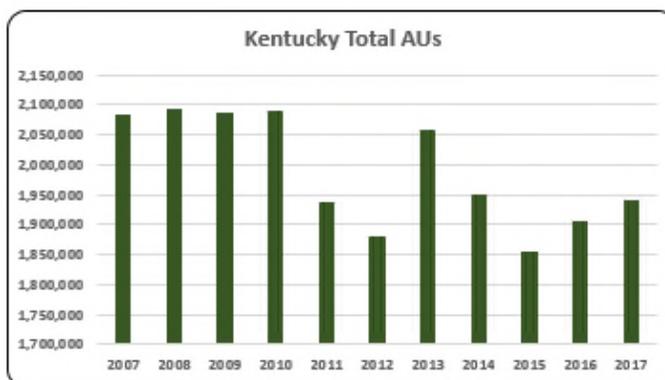
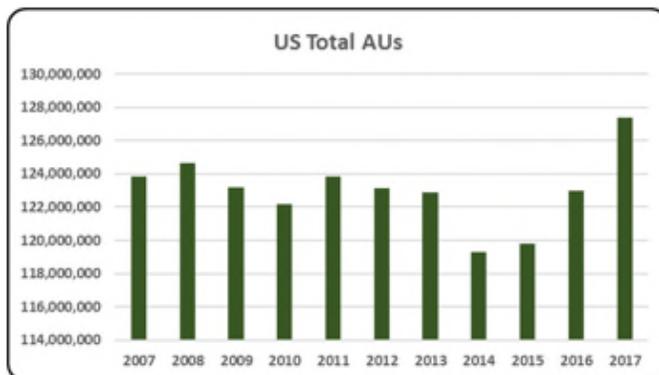


Kentucky Animal Unit (AU) Trends

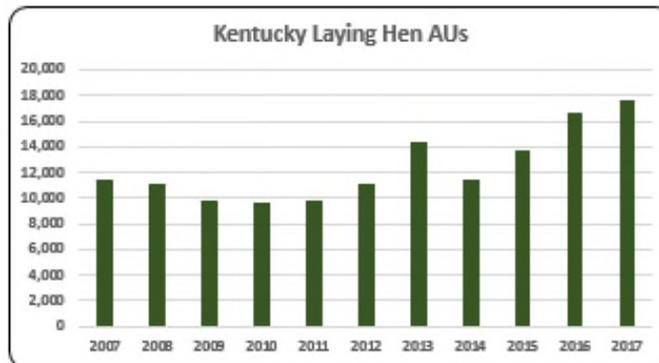
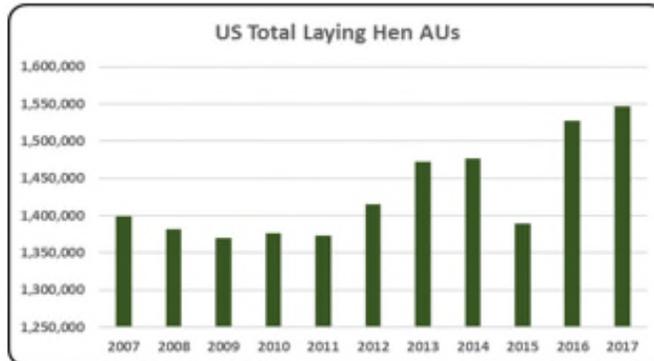
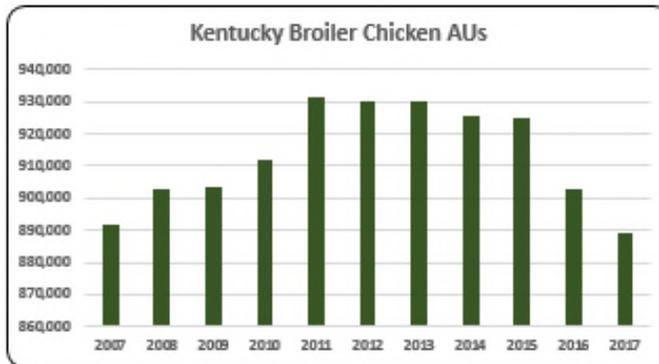
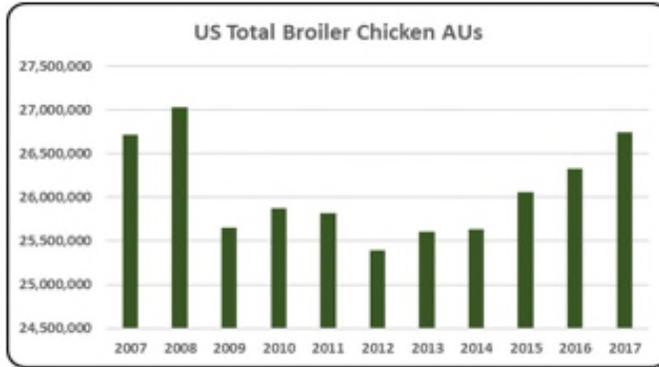
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Kentucky. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

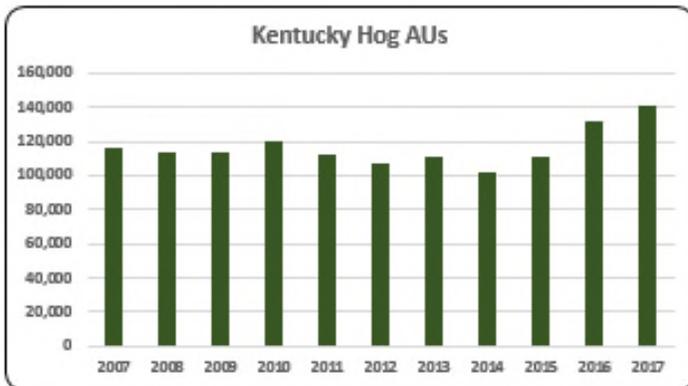
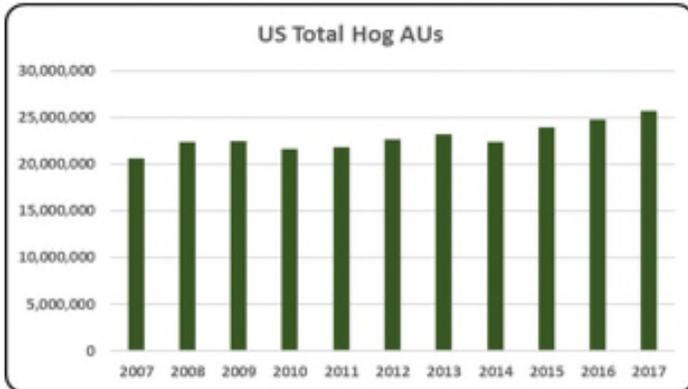
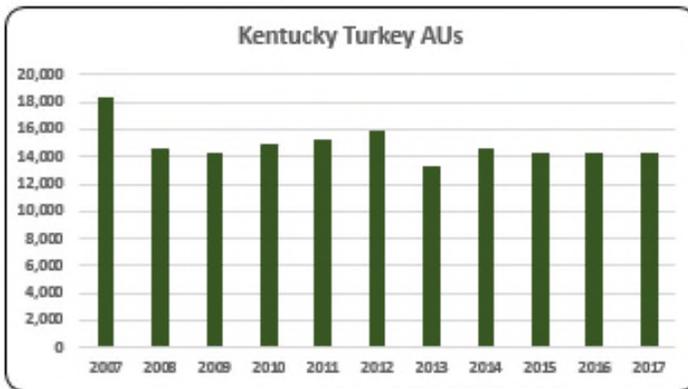
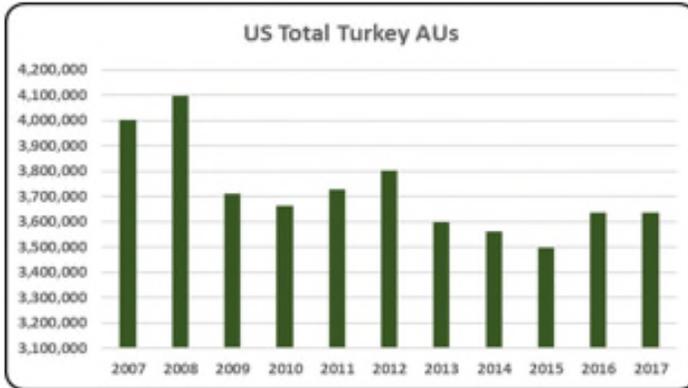
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Kentucky, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (889,021 AUs), Beef Cows (798,075 AUs), and Hogs (141,600 AUs). Total animal units in Kentucky during 2017 were 1.9 million AUs.



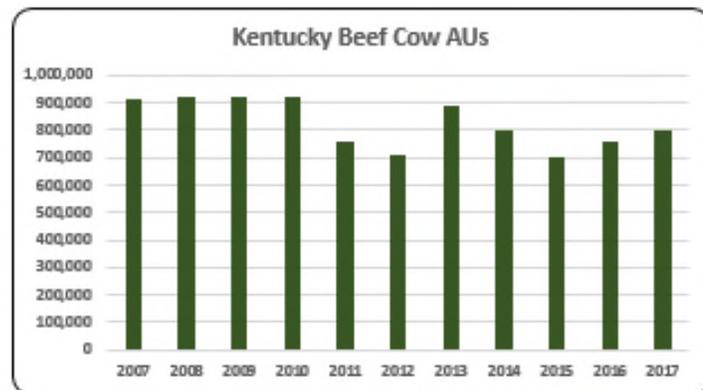
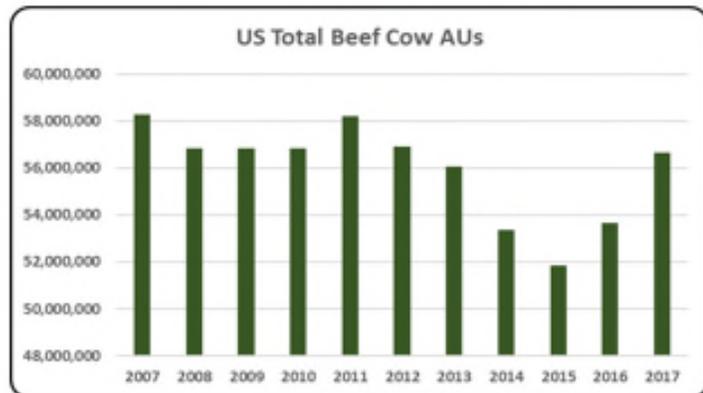
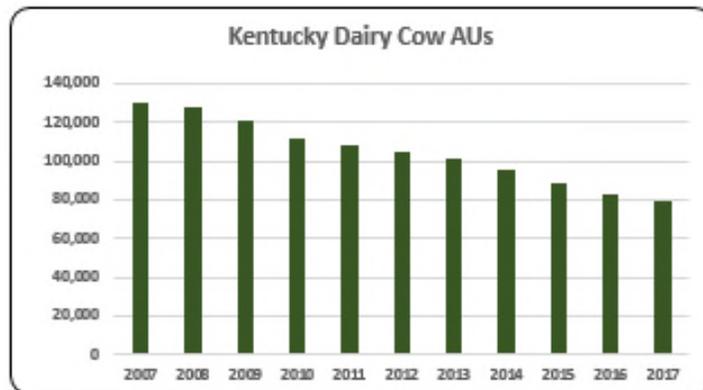
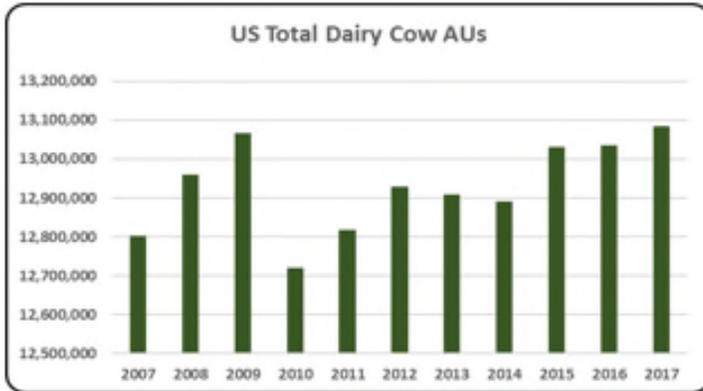
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The total number of AUs in Kentucky in 2017 was 1.9 million. Animal units have decreased about 6.8% throughout the decade.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There were 889,021 broiler AUs in 2017, which was a small decline from the previous year, Kentucky’s broiler AUs decreased 0.34% since 2007.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layer AUs in 2017 were 17,606 compared to 11,496 in 2007. On average for the decade there was 12,438 AUs.



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkey numbers in Kentucky have contracted slightly during the decade decreasing from 18,330 turkey AUs in 2007 to 14,215 turkey AUs in 2017.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs grown 21.7% from the numbers in 2007 (116,400). There was a total of 141,600 hog AUs in 2017.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- Kentucky’s dairy cow numbers have been consistently declining from 130,200 dairy cow AUs in 2007 to 79,800 dairy cow AUs in 2017.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- 41% (798,075) of all AUs in the state of Kentucky in 2017 were beef cow AUs. There has been a 12% decrease in beef cow AUs since 2007.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	914,250	923,700	923,700	923,700	762,150	712,500	887,550	801,300	703,050	757,050	798,075
	Hog and Pig AUs	116,400	114,300	114,000	119,550	112,650	107,250	111,150	102,000	110,550	131,850	141,600
	Broiler AUs	892,024	902,564	903,320	911,682	931,403	930,291	930,248	925,704	924,816	902,612	889,021
	Turkey AUs	18,330	14,651	14,352	14,949	15,215	15,935	13,292	14,674	14,357	14,309	14,215
	Egg Layer AUs	11,496	11,168	9,768	9,703	9,761	11,079	14,344	11,430	13,753	16,704	17,606
	Dairy AUs	130,200	127,400	120,400	112,000	107,800	105,000	100,800	95,200	88,200	82,600	79,800
	Total Animal Units	2,082,700	2,093,783	2,085,540	2,091,584	1,938,979	1,882,055	2,057,385	1,950,308	1,854,726	1,905,125	1,940,318
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 570,235	\$ 507,540	\$ 476,884	\$ 563,075	\$ 585,804	\$ 736,272	\$ 670,516	\$ 940,912	\$ 980,781	\$ 703,234	\$ 722,468
	Hogs and Pigs (\$1,000)	\$ 83,889	\$ 76,419	\$ 66,990	\$ 101,443	\$ 115,178	\$ 105,609	\$ 115,851	\$ 128,741	\$ 108,637	\$ 104,009	\$ 112,831
	Broilers (\$1,000)	\$ 717,326	\$ 760,334	\$ 757,615	\$ 806,338	\$ 782,595	\$ 866,600	\$ 1,014,479	\$ 1,098,698	\$ 960,169	\$ 875,600	\$ 1,029,846
	Turkeys (\$1,000)	\$ 12,202	\$ 14,888	\$ 14,110	\$ 30,709	\$ 24,147	\$ 25,963	\$ 18,820	\$ 12,450	\$ 13,439	\$ 15,197	\$ 10,290
	Eggs (\$1,000)	\$ 120,075	\$ 130,387	\$ 110,285	\$ 101,530	\$ 115,438	\$ 116,170	\$ 131,969	\$ 154,883	\$ 191,617	\$ 118,592	\$ 118,459
	Milk (\$1,000)	\$ 252,500	\$ 242,000	\$ 168,072	\$ 206,208	\$ 235,440	\$ 221,760	\$ 230,050	\$ 258,516	\$ 202,476	\$ 180,084	\$ 196,749
	Other	\$ 4,504	\$ 4,532	\$ 4,612	\$ 4,775	\$ 4,754	\$ 5,229	\$ 5,516	\$ 5,851	\$ 5,661	\$ 6,501	\$ 35,926
	Sheep and Lambs (\$1,000)	\$ 2,275	\$ 2,359	\$ 2,495	\$ 2,714	\$ 2,749	\$ 3,280	\$ 3,623	\$ 4,014	\$ 3,880	\$ 4,776	\$ 4,279
	Aquaculture (\$1,000)	\$ 2,229	\$ 2,173	\$ 2,117	\$ 2,061	\$ 2,005	\$ 1,949	\$ 1,893	\$ 1,837	\$ 1,781	\$ 1,725	\$ 31,647
	Total (\$1,000)	\$ 1,760,731	\$ 1,736,100	\$ 1,598,568	\$ 1,814,078	\$ 1,863,356	\$ 2,077,604	\$ 2,187,201	\$ 2,600,051	\$ 2,462,780	\$ 2,003,217	\$ 2,226,569

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	24,962	31,035	33,966	30,041	
	Cattle feedlots (112112)	877	1,820	1,073	541	
	Dairy cattle and milk production (11212)	2,010	2,078	1,641	890	
	Hog and pig farming (1122)	588	366	354	262	
	Poultry and egg production (1123)	418	904	1,593	1,603	
	Sheep and goat farming (1124)	269	901	2,038	1,746	
	Animal aquaculture and other animal production (1125,1129)	3,495	7,309	9,351	7,826	
Value of Sales (\$1,000)	Cattle and Calves	570,377	622,855	935,611	1,033,722	
	Hogs and Pigs	119,651	69,722	90,198	122,130	
	Poultry and Eggs	273,284	561,178	978,025	1,107,452	
	Milk and Other Dairy Products	237,734	214,365	250,305	207,602	
	Aquaculture	1,628	2,017	2,683	2,884	
	Other (calculated)	345,173	499,734	1,162,970	134,038	
	Total	1,547,847	1,969,871	3,419,792	2,607,828	
Input Purchases	Livestock and poultry purchased	(Farms)	19,647	21,156	18,470	21,345
		\$1,000	236,935	298,839	523,127	598,201
	Breeding livestock purchased	(Farms)	n/a	13,530	11,737	13,387
		\$1,000	n/a	71,492	171,651	124,223
	Other livestock and poultry purchased	(Farms)	n/a	9,936	9,159	11,237
		\$1,000	n/a	227,347	351,475	473,978
Feed purchased	(Farms)	39,926	51,368	46,766	50,685	
	\$1,000	341,123	443,883	793,669	1,176,273	

	Animal Type		Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)		
	2017 Animal Agriculture	Cattle and Calves	\$	1,858,115	\$	374,816	12,577	\$
	Hogs, Pigs, and Other	\$	269,860	\$	61,243	2,028	\$	14,515
	Poultry and Eggs	\$	3,474,973	\$	725,859	20,940	\$	172,029
	Dairy	\$	477,313	\$	107,012	3,574	\$	25,362
	Total	\$	6,080,262	\$	1,268,931	39,119	\$	300,737
Change from 2007 to 2017	Cattle and Calves	\$	136,749	\$	27,585	926	\$	6,538
	Hogs, Pigs, and Other	\$	81,650	\$	18,530	613	\$	4,392
	Poultry and Eggs	\$	484,077	\$	101,115	2,917	\$	23,964
	Dairy	\$	(241,668)	\$	(54,181)	(1,810)	\$	(12,841)
	Total	\$	460,807	\$	93,049	2,646	\$	22,053
	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				13.5%			
	Federal Social Security tax rate				6.2%			
	State Effective Rate				4.0%			
	Total				23.7%			

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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. For example, in the State of Louisiana during 2017 animal agriculture contributed:

- \$803.2 million in economic output
- 3,603 jobs
- \$169.9 million in earnings
- \$40.3 million in income taxes paid at local, state, and federal levels
- \$32.1 million in the form of property taxes

Louisiana's animal agriculture consumed almost 56.2 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (33.1 thousand tons)
- Egg-Laying Hens (9.1 thousand tons)
- Companion Animals (6.0 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 2017, Louisiana's animal agriculture contributed the following to the economy:

- About \$803.2 million in economic output
- \$169.9 million in household earnings
- 3,603 jobs
- \$40.3 million in income taxes

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

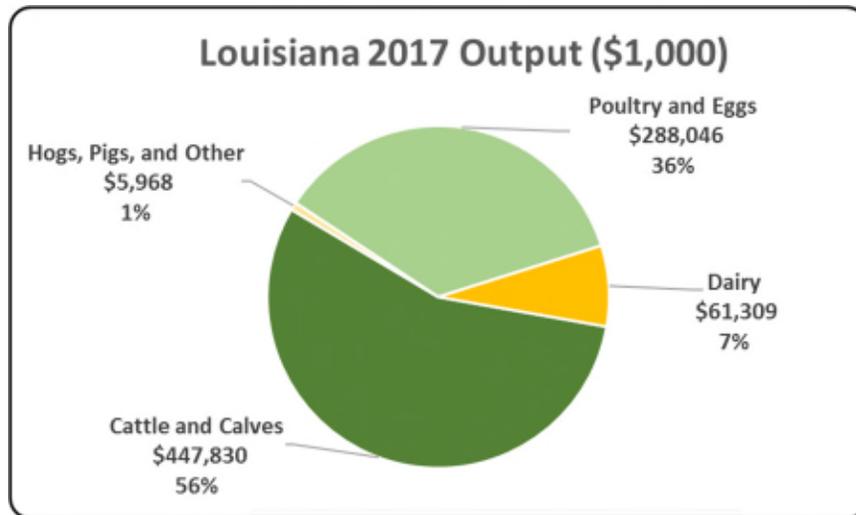
- Decreased economic output by \$427.4 million
- Reduced household earnings by \$97.3 million
- Shrunk by 2,111 jobs
- Paid \$23.1 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 803,152	\$ (427,372)	-34.73%
Earnings (\$1,000)	\$ 169,881	\$ (97,294)	-36.42%
Employment (Jobs)	3,603	(2,111)	-36.94%
Income Taxes Paid (\$1,000)	\$ 40,262	\$ (23,059)	-36.42%
Property Taxes Paid in 2012 (\$1,000)	#N/A		

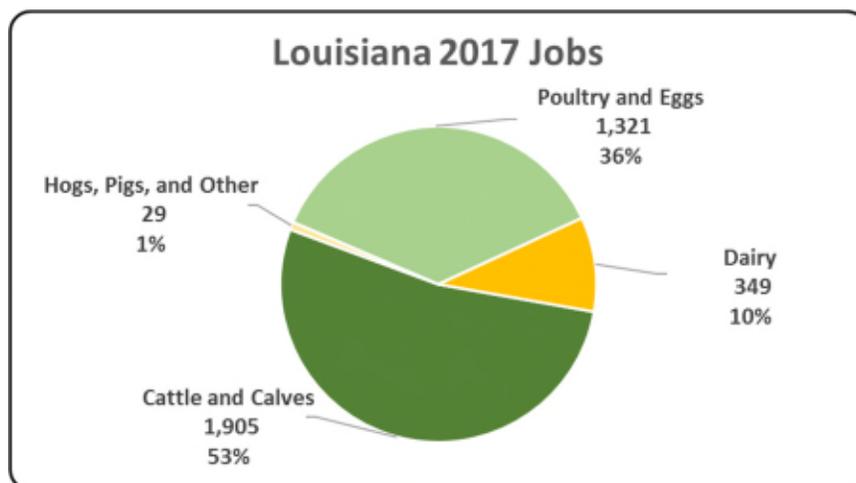
Louisiana Output

“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 \$803.2 million.



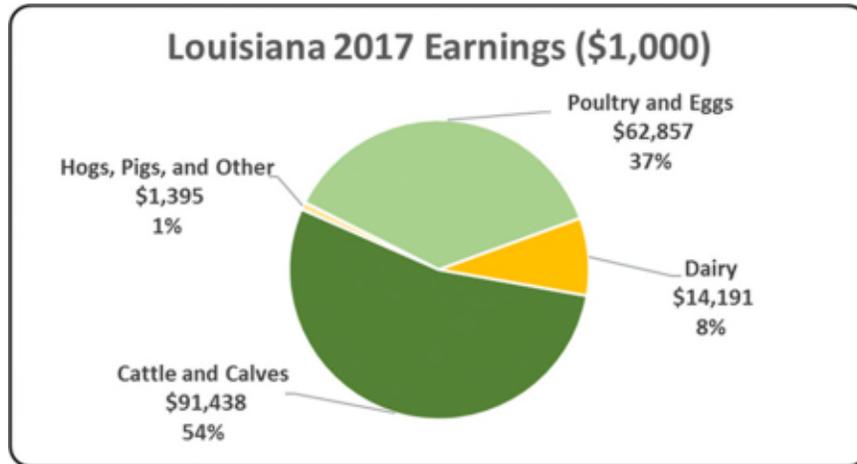
Louisiana Jobs

“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 3,603 jobs within and outside of animal agriculture.



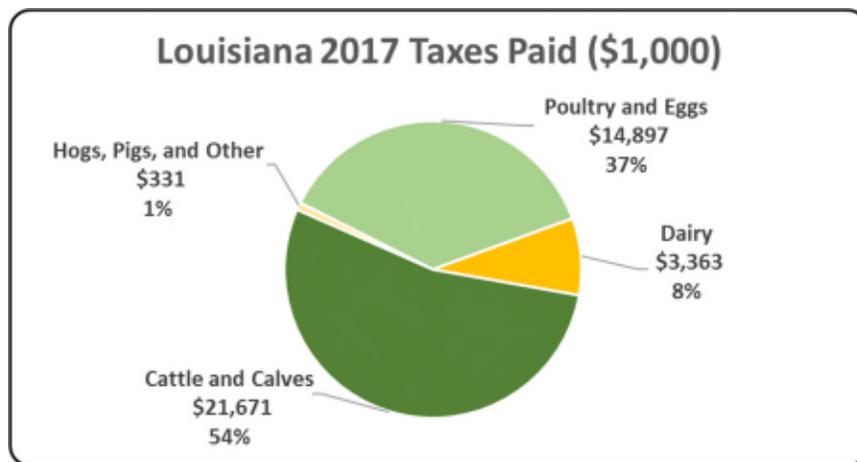
Louisiana Earnings

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 Louisiana economy in terms of earnings. Louisiana’s animal agriculture contributed about \$169.9 million to household earnings in 2017.



Louisiana Taxes Paid by Animal Agriculture

Louisiana’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$40.3 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$32.1 million in property taxes paid by all of Louisiana agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



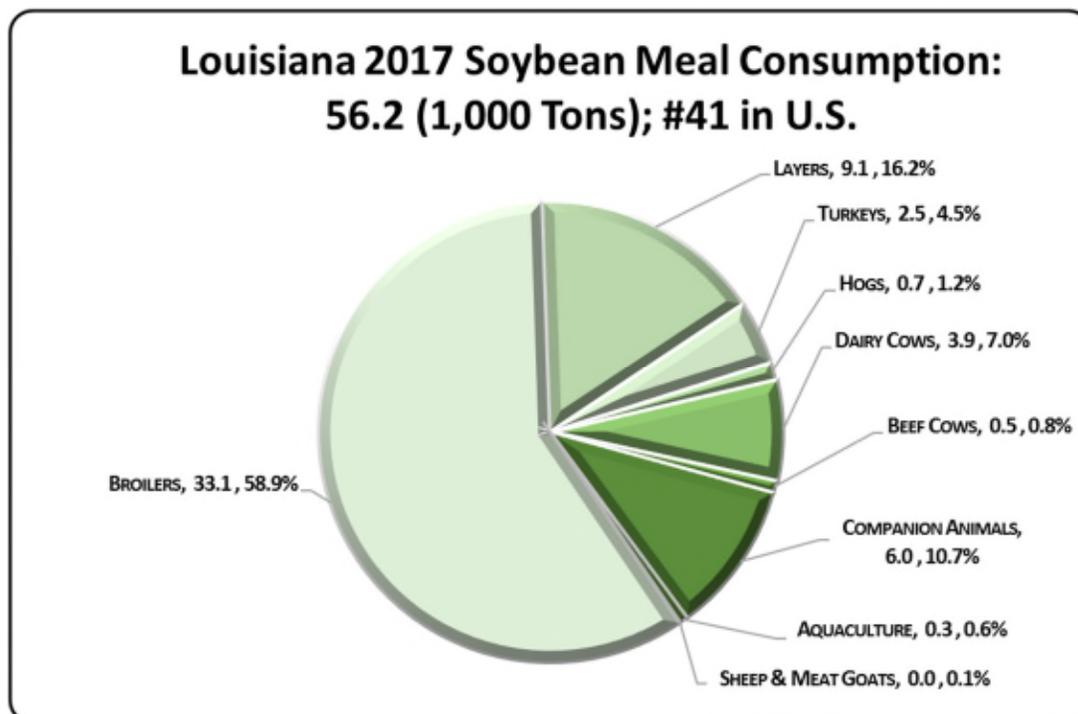
Louisiana Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Louisiana's animal agriculture consumed almost 56.2 thousand tons of soybean meal in 2017, placing the state as #41 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Louisiana consumed 3,449 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (33.1 thousand tons)
- Egg-Laying Hens (9.1 thousand tons)
- Companion Animals (6.0 thousand tons)

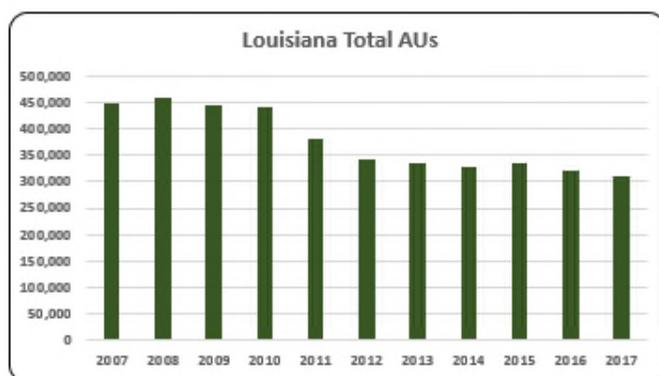
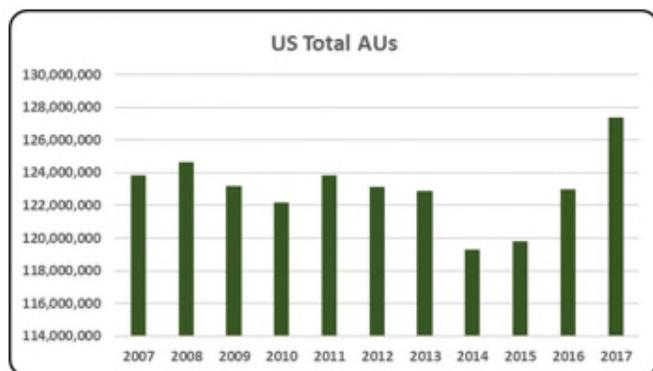


Louisiana Animal Unit (AU) Trends

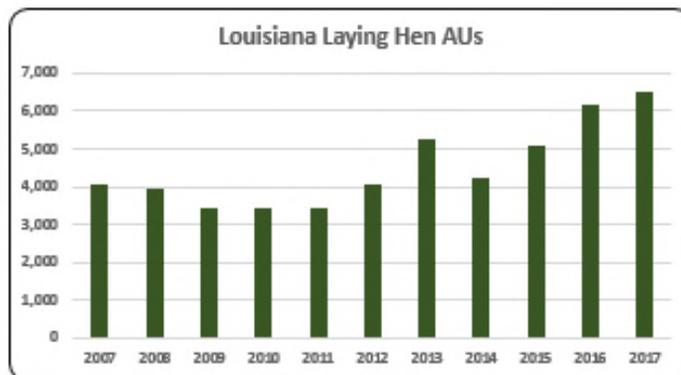
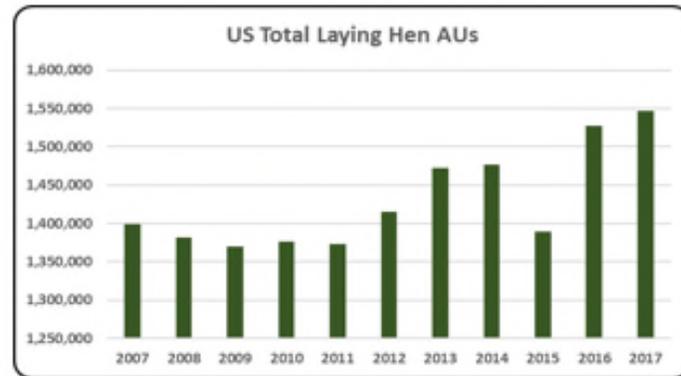
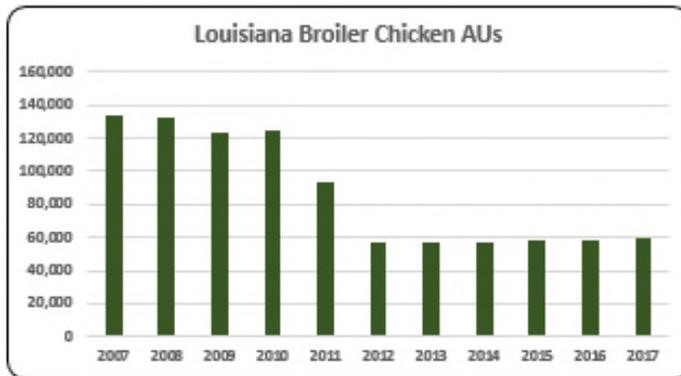
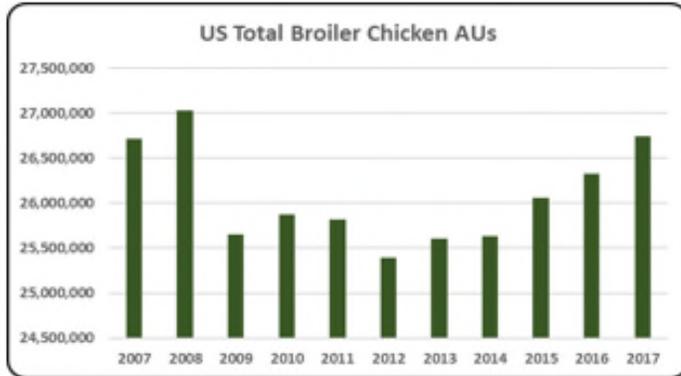
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Louisiana. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

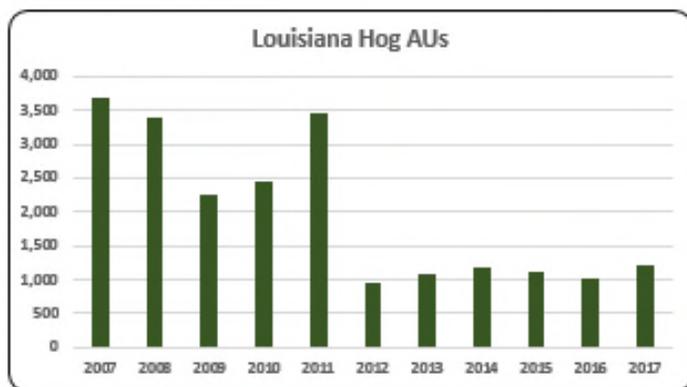
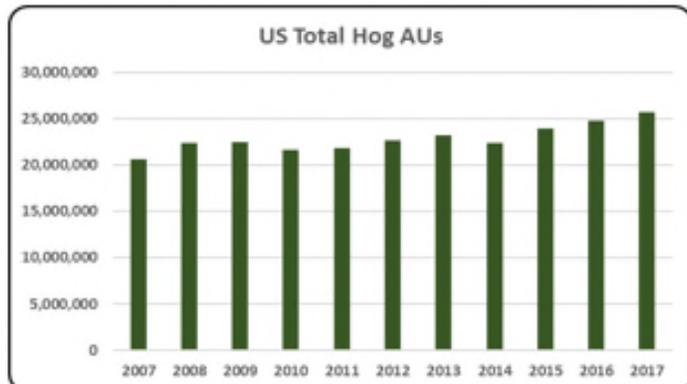
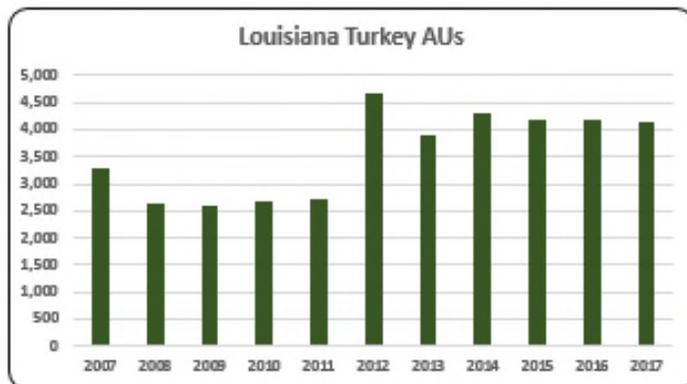
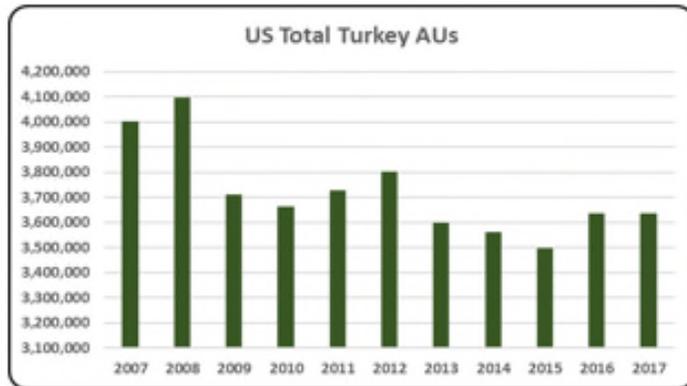
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Louisiana, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (223,050 AUs), Broiler Chickens (59,498 AUs), and Dairy Cows (16,800 AUs). Total animal units in Louisiana during 2017 were 311,192 AUs.



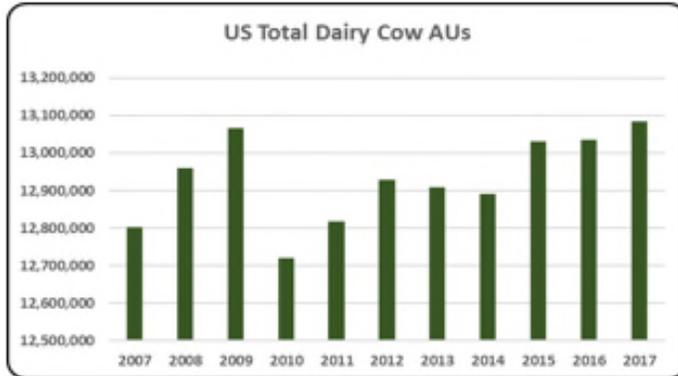
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The largest animal sector in Louisiana in terms of animal units is beef. About 72% (233,050) of all AUs in Louisiana in 2017 were beef cow AUs.



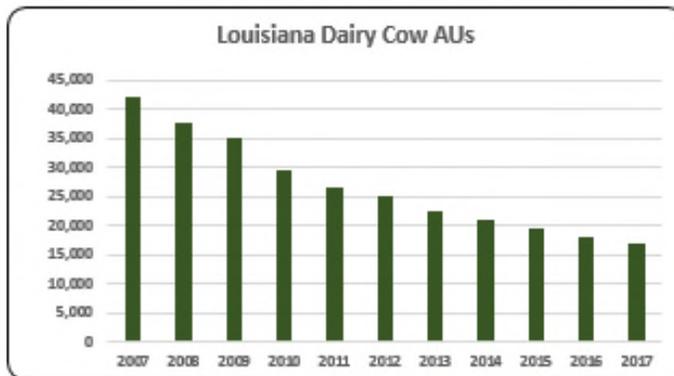
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler numbers in Louisiana have decreased by 56% from 134,153 in 2007 to 59,498 in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 2017, there were 6,485 layer AUs, increasing 60% from 2007.



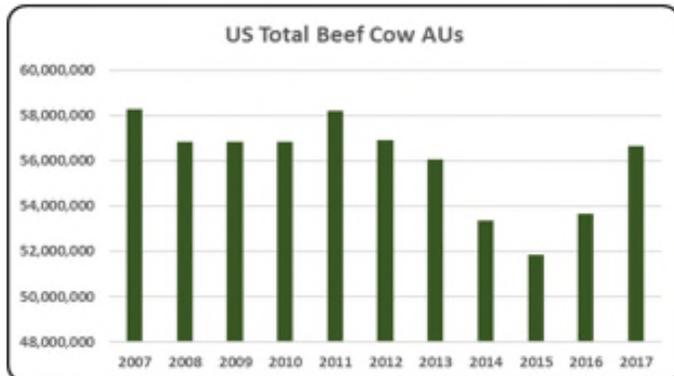
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- The average number of turkey AUs for the 2007-2017 decade was 3,572 AUs, with 4,158 AUs in 2017.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs only make up 0.4% of total AUs in Louisiana. There were 1,200 hog AUs in 2017.



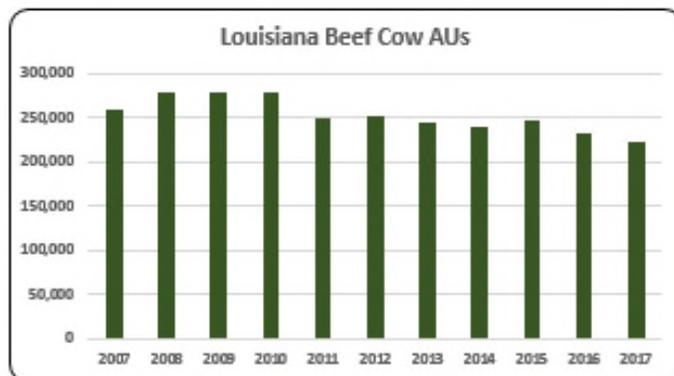
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Louisiana had 16,800 dairy cow AUs in 2017. This is a 60% drop from 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow AUs have declined 14% since 2007 (259,000). There were 223,050 beef cow AUs in 2017.

Louisiana Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 soybean marketing year for up to sixteen specific animal species has been estimated.

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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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	259,200	278,850	278,850	278,850	249,150	251,250	244,650	241,200	248,250	233,850	223,050
	Hog and Pig AUs	3,675	3,405	2,265	2,445	3,450	960	1,080	1,185	1,125	1,005	1,200
	Broiler AUs	134,153	132,061	122,785	124,437	93,764	57,281	57,081	56,757	58,222	58,661	59,498
	Turkey AUs	3,290	2,630	2,576	2,683	2,731	4,661	3,888	4,292	4,200	4,186	4,158
	Egg Layer AUs	4,037	3,922	3,430	3,408	3,428	4,081	5,284	4,210	5,066	6,153	6,485
	Dairy AUs	42,000	37,800	35,000	29,400	26,600	25,200	22,400	21,000	19,600	18,200	16,800
	Total Animal Units	446,355	458,667	444,907	441,223	379,123	343,434	334,383	328,645	336,463	322,055	311,192
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 208,881	\$ 189,780	\$ 170,208	\$ 171,121	\$ 225,510	\$ 262,296	\$ 254,357	\$ 346,724	\$ 348,718	\$ 222,237	\$ 237,500
	Hogs and Pigs (\$1,000)	\$ 1,671	\$ 1,817	\$ 975	\$ 1,426	\$ 2,770	\$ 862	\$ 1,015	\$ 1,239	\$ 915	\$ 772	\$ 943
	Broilers (\$1,000)	\$ 103,531	\$ 105,772	\$ 91,258	\$ 95,368	\$ 83,494	\$ 57,076	\$ 69,546	\$ 72,959	\$ 63,650	\$ 56,593	\$ 66,454
	Turkeys (\$1,000)	\$ 3,532	\$ 4,310	\$ 4,085	\$ 5,512	\$ 4,334	\$ 4,660	\$ 3,378	\$ 2,235	\$ 3,931	\$ 4,445	\$ 3,010
	Eggs (\$1,000)	\$ 42,333	\$ 47,694	\$ 38,009	\$ 46,210	\$ 55,356	\$ 58,699	\$ 62,904	\$ 72,790	\$ 89,081	\$ 53,193	\$ 53,041
	Milk (\$1,000)	\$ 70,498	\$ 66,033	\$ 38,482	\$ 42,300	\$ 50,808	\$ 43,512	\$ 45,114	\$ 53,448	\$ 35,720	\$ 28,223	\$ 29,920
	Other	\$ 98,813	\$ 97,469	\$ 96,149	\$ 94,893	\$ 93,528	\$ 92,223	\$ 90,947	\$ 89,608	\$ 88,310	\$ 86,971	\$ 2,833
	Sheep and Lambs (\$1,000)	\$ 168	\$ 158	\$ 173	\$ 251	\$ 220	\$ 249	\$ 308	\$ 304	\$ 339	\$ 335	\$ 320
	Aquaculture (\$1,000)	\$ 98,645	\$ 97,311	\$ 95,977	\$ 94,642	\$ 93,308	\$ 91,973	\$ 90,639	\$ 89,305	\$ 87,970	\$ 86,636	\$ 2,513
	Total (\$1,000)	\$ 529,260	\$ 512,874	\$ 439,166	\$ 456,830	\$ 515,800	\$ 519,328	\$ 527,261	\$ 639,003	\$ 630,325	\$ 452,435	\$ 393,701

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	12,003	12,715	11,775	11,218
	Cattle feedlots (112112)	209	12	-	28
	Dairy cattle and milk production (11212)	602	143	282	111
	Hog and pig farming (1122)	196	237	232	202
	Poultry and egg production (1123)	476	815	808	717
	Sheep and goat farming (1124)	166	256	627	607
	Animal aquaculture and other animal production (1125,1129)	1,606	3,334	4,699	4,116
Value of Sales (\$1,000)	Cattle and Calves	152,202	170,569	223,922	249,963
	Hogs and Pigs	4,093	withheld	1,235	-
	Poultry and Eggs	323,274	417,755	575,989	574,239
	Milk and Other Dairy Products	109,332	82,866	72,020	42,628
	Aquaculture	53,220	41,285	109,138	122,989
	Other (calculated)	42,716	37,717	31,030	-
	Total	684,837	750,192	1,013,334	989,819
Input Purchases	Livestock and poultry purchased	(Farms) 6,487	6,664	5,909	6,651
		\$1,000 73,786	89,122	120,621	134,875
	Breeding livestock purchased	(Farms) n/a	4,440	3,899	4,314
		\$1,000 n/a	13,593	27,852	42,909
	Other livestock and poultry purchased	(Farms) n/a	3,140	2,804	3,282
		\$1,000 n/a	75,529	92,769	91,965
	Feed purchased	(Farms) 13,261	17,496	16,578	18,356
	\$1,000 247,019	260,900	369,975	452,403	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 447,830	\$ 91,438	1,905	\$ 21,671
	Hogs, Pigs, and Other	\$ 5,968	\$ 1,395	29	\$ 331
	Poultry and Eggs	\$ 288,046	\$ 62,857	1,321	\$ 14,897
	Dairy	\$ 61,309	\$ 14,191	349	\$ 3,363
	Total	\$ 803,152	\$ 169,881	3,603	\$ 40,262
Change from 2007 to 2017	Cattle and Calves	\$ (14,459)	\$ (2,952)	(62)	\$ (700)
	Hogs, Pigs, and Other	\$ (180,413)	\$ (42,172)	(864)	\$ (9,995)
	Poultry and Eggs	\$ (124,255)	\$ (27,115)	(570)	\$ (6,426)
	Dairy	\$ (108,244)	\$ (25,055)	(615)	\$ (5,938)
	Total	\$ (427,372)	\$ (97,294)	(2,111)	\$ (23,059)
	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	
Tax Rates	Federal effective income tax rate				13.5%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.0%
	Total				23.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$517.3 million in economic output
- 3,752 jobs
- \$115.5 million in earnings
- \$30.2 million in income taxes paid at local, state, and federal levels
- \$30.7 million in the form of property taxes

Maine's animal agriculture consumed almost 76.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (38.2 thousand tons)
- Turkeys (14.3 thousand tons)
- Dairy Cows (11.3 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 part of Maine's economy. In 2017, Maine's animal agriculture contributed the following to the economy:

- About \$517.3 million in economic output
- \$115.5 million in household earnings
- 3,752 jobs
- \$30.2 million in income taxes

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

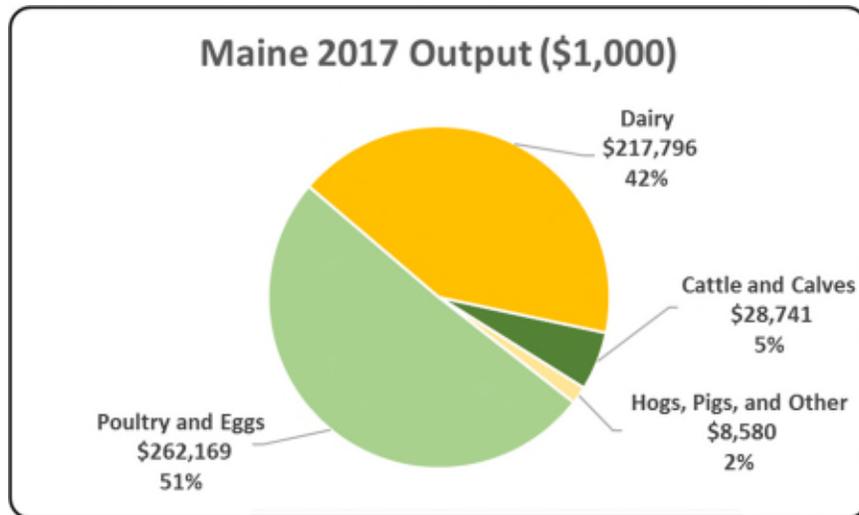
- Decreased economic output by \$216.6 million
- Reduced household earnings by \$48.8 million
- Shrunk by 1,562 jobs
- Paid \$12.8 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 517,286	\$ (216,600)	-29.51%
Earnings (\$1,000)	\$ 115,521	\$ (48,782)	-29.69%
Employment (Jobs)	3,752	(1,562)	-29.39%
Income Taxes Paid (\$1,000)	\$ 30,238	\$ (12,769)	-29.69%
Property Taxes Paid in 2012 (\$1,000)	\$ 30,735		

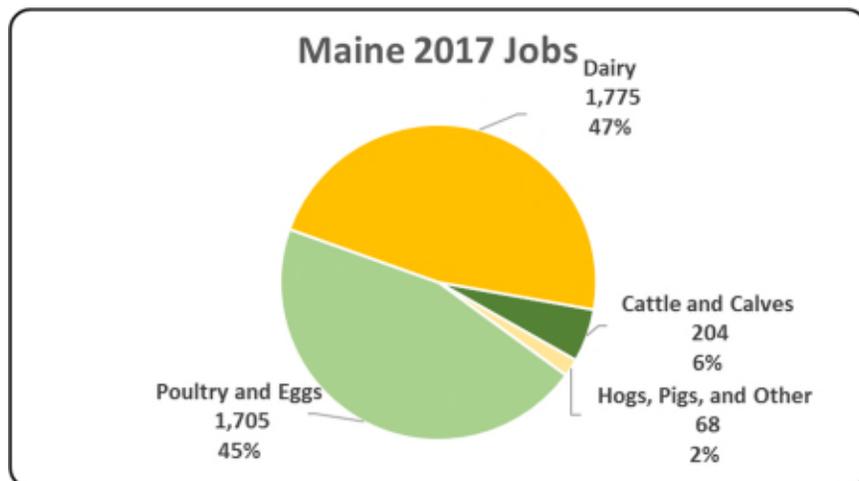
Maine Output

“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 \$517.3 million.



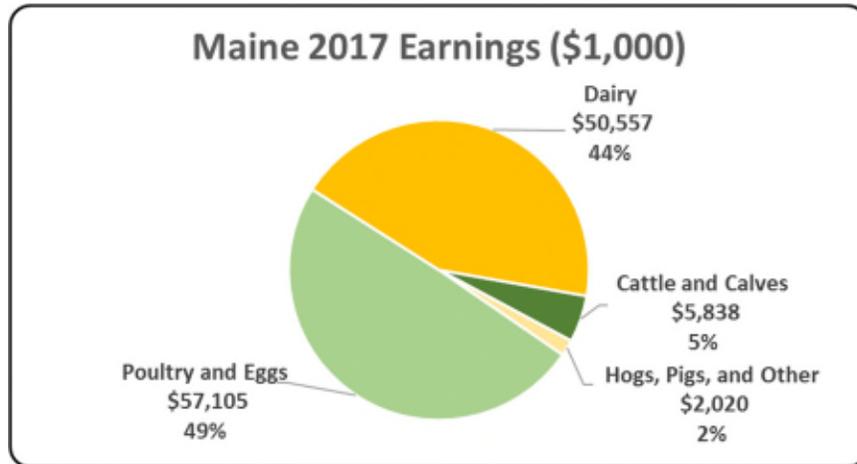
Maine Jobs

“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 3,752 jobs within and outside of animal agriculture.



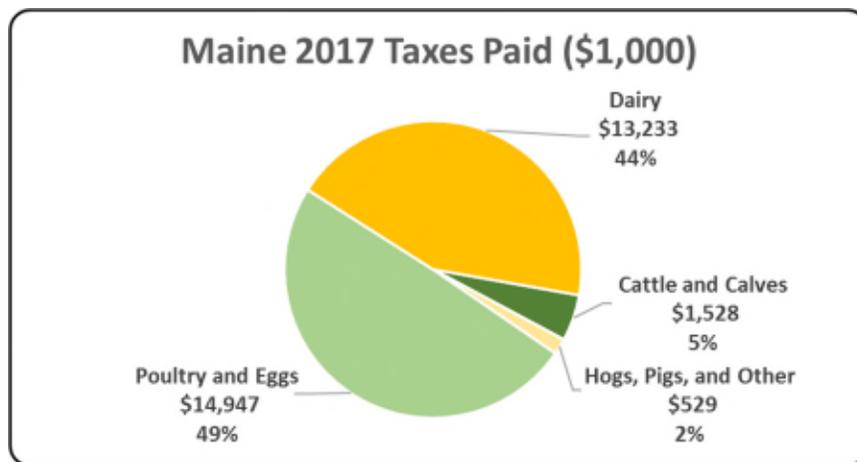
Maine Earnings

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 \$115.5 million to household earnings in 2017.



Maine Taxes Paid by Animal Agriculture

Maine’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$30.2 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$30.7 million in property taxes paid by all of Maine agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



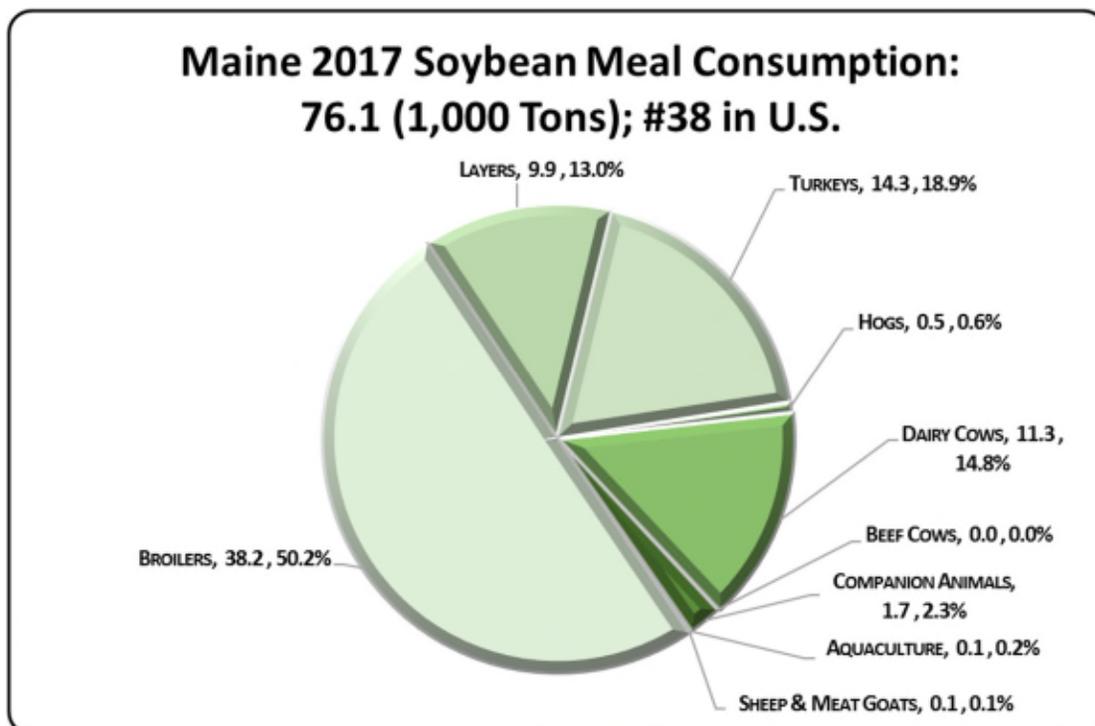
Maine Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Maine's animal agriculture consumed almost 76.1 thousand tons of soybean meal in 2017, placing the state as #38 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:

- Broilers (38.2 thousand tons)
- Turkeys (14.3 thousand tons)
- Dairy Cows (11.3 thousand tons)

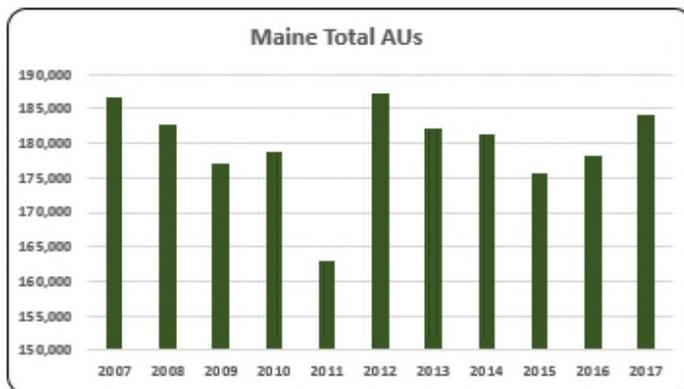
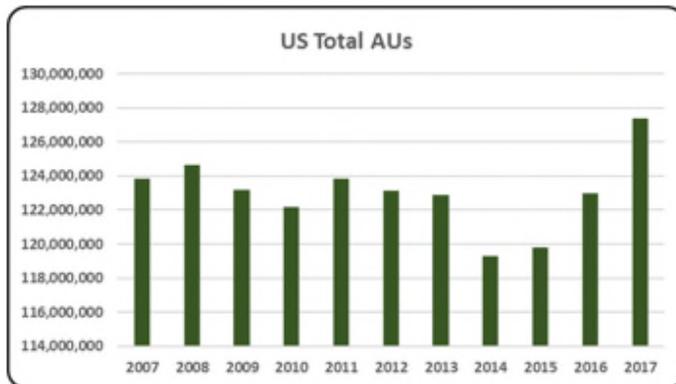


Maine Animal Unit (AU) Trends

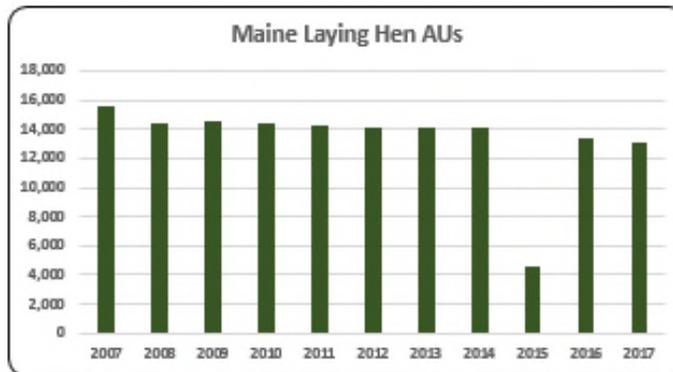
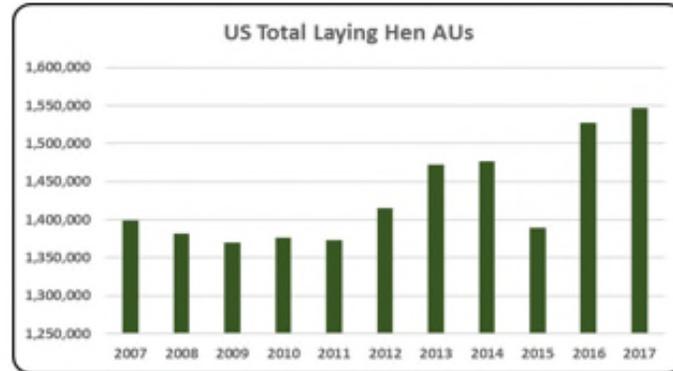
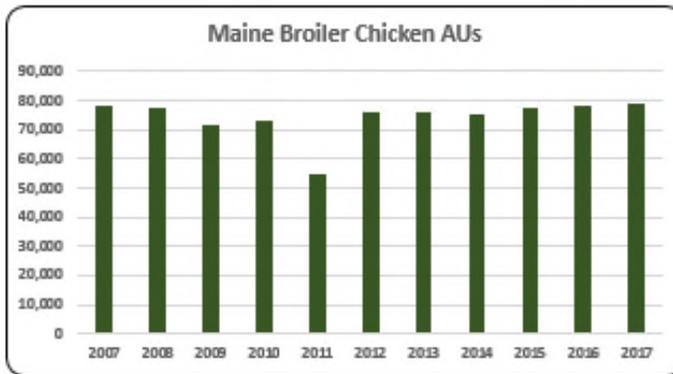
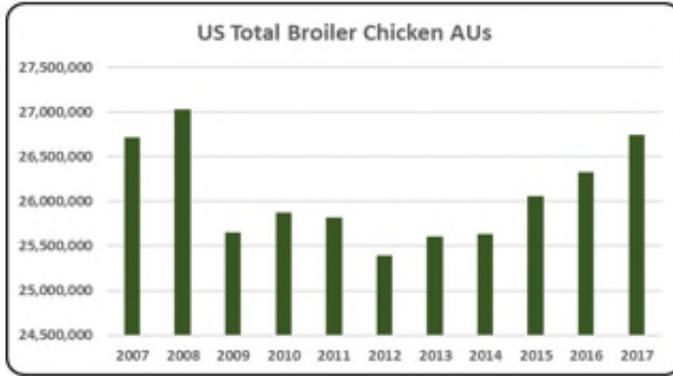
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Maine. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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 Maine and to give perspective on Maine’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.

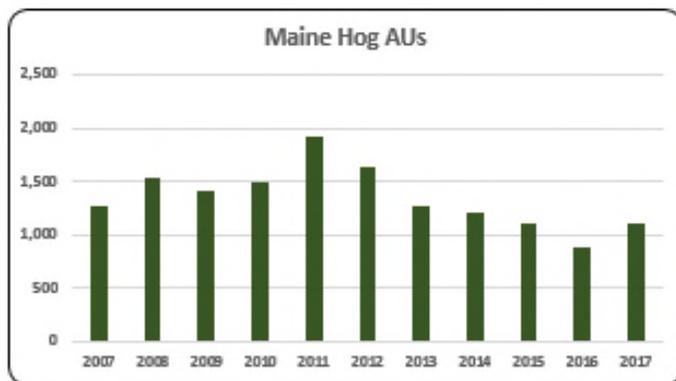
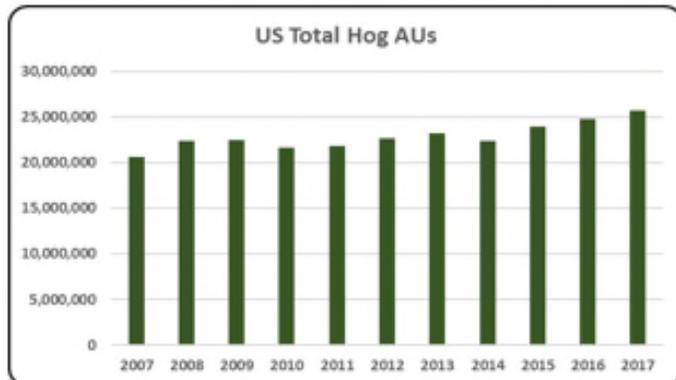
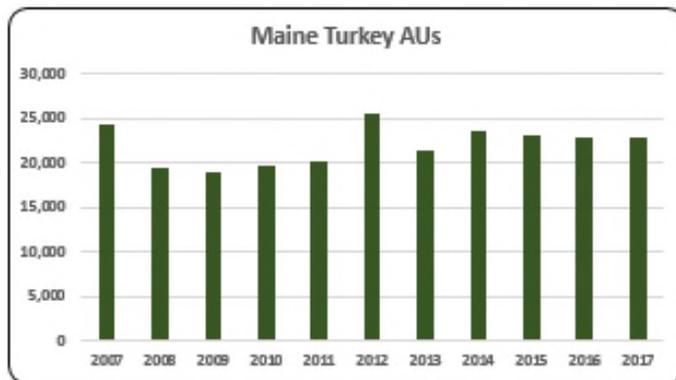
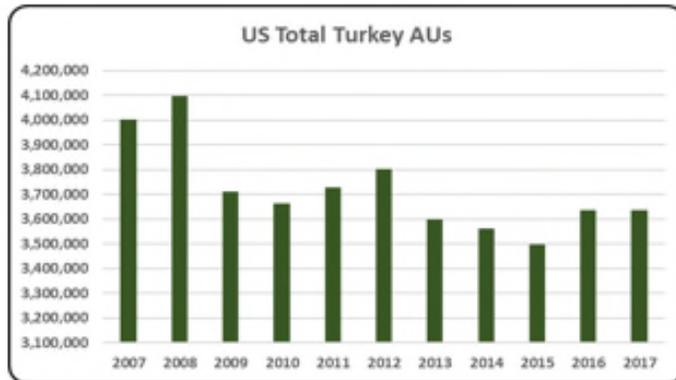
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Maine, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (79,015 AUs), Dairy Cows (42,000 AUs), and Beef Cows (25,965 AUs). Total animal units in Maine during 2017 were 184,021 AUs.



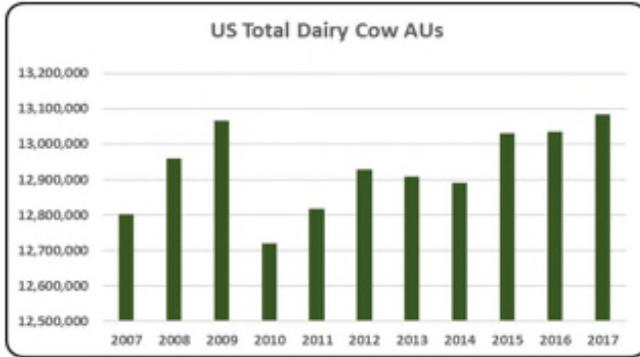
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 184,021 total AUs in Maine in 2017. From 2007 to 2017 AU numbers fluctuated between 162,000 and 187,000, and on average represented 0.14% of all AUs in the country.



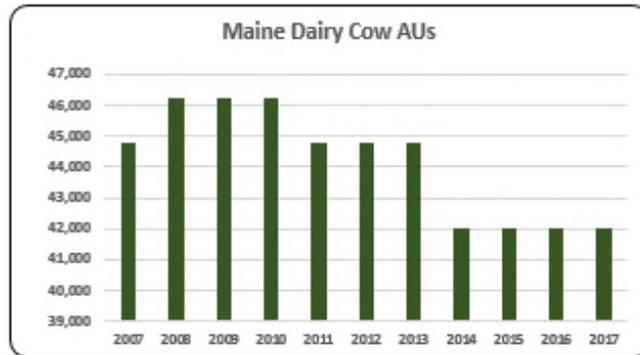
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- About 42.9% (79,015) of all AUs in Maine were broiler AUs in 2017. This is the largest animal sector in the state in terms of animal units.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 2007-2017 was 13,337 layer AUs. Laying Hen numbers have been below 15,000 since 2007.



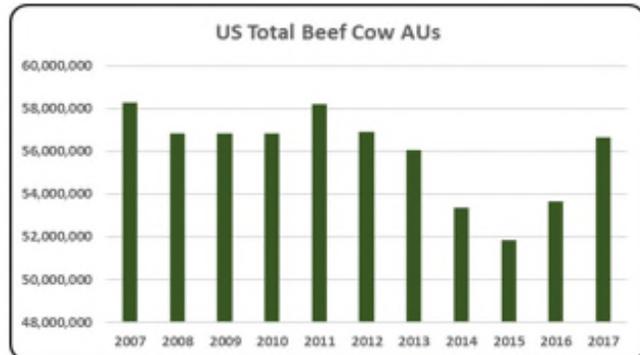
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- Turkey production in Maine has varied during the decade; 2017 turkey AUs were 22,822.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Maine’s hog sector represents less than 1% (1,110) of all AUs in the state. Hog AUs have declined 13% since 2007.



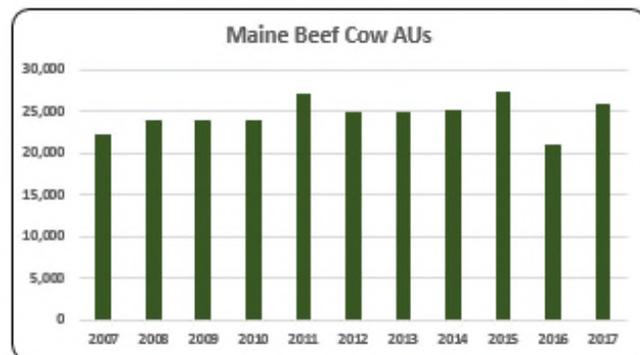
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Maine had 42,000 dairy cow AUs in 2017, this is a 6% drop from 2007. This is also 22% of all AUs in the state.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow AUs declined in 2007 to 22,215 AUs. Since then beef cow numbers have slowly increased until 2016 when they dropped to 21,165 AUs. However, 2017 beef cow AUs increased to 25,965.

Maine Additional Information and Methodology

Animal agriculture is an important 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:

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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 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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	22,215	23,970	23,970	23,970	27,060	24,990	24,885	25,110	27,525	21,165	25,965
	Hog and Pig AUs	1,275	1,530	1,410	1,500	1,920	1,635	1,275	1,200	1,110	885	1,110
	Broiler AUs	78,401	77,178	71,758	72,723	54,797	76,071	75,805	75,375	77,321	77,903	79,015
	Turkey AUs	24,283	19,410	19,013	19,804	20,157	25,582	21,340	23,559	23,050	22,972	22,822
	Egg Layer AUs	15,552	14,404	14,608	14,456	14,264	14,133	14,121	14,124	4,593	13,338	13,109
	Dairy AUs	44,800	46,200	46,200	46,200	44,800	44,800	44,800	42,000	42,000	42,000	42,000
	Total Animal Units	186,526	182,692	176,958	178,653	162,999	187,211	182,226	181,967	175,599	178,264	184,021
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 16,158	\$ 14,939	\$ 10,910	\$ 12,096	\$ 15,121	\$ 21,564	\$ 19,579	\$ 26,778	\$ 24,806	\$ 19,760	\$ 18,653
	Hogs and Pigs (\$1,000)	\$ 821	\$ 995	\$ 860	\$ 1,206	\$ 2,140	\$ 1,933	\$ 1,514	\$ 1,490	\$ 1,139	\$ 819	\$ 1,073
	Broilers (\$1,000)	\$ 60,505	\$ 61,815	\$ 53,333	\$ 55,734	\$ 48,795	\$ 75,798	\$ 92,359	\$ 96,891	\$ 84,529	\$ 75,157	\$ 88,253
	Turkeys (\$1,000)	\$ 31,628	\$ 38,592	\$ 36,575	\$ 40,683	\$ 31,989	\$ 34,396	\$ 24,932	\$ 16,494	\$ 21,575	\$ 24,398	\$ 16,519
	Eggs (\$1,000)	\$ 80,093	\$ 104,433	\$ 63,226	\$ 57,690	\$ 64,544	\$ 69,041	\$ 72,208	\$ 39,779	\$ 66,314	\$ 26,078	\$ 35,261
	Milk (\$1,000)	\$ 128,553	\$ 124,821	\$ 88,208	\$ 109,182	\$ 134,550	\$ 125,052	\$ 135,138	\$ 160,532	\$ 119,988	\$ 117,180	\$ 124,740
	Other	\$ 33,779	\$ 37,732	\$ 41,723	\$ 45,814	\$ 49,734	\$ 53,749	\$ 57,809	\$ 61,770	\$ 65,794	\$ 69,756	\$ 4,479
	Sheep and Lambs (\$1,000)	\$ 263	\$ 247	\$ 270	\$ 393	\$ 344	\$ 391	\$ 483	\$ 476	\$ 532	\$ 526	\$ 501
	Aquaculture (\$1,000)	\$ 33,517	\$ 37,485	\$ 41,453	\$ 45,421	\$ 49,390	\$ 53,358	\$ 57,326	\$ 61,294	\$ 65,263	\$ 69,231	\$ 3,978
	Total (\$1,000)	\$ 351,538	\$ 383,327	\$ 294,835	\$ 322,406	\$ 346,874	\$ 381,533	\$ 403,538	\$ 403,734	\$ 384,145	\$ 333,149	\$ 288,978

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	699	573	765	950	
	Cattle feedlots (112112)	95	122	119	14	
	Dairy cattle and milk production (11212)	535	406	396	308	
	Hog and pig farming (1122)	71	62	97	160	
	Poultry and egg production (1123)	104	215	323	209	
	Sheep and goat farming (1124)	193	189	364	326	
	Animal aquaculture and other animal production (1125,1129)	468	1,316	1,147	1,291	
Value of Sales (\$1,000)	Cattle and Calves	10,651	15,994	15,660	31,076	
	Hogs and Pigs	1,492	n/a	813	1,726	
	Poultry and Eggs	73,637	78,848	75,831	38,938	
	Milk and Other Dairy Products	96,130	87,544	126,392	126,632	
	Aquaculture	n/a	31,944	26,300	75,107	
	Other (calculated)	(181,910)	26,917	45,621	8,572	
	Total	-	241,247	290,617	282,051	
Input Purchases	Livestock and poultry purchased	(Farms) 1,234	1,845	1,741	2,456	
		\$1,000	11,988	16,895	13,601	26,557
	Breeding livestock purchased	(Farms) n/a	1,007	721	946	
		\$1,000	n/a	5,319	4,596	3,163
	Other livestock and poultry purchased	(Farms) n/a	1,112	1,291	1,975	
		\$1,000	n/a	11,576	9,005	23,394
Feed purchased	(Farms)	2,201	3,567	3,640	4,659	
	\$1,000	79,605	73,459	103,475	104,563	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 28,741	\$ 5,838	204	\$ 1,528
	Hogs, Pigs, and Other	\$ 8,580	\$ 2,020	68	\$ 529
	Poultry and Eggs	\$ 262,169	\$ 57,105	1,705	\$ 14,947
	Dairy	\$ 217,796	\$ 50,557	1,775	\$ 13,233
	Total	\$ 517,286	\$ 115,521	3,752	\$ 30,238

Change from 2007 to 2017	Cattle and Calves	\$ (481)	\$ (98)	(3)	\$ (26)
	Hogs, Pigs, and Other	\$ (54,181)	\$ (12,758)	(430)	\$ (3,339)
	Poultry and Eggs	\$ (116,289)	\$ (25,330)	(756)	\$ (6,630)
	Dairy	\$ (45,650)	\$ (10,597)	(372)	\$ (2,774)
	Total	\$ (216,600)	\$ (48,782)	(1,562)	\$ (12,769)

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	6.5%
	Total	26.2%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 Animal Agriculture: MARYLAND

Maryland Executive Summary

The use of soybean meal as a key feed ingredient is an important 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 2017 animal agriculture contributed:

- \$2.4 billion in economic output
- 13,216 jobs
- \$495.4 million in earnings
- \$116.8 million in income taxes paid at local, state, and federal levels
- \$48.4 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Maryland has increased economic output by over \$78.8 million, boosted household earnings by \$15.2 million, contributed 259 additional jobs and paid \$3.6 million in additional tax revenues.

Maryland's animal agriculture consumed almost 510.3 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (445.6 thousand tons)
- Egg-Laying Hens (30.5 thousand tons)
- Dairy Cows (18.3 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 contributor to the economic well-being of the people of Maryland and beyond.

Maryland Economic Impact of Animal Agriculture

Animal agriculture is an important part of Maryland's economy. In 2017, Maryland's animal agriculture contributed the following to the economy:

- About \$2.4 billion in economic output
- \$495.4 million in household earnings
- 13,216 jobs
- \$116.8 million in income taxes

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

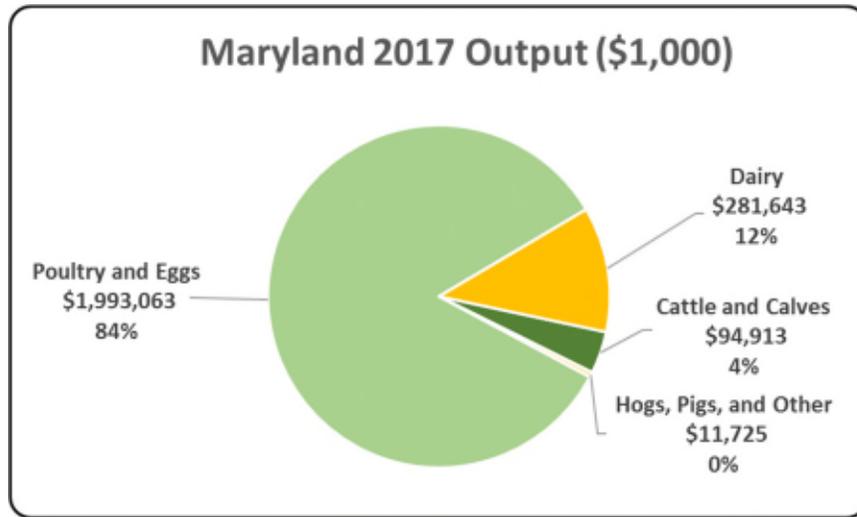
- Increased economic output by \$78.8 million
- Boosted household earnings by \$15.2 million
- Added 259 jobs
- Paid an additional \$3.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,381,344	\$ 78,840	3.42%
Earnings (\$1,000)	\$ 495,374	\$ 15,213	3.17%
Employment (Jobs)	13,216	259	2.00%
Income Taxes Paid (\$1,000)	\$ 116,784	\$ 3,586	3.17%
Property Taxes Paid in 2012 (\$1,000)	\$ 48,380		

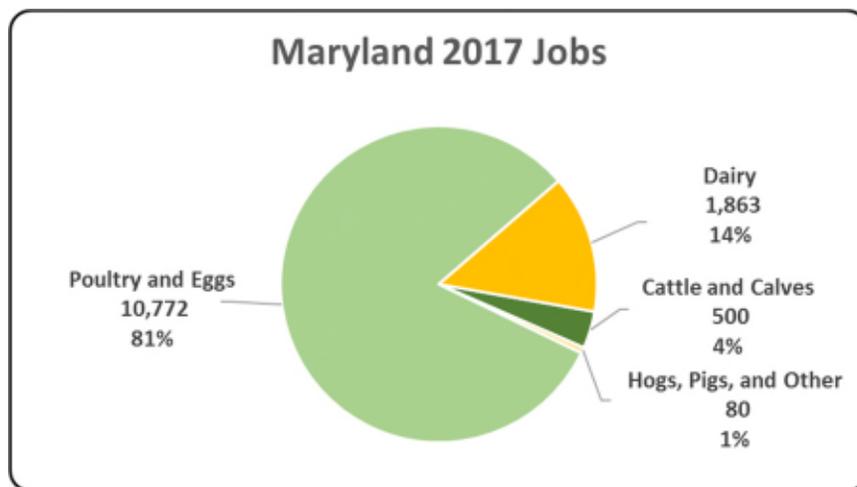
Maryland Output

“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.



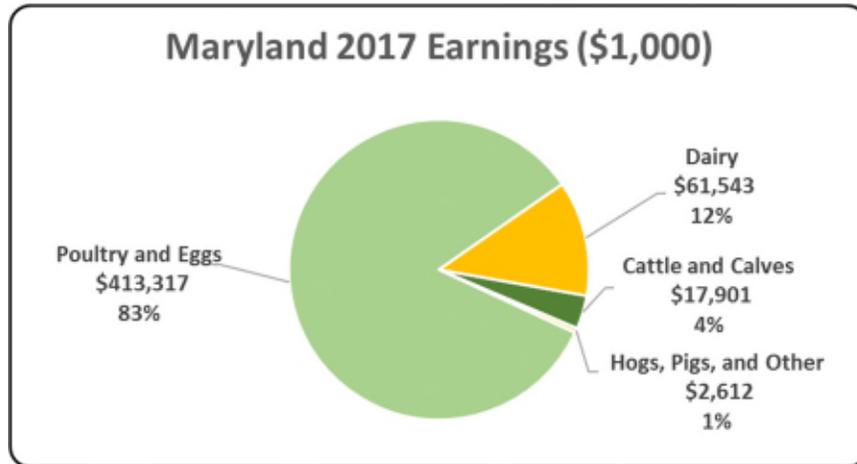
Maryland Jobs

“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 13,216 jobs within and outside of animal agriculture.



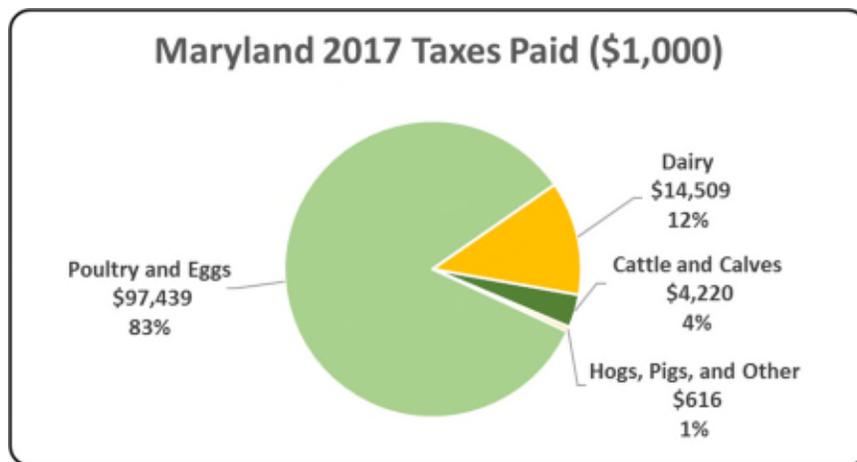
Maryland Earnings

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 \$495.4 million to household earnings in 2017.



Maryland Taxes Paid by Animal Agriculture

Maryland’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$116.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$48.4 million in property taxes paid by all of Maryland agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



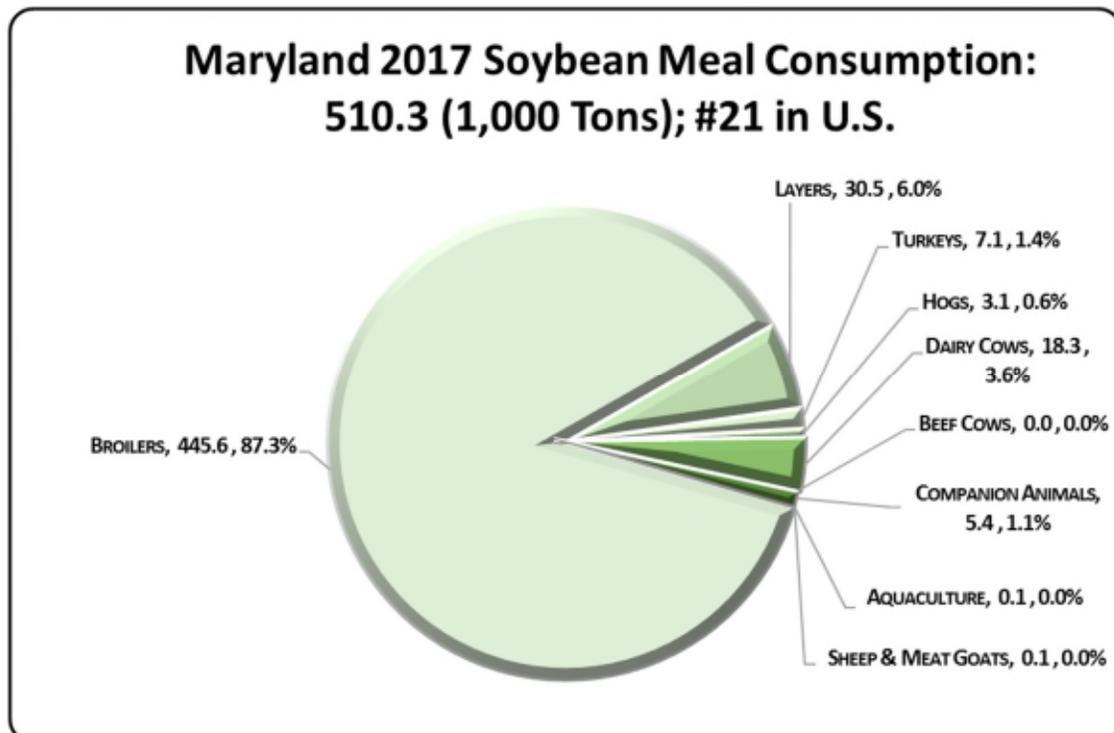
Maryland Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Maryland's animal agriculture consumed almost 510.3 thousand tons of soybean meal in 2017, placing the state as #21 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Maryland consumed 499.2 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (445.6 thousand tons)
- Egg-Laying Hens (30.5 thousand tons)
- Dairy Cows (18.3 thousand tons)

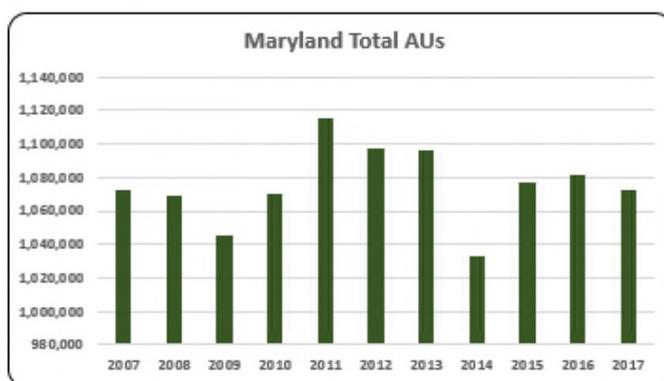
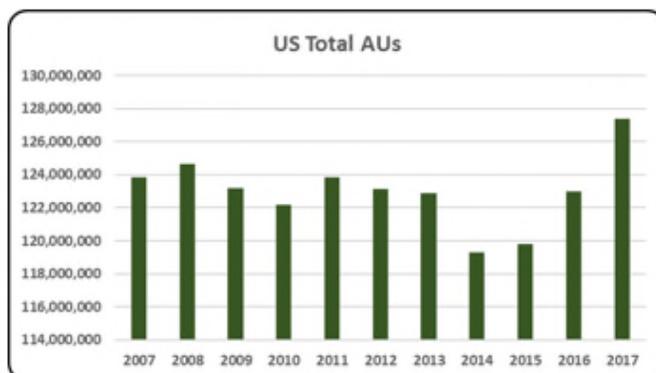


Maryland Animal Unit (AU) Trends

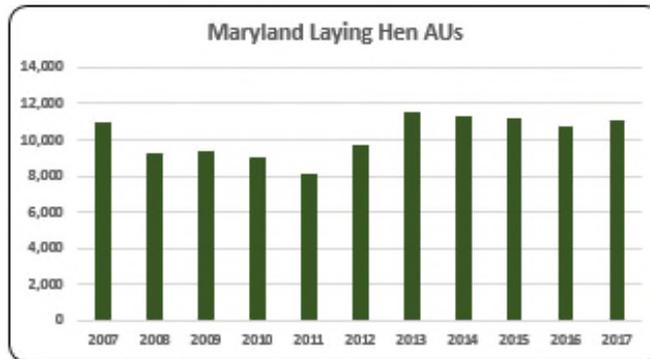
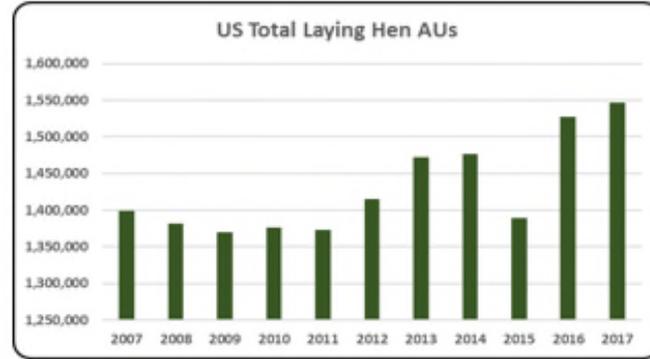
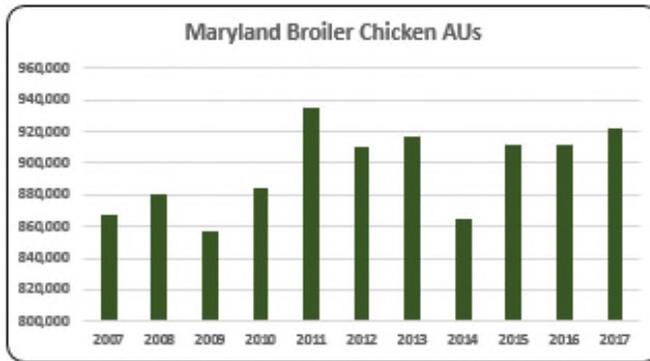
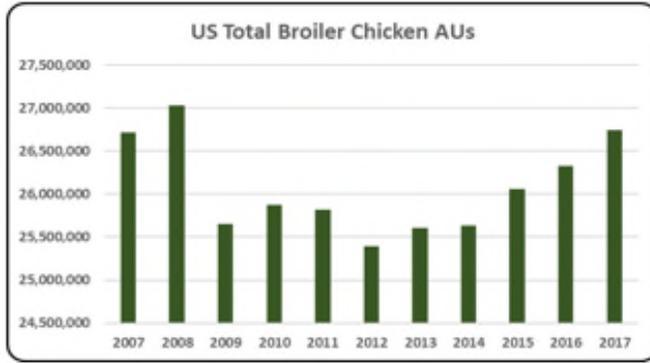
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Maryland. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

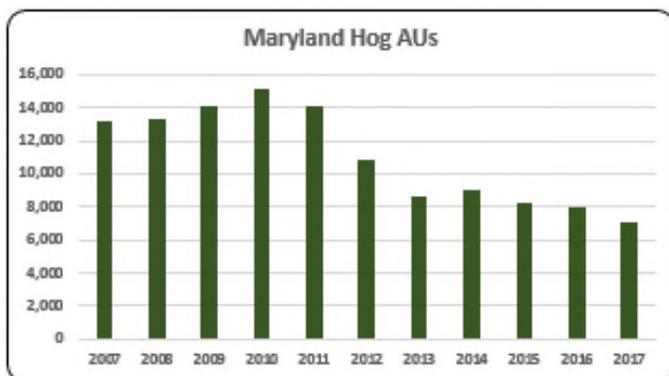
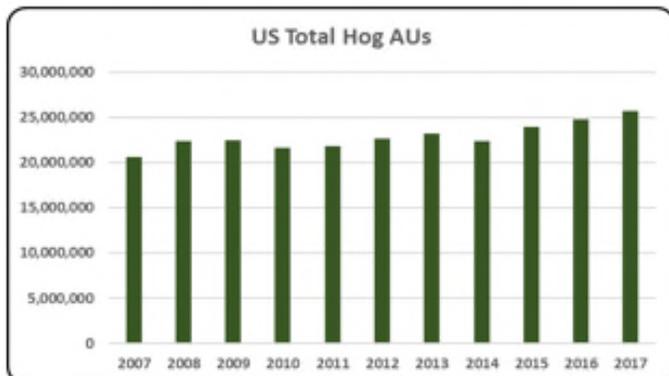
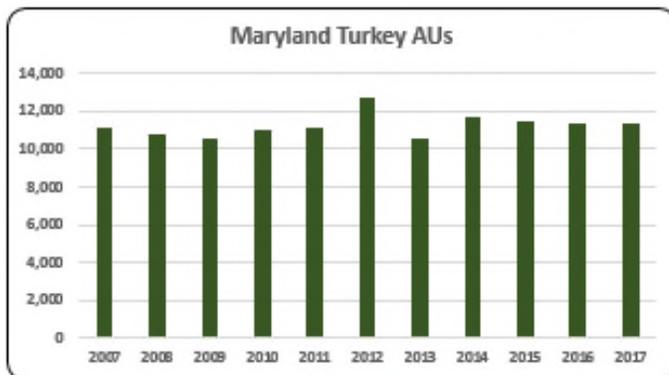
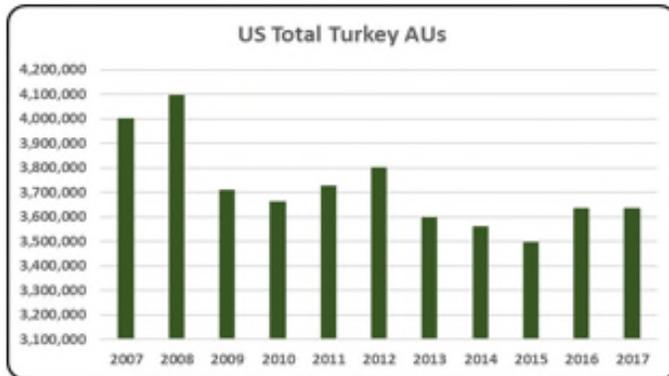
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Maryland, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (921,781 AUs), Dairy Cows (65,800 AUs), and Beef Cows (55,785 AUs). Total animal units in Maryland during 2017 were 1.1 million AUs.



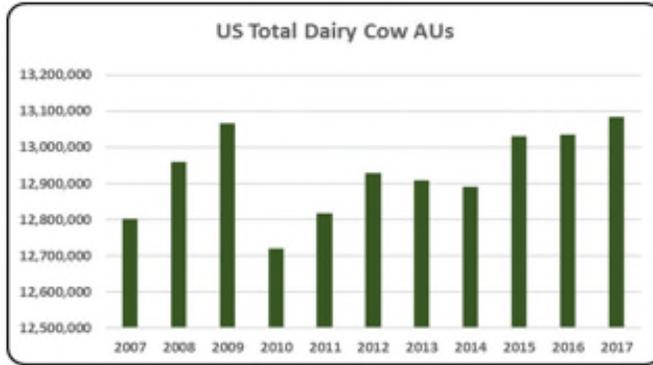
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were nearly 1.1 million AUs in Maryland in 2017. Broilers have the highest proportion of AUs with 85% of AUs in 2017.



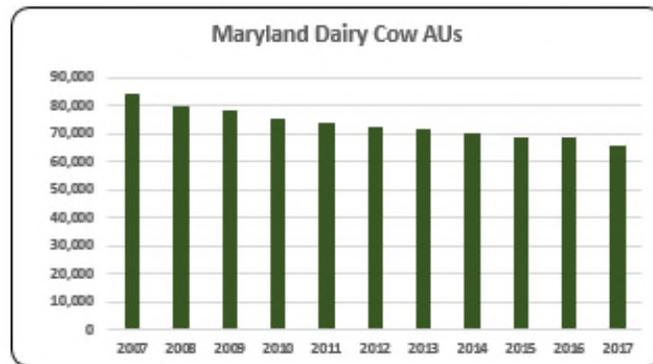
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- The average number of broiler AUs in Maryland during 2007-2017 was 896,626, representing about 85.91% of all AUs in the state. Total broiler AUs in 2017 were 921,781.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Layers represent only 1% of the total AUs in Maryland. There were 11,123 layers AUs in 2017.



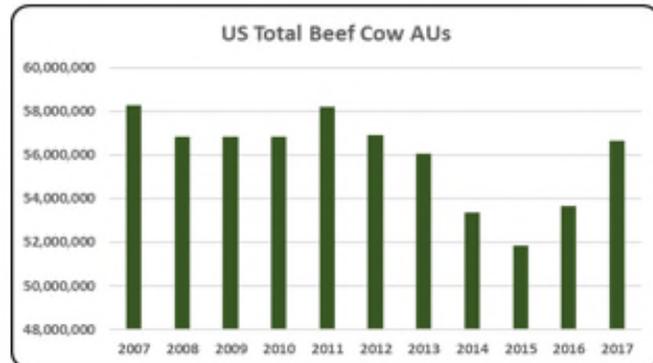
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkey numbers in Maryland are very small with only 0.31% (11,314 AUs) of total U.S. AUs in 2017. Turkey numbers have been relatively steady during the last decade averaging about 11,249 turkey AUs.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Maryland’s hog production represents less than 1% (7,125) of all AUs in the state in 2017.



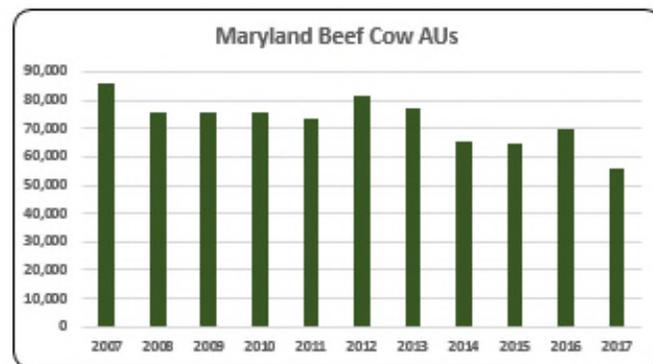
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Maryland had 65,800 dairy cow AUs in 2017. The dairy sector has consistently declined throughout the decade from 84,000 AUs in 2007 to 65,800 in 2017, representing a 22% reduction.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- There were 55,785 beef cow AUs in Maryland in 2017 which is a 5% contribution to Maryland's total AUs.

Maryland Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

Given the long-term presence of animal agriculture in Maryland, of interest is the degree to which the industry impacts the Maryland economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Maryland 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 Maryland'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 2007-2017 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 Maryland which have occurred. As shown in this state report, Maryland 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 Maryland. 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	85,650	75,750	75,750	75,750	73,590	81,345	76,995	65,265	65,025	70,065	55,785
	Hog and Pig AUs	13,140	13,290	14,040	15,090	14,040	10,785	8,670	9,060	8,250	7,980	7,125
	Broiler AUs	867,025	880,449	857,418	884,314	934,708	910,152	917,324	865,293	912,193	912,230	921,781
	Turkey AUs	11,173	10,769	10,549	10,988	11,184	12,683	10,580	11,679	11,427	11,389	11,314
	Egg Layer AUs	11,024	9,312	9,368	9,016	8,120	9,671	11,543	11,301	11,226	10,754	11,123
	Dairy AUs	84,000	79,800	78,400	75,600	74,200	72,800	71,400	70,000	68,600	68,600	65,800
	Total Animal Units	1,072,013	1,069,371	1,045,525	1,070,758	1,115,842	1,097,436	1,096,511	1,032,599	1,076,721	1,081,019	1,072,928
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 69,617	\$ 63,869	\$ 54,222	\$ 63,252	\$ 78,061	\$ 89,314	\$ 79,343	\$ 95,789	\$ 103,094	\$ 75,386	\$ 65,049
	Hogs and Pigs (\$1,000)	\$ 5,490	\$ 6,503	\$ 6,079	\$ 6,481	\$ 6,626	\$ 6,099	\$ 6,629	\$ 8,644	\$ 7,028	\$ 6,172	\$ 6,190
	Broilers (\$1,000)	\$ 732,274	\$ 741,704	\$ 639,206	\$ 690,899	\$ 756,799	\$ 802,400	\$ 981,883	\$ 990,344	\$ 930,740	\$ 884,969	\$ 1,001,069
	Turkeys (\$1,000)	\$ 7,003	\$ 9,536	\$ 11,466	\$ 14,213	\$ 17,749	\$ 19,084	\$ 13,833	\$ 9,152	\$ 10,696	\$ 12,096	\$ 8,190
	Eggs (\$1,000)	\$ 49,170	\$ 62,682	\$ 33,150	\$ 35,837	\$ 38,008	\$ 46,750	\$ 52,925	\$ 70,726	\$ 99,117	\$ 31,449	\$ 44,046
	Milk (\$1,000)	\$ 210,200	\$ 195,510	\$ 145,580	\$ 184,184	\$ 206,610	\$ 188,947	\$ 203,148	\$ 246,750	\$ 173,008	\$ 156,948	\$ 169,634
	Other	\$ 8,007	\$ 7,817	\$ 6,981	\$ 6,955	\$ 6,767	\$ 6,669	\$ 6,614	\$ 6,466	\$ 6,377	\$ 6,230	\$ 2,036
	Sheep and Lambs (\$1,000)	\$ 998	\$ 950	\$ 256	\$ 372	\$ 326	\$ 369	\$ 456	\$ 450	\$ 503	\$ 497	\$ 474
	Aquaculture (\$1,000)	\$ 7,009	\$ 6,867	\$ 6,725	\$ 6,583	\$ 6,442	\$ 6,300	\$ 6,158	\$ 6,016	\$ 5,875	\$ 5,733	\$ 1,562
	Total (\$1,000)	\$ 1,081,761	\$ 1,087,621	\$ 896,684	\$ 1,001,820	\$ 1,110,620	\$ 1,159,263	\$ 1,344,375	\$ 1,427,871	\$ 1,330,060	\$ 1,173,249	\$ 1,296,213

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	1,867	1,655	1,582	1,649	
	Cattle feedlots (112112)	356	420	189	45	
	Dairy cattle and milk production (11212)	889	698	565	417	
	Hog and pig farming (1122)	173	94	109	76	
	Poultry and egg production (1123)	1,091	964	1,001	922	
	Sheep and goat farming (1124)	289	370	594	482	
	Animal aquaculture and other animal production (1125,1129)	1,280	1,757	2,070	1,995	
Value of Sales (\$1,000)	Cattle and Calves	56,287	50,570	58,293	69,917	
	Hogs and Pigs	14,292	8,268	withheld	withheld	
	Poultry and Eggs	632,887	583,343	903,531	922,999	
	Milk and Other Dairy Products	172,218	169,458	192,426	187,497	
	Aquaculture	14,822	1,459	4,023	9,011	
	Other (calculated)	n/a	5,065	47,514	withheld	
	Total		890,506	818,163	1,205,787	1,189,424
Input Purchases	Livestock and poultry purchased	(Farms)	3,714	3,300	3,087	3,184
		\$1,000	129,432	96,056	171,246	161,816
	Breeding livestock purchased	(Farms)	n/a	1,208	1,216	1,293
		\$1,000	n/a	7,486	10,151	13,058
	Other livestock and poultry purchased	(Farms)	n/a	2,376	2,236	2,296
		\$1,000	n/a	88,569	161,095	148,758
Feed purchased	(Farms)	6,112	6,740	6,474	7,133	
	\$1,000	435,279	318,290	456,411	629,143	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 94,913	\$ 17,901	500	\$ 4,220
	Hogs, Pigs, and Other	\$ 11,725	\$ 2,612	80	\$ 616
	Poultry and Eggs	\$ 1,993,063	\$ 413,317	10,772	\$ 97,439
	Dairy	\$ 281,643	\$ 61,543	1,863	\$ 14,509
	Total	\$ 2,381,344	\$ 495,374	13,216	\$ 116,784
Change from 2007 to 2017	Cattle and Calves	\$ (24,312)	\$ (4,585)	(128)	\$ (1,081)
	Hogs, Pigs, and Other	\$ (10,855)	\$ (2,419)	(74)	\$ (570)
	Poultry and Eggs	\$ 241,987	\$ 50,183	1,308	\$ 11,831
	Dairy	\$ (127,980)	\$ (27,966)	(847)	\$ (6,593)
	Total	\$ 78,840	\$ 15,213	259	\$ 3,586
	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	
Tax Rates	Federal effective income tax rate			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.9%	
	Total			23.6%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$163.6 million in economic output
- 733 jobs
- \$33.8 million in earnings
- \$8.4 million in income taxes paid at local, state, and federal levels
- \$38.0 million in the form of property taxes

Massachusetts's animal agriculture consumed almost 47.0 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (18.7 thousand tons)
- Turkeys (8.8 thousand tons)
- Egg-Laying Hens (8.4 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 2017, Massachusetts's animal agriculture contributed the following to the economy:

- About \$163.6 million in economic output
- \$33.8 million in household earnings
- 733 jobs
- \$8.4 million in income taxes

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

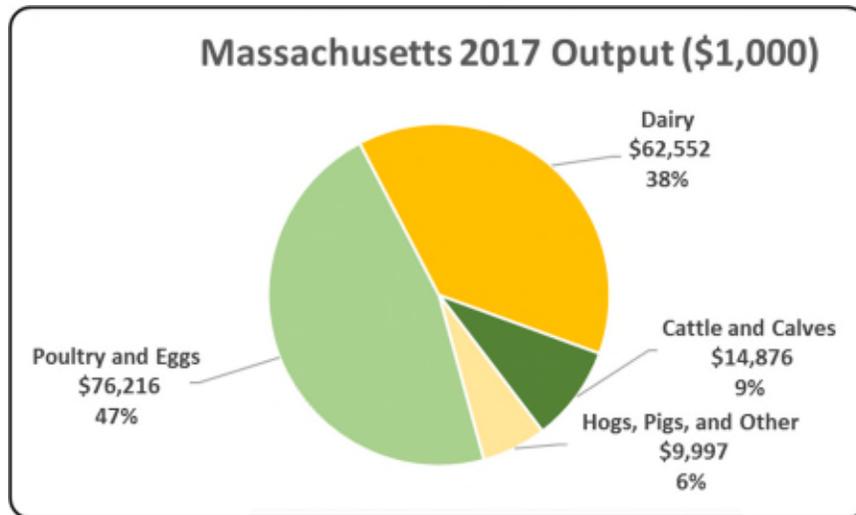
- Decreased economic output by \$37.1 million
- Reduced household earnings by \$8.1 million
- Shrunk by 206 jobs
- Paid \$2.0 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 163,642	\$ (37,073)	-18.47%
Earnings (\$1,000)	\$ 33,827	\$ (8,137)	-19.39%
Employment (Jobs)	733	(206)	-21.96%
Income Taxes Paid (\$1,000)	\$ 8,389	\$ (2,018)	-19.39%
Property Taxes Paid in 2012 (\$1,000)	\$ 37,954		

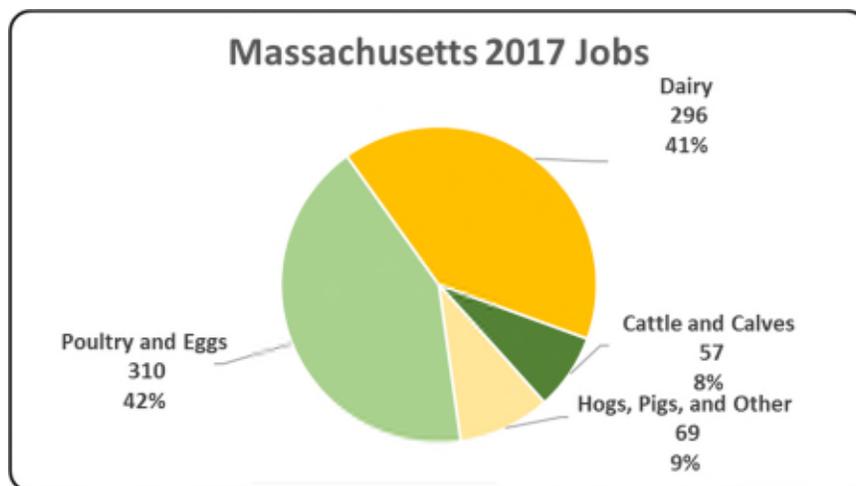
Massachusetts Output

“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 \$163.6 million.



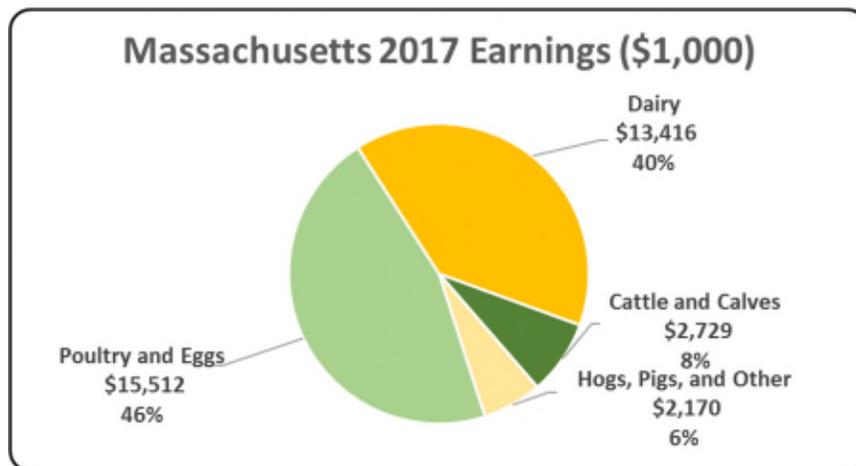
Massachusetts Jobs

“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 733 jobs within and outside of animal agriculture.



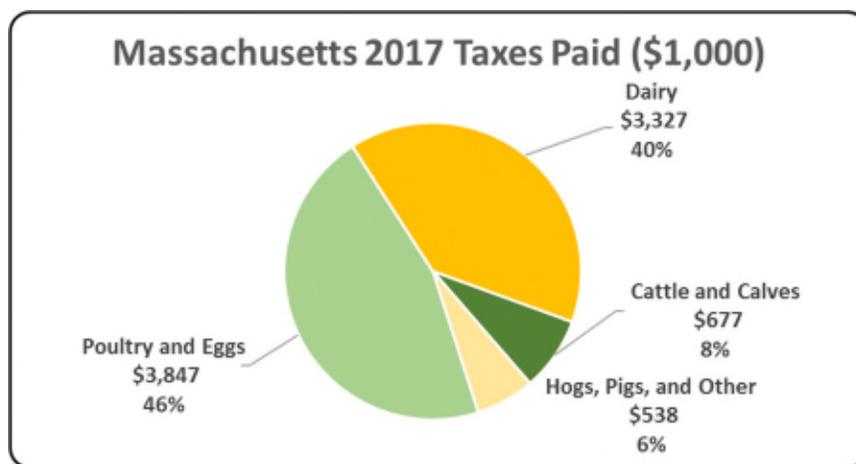
Massachusetts Earnings

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 \$33.8 million to household earnings in 2017.



Massachusetts Taxes Paid by Animal Agriculture

Massachusetts’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$8.4 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$38.0 million in property taxes paid by all of Massachusetts agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



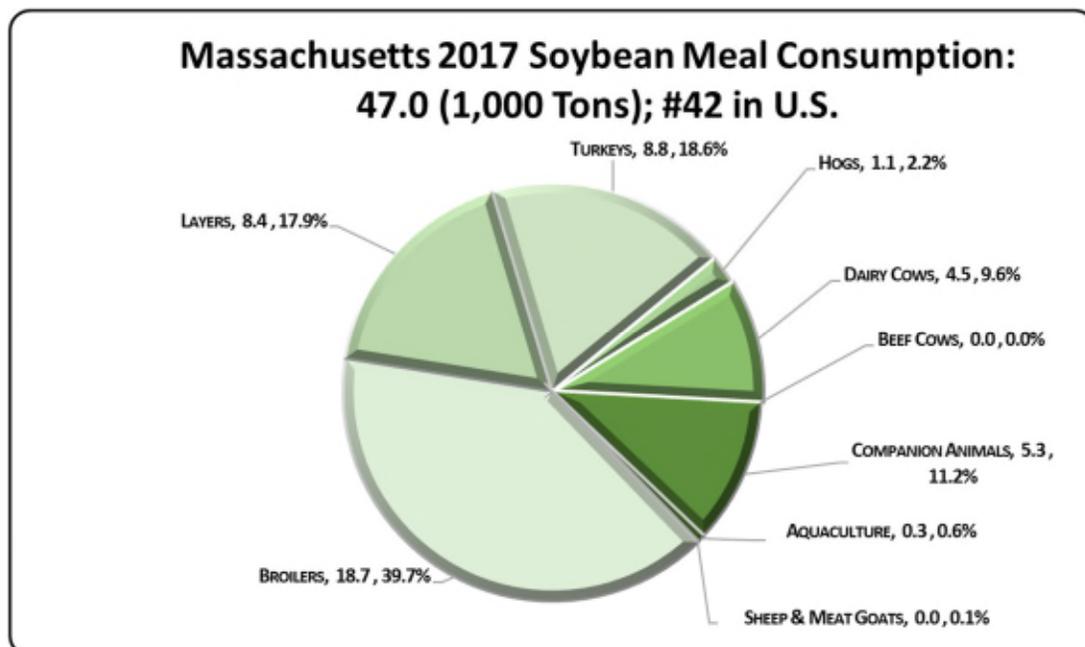
Massachusetts Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Massachusetts's animal agriculture consumed almost 47.0 thousand tons of soybean meal in 2017, placing the state as #42 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:

- Broilers (18.7 thousand tons)
- Turkeys (8.8 thousand tons)
- Egg-Laying Hens (8.4 thousand tons)

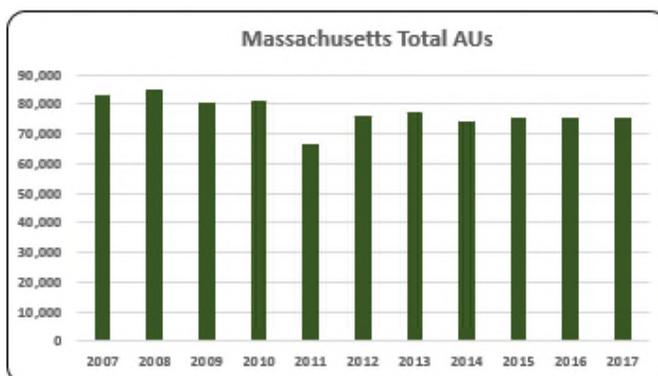
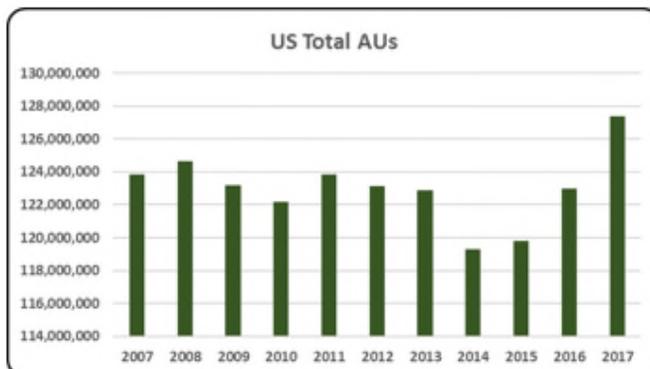


Massachusetts Animal Unit (AU) Trends

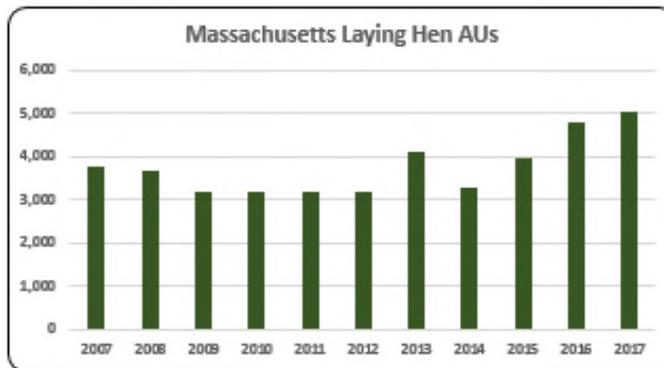
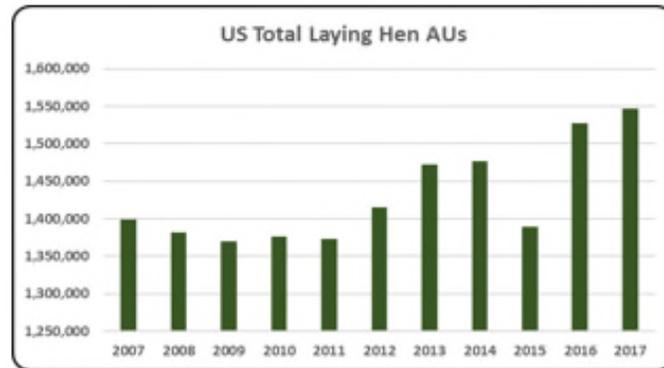
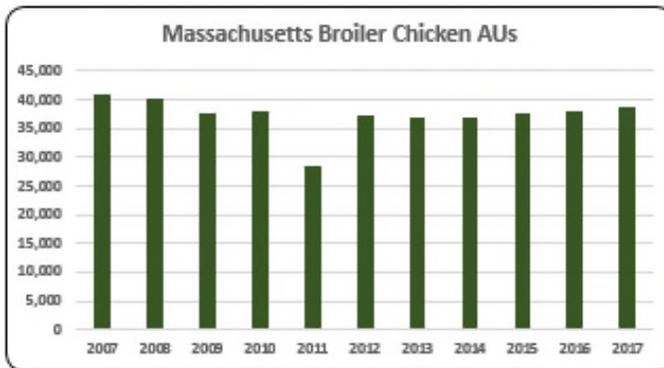
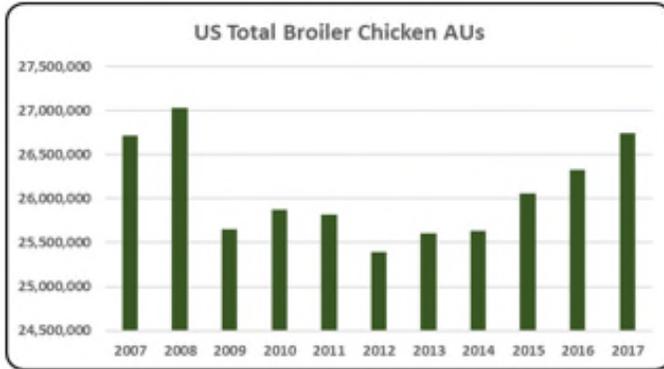
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Massachusetts. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

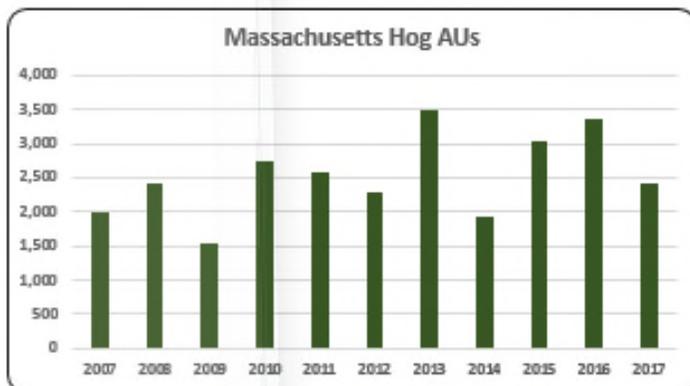
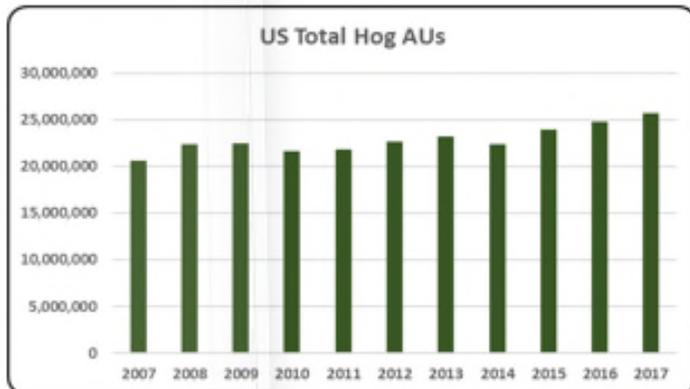
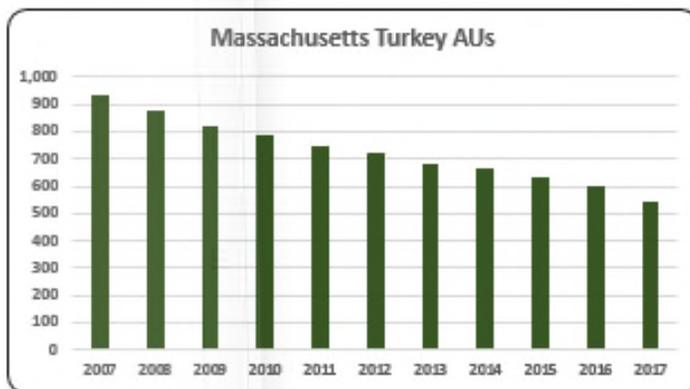
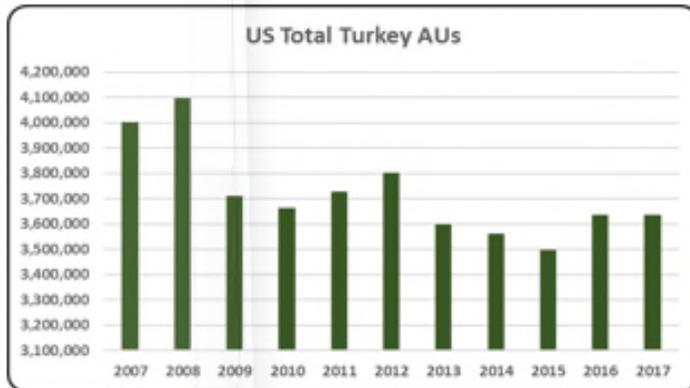
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Massachusetts, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (38,655 AUs), Dairy Cows (16,100 AUs), and Beef Cows (12,585 AUs). Total animal units in Massachusetts during 2017 were 75,371 AUs.



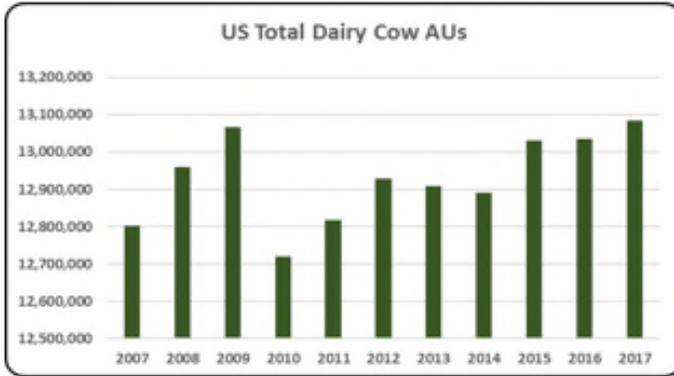
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Overall animal agriculture in Massachusetts is very small representing only 0.06% (75,371) of all AUs in the country in 2017.



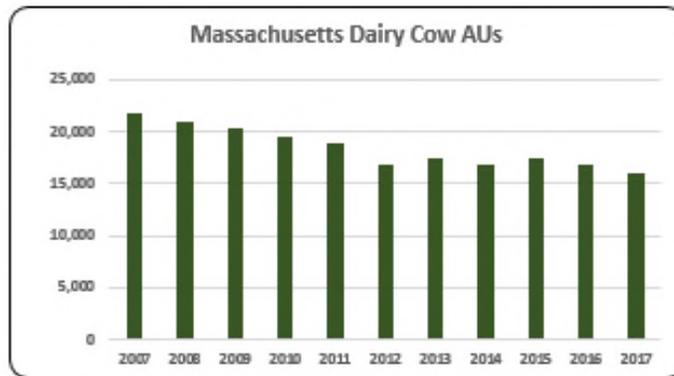
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- 51.26% (38,665) of all AUs in Massachusetts in 2017 were broiler AUs. Broiler numbers have fluctuated throughout the decade but in 2017 broiler numbers remained below the highs in 2007-2008.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 3,763 over the ten-year period. Record high numbers of the decade occurred in 2017.



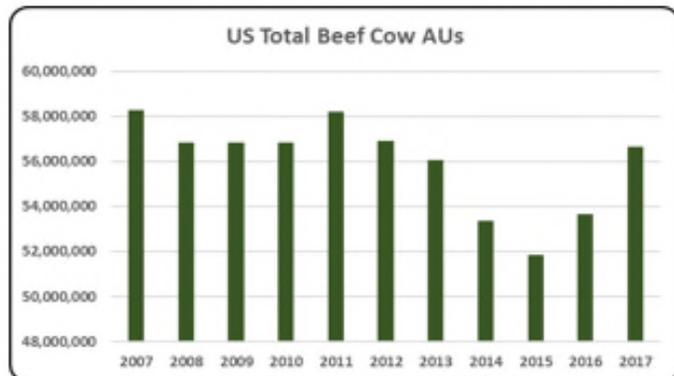
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkeys represent less than 1% of the animal units in the state. Turkey numbers have been declining since the beginning of the decade from 876 turkey AUs in 2007 to 547 turkey AUs in 2017.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs in 2017 were at 2,430 AUs. Hog numbers have nearly increased to the levels of 2013 (3,495), the highest of the decade.



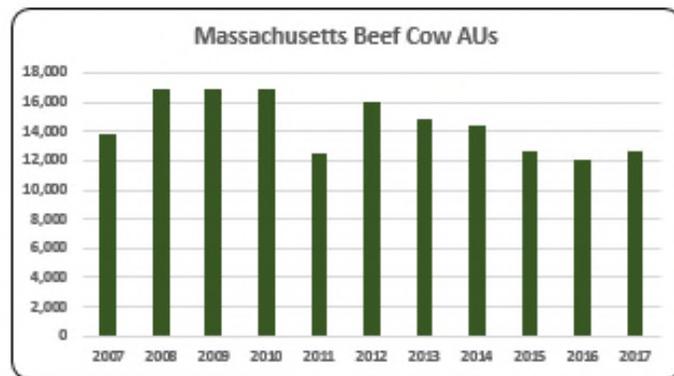
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Massachusetts had 16,100 dairy cow AUs in 2017, a 25% decrease since 2007. This was 21% of total statewide AUs.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- About 17% (12,585) of total AUs in Massachusetts were from beef cows. The average number of beef cow AUs was 14,513 during the 2007-2017 decade.

Massachusetts Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Animal Units (AUs)	Beef Cattle AUs	13,800	16,950	16,950	16,950	12,450	16,065	14,790	14,415	12,645	12,045	12,585
	Hog and Pig AUs	1,995	2,415	1,530	2,730	2,580	2,295	3,495	1,935	3,045	3,375	2,430
	Broiler AUs	40,943	40,304	37,473	37,977	28,616	37,215	37,085	36,874	37,826	38,111	38,655
	Turkey AUs	936	876	818	784	751	719	681	667	633	600	547
	Egg Layer AUs	3,770	3,662	3,203	3,182	3,201	3,181	4,118	3,282	3,949	4,796	5,055
	Dairy AUs	21,700	21,000	20,300	19,600	18,900	16,800	17,500	16,800	17,500	16,800	16,100
	Total Animal Units	83,144	85,207	80,274	81,224	66,498	76,274	77,669	73,973	75,598	75,727	75,371
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 7,677	\$ 6,816	\$ 5,118	\$ 5,197	\$ 7,792	\$ 10,692	\$ 11,174	\$ 12,449	\$ 15,186	\$ 9,225	\$ 10,690
	Hogs and Pigs (\$1,000)	\$ 984	\$ 1,296	\$ 656	\$ 1,652	\$ 1,911	\$ 1,526	\$ 2,816	\$ 2,199	\$ 2,385	\$ 2,318	\$ 1,909
	Broilers (\$1,000)	\$ 31,597	\$ 32,281	\$ 27,852	\$ 29,106	\$ 25,482	\$ 37,081	\$ 45,183	\$ 47,400	\$ 41,352	\$ 36,768	\$ 43,174
	Turkeys (\$1,000)	\$ 2,918	\$ 3,009	\$ 3,049	\$ 3,336	\$ 3,784	\$ 4,092	\$ 4,354	\$ 4,842	\$ 5,114	\$ 5,358	\$ 5,580
	Eggs (\$1,000)	\$ 4,288	\$ 3,718	\$ 2,603	\$ 2,010	\$ 2,321	\$ 2,583	\$ 3,496	\$ 3,842	\$ 5,608	\$ 1,425	\$ 2,023
	Milk (\$1,000)	\$ 53,550	\$ 51,308	\$ 35,178	\$ 43,560	\$ 48,400	\$ 43,800	\$ 50,140	\$ 60,813	\$ 40,362	\$ 38,233	\$ 39,668
	Other	\$ 11,756	\$ 12,833	\$ 13,944	\$ 15,143	\$ 16,190	\$ 17,322	\$ 18,494	\$ 19,578	\$ 20,718	\$ 21,803	\$ 5,312
	Sheep and Lambs (\$1,000)	\$ 234	\$ 220	\$ 240	\$ 349	\$ 306	\$ 347	\$ 429	\$ 423	\$ 472	\$ 467	\$ 445
	Aquaculture (\$1,000)	\$ 11,523	\$ 12,613	\$ 13,704	\$ 14,794	\$ 15,884	\$ 16,975	\$ 18,065	\$ 19,155	\$ 20,246	\$ 21,336	\$ 4,867
	Total (\$1,000)	\$ 112,771	\$ 111,261	\$ 88,400	\$ 100,003	\$ 105,880	\$ 117,096	\$ 135,656	\$ 151,123	\$ 130,726	\$ 115,130	\$ 108,357

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	472	337	751	620
	Cattle feedlots (112112)	49	87	53	8
	Dairy cattle and milk production (11212)	338	279	258	147
	Hog and pig farming (1122)	118	72	82	135
	Poultry and egg production (1123)	115	163	480	380
	Sheep and goat farming (1124)	163	211	279	365
	Animal aquaculture and other animal production (1125,1129)	627	1,312	1,776	1,887
Value of Sales (\$1,000)	Cattle and Calves	6,844	9,612	12,444	9,503
	Hogs and Pigs	2,638	withheld	2,108	2,898
	Poultry and Eggs	16,054	12,107	13,207	11,748
	Milk and Other Dairy Products	59,497	withheld	50,485	44,250
	Aquaculture	n/a	9,481	18,548	23,251
	Other (calculated)	13,563	76,044	28,546	6,046
	Total	98,596	107,244	125,338	97,696
Input Purchases	Livestock and poultry purchased	(Farms) 1,075	1,101	1,450	1,961
		\$1,000 7,408	6,482	5,819	7,275
	Breeding livestock purchased	(Farms) n/a	373	556	637
		\$1,000 n/a	2,703	1,776	2,006
	Other livestock and poultry purchased	(Farms) n/a	816	1,064	1,612
		\$1,000 n/a	3,779	4,043	5,268
Feed purchased	(Farms) 2,161	2,698	3,821	4,276	
	\$1,000 31,880	26,253	45,134	50,732	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 14,876	\$ 2,729	57	\$ 677
	Hogs, Pigs, and Other	\$ 9,997	\$ 2,170	69	\$ 538
	Poultry and Eggs	\$ 76,216	\$ 15,512	310	\$ 3,847
	Dairy	\$ 62,552	\$ 13,416	296	\$ 3,327
	Total	\$ 163,642	\$ 33,827	733	\$ 8,389

Change from 2007 to 2017	Cattle and Calves	\$ 2,337	\$ 429	9	\$ 106
	Hogs, Pigs, and Other	\$ (10,704)	\$ (2,323)	(74)	\$ (576)
	Poultry and Eggs	\$ 7,854	\$ 1,599	32	\$ 396
	Dairy	\$ (36,560)	\$ (7,841)	(173)	\$ (1,945)
	Total	\$ (37,073)	\$ (8,137)	(206)	\$ (2,018)

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	5.1%
	Total	24.8%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$6.3 billion in economic output
- 39,752 jobs
- \$1.4 billion in earnings
- \$343.7 million in income taxes paid at local, state, and federal levels
- \$217.5 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Michigan has increased economic output by over \$641.0 million, boosted household earnings by \$142.4 million, contributed 3,992 additional jobs and paid \$34.1 million in additional tax revenues.

Michigan's animal agriculture consumed almost 580.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (163.8 thousand tons)
- Broilers (130.2 thousand tons)
- Hogs (116.6 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 important part of Michigan's economy. In 2017, Michigan's animal agriculture contributed the following to the economy:

- About \$6.3 billion in economic output
- \$1.4 billion in household earnings
- 39,752 jobs
- \$343.7 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:

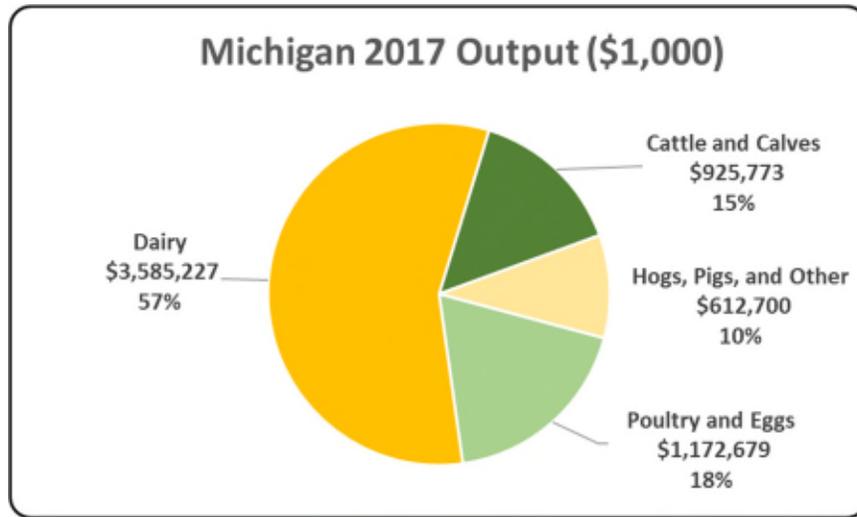
- Increased economic output by \$641.0 million
- Boosted household earnings by \$142.4 million
- Added 3,992 jobs
- Paid an additional \$34.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 6,296,380	\$ 641,025	11.33%
Earnings (\$1,000)	\$ 1,435,060	\$ 142,439	11.02%
Employment (Jobs)	39,752	3,992	11.16%
Income Taxes Paid (\$1,000)	\$ 343,697	\$ 34,114	11.02%
Property Taxes Paid in 2012 (\$1,000)	\$ 217,503		

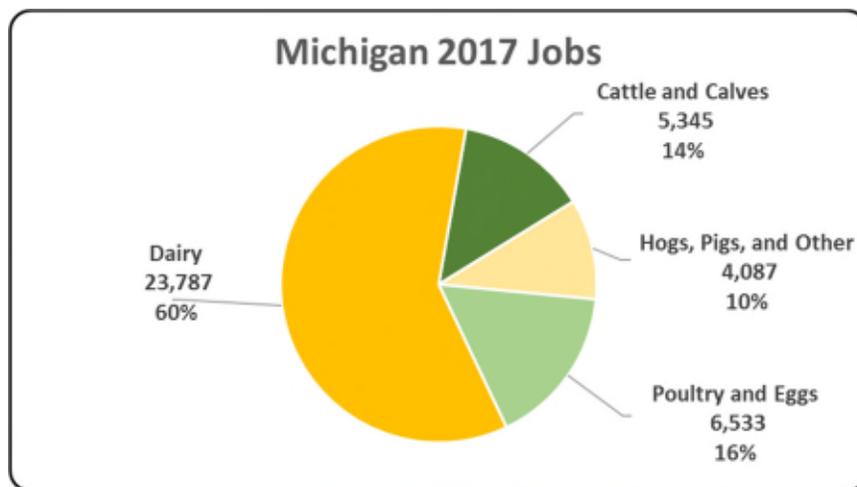
Michigan Output

“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 \$6.3 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 39,752 jobs within and outside of animal agriculture.



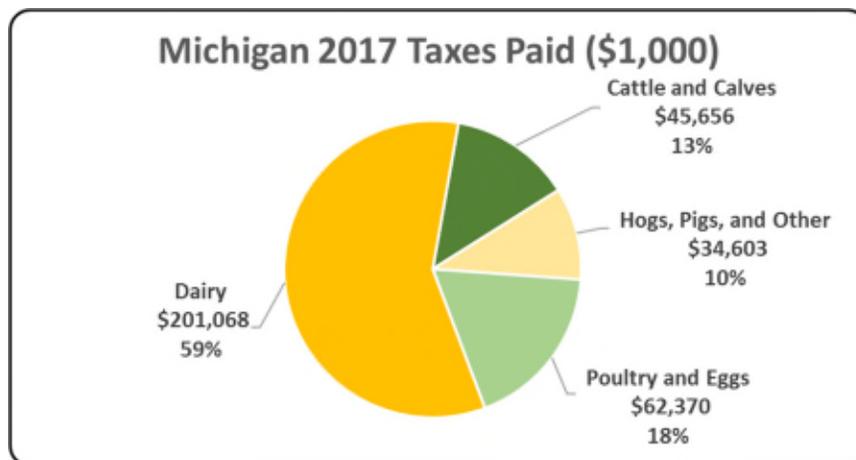
Michigan Earnings

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 \$1.4 billion to household earnings in 2017.



Michigan Taxes Paid by Animal Agriculture

Michigan’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$343.7 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$217.5 million in property taxes paid by all of Michigan agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



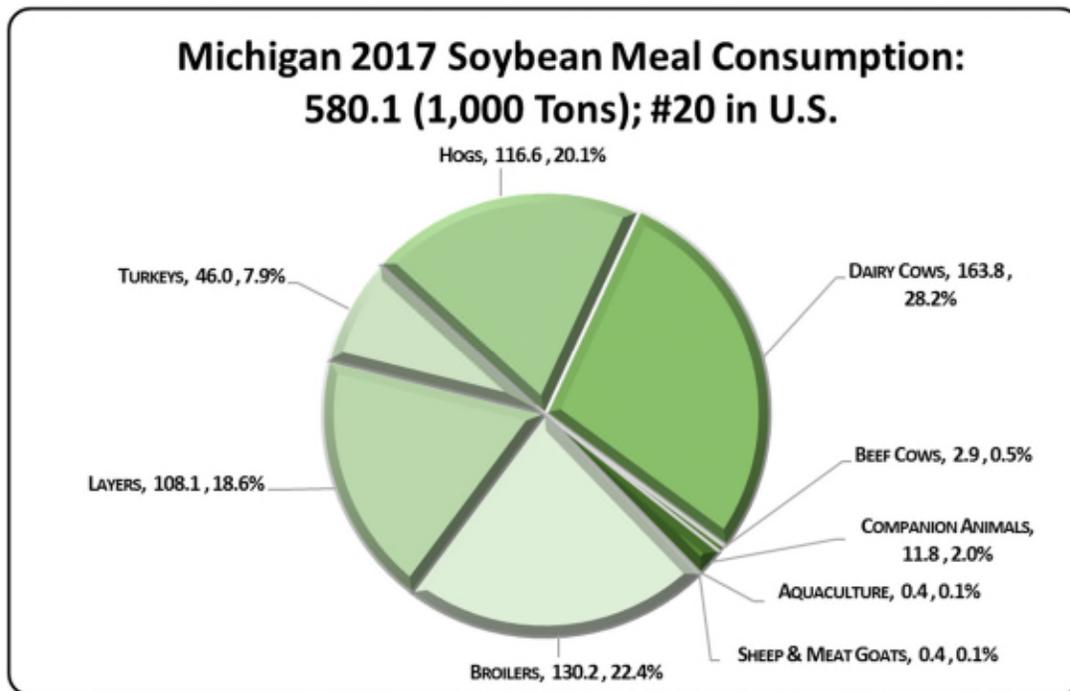
Michigan Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Michigan's animal agriculture consumed almost 580.1 thousand tons of soybean meal in 2017, placing the state as #20 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Michigan consumed 191,543 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (163.8 thousand tons)
- Broilers (130.2 thousand tons)
- Hogs (116.6 thousand tons)

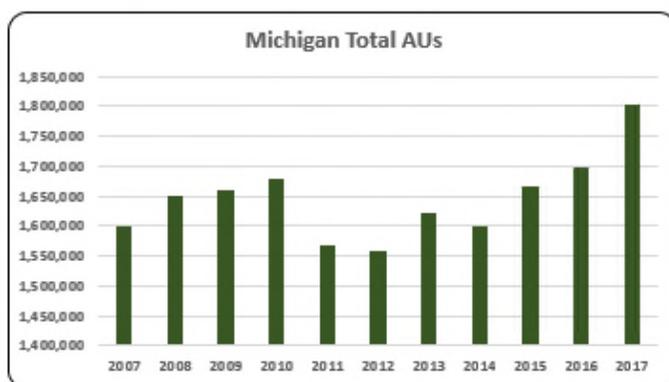
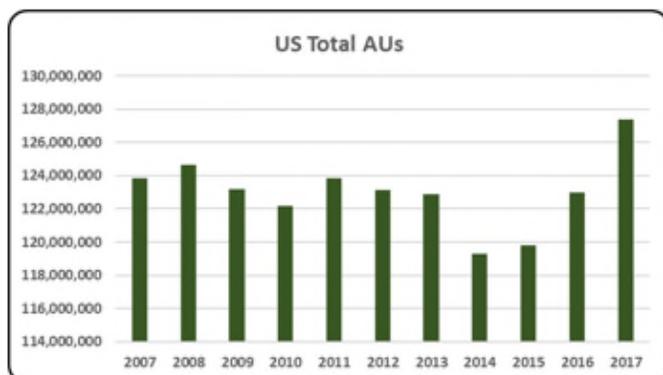


Michigan Animal Unit (AU) Trends

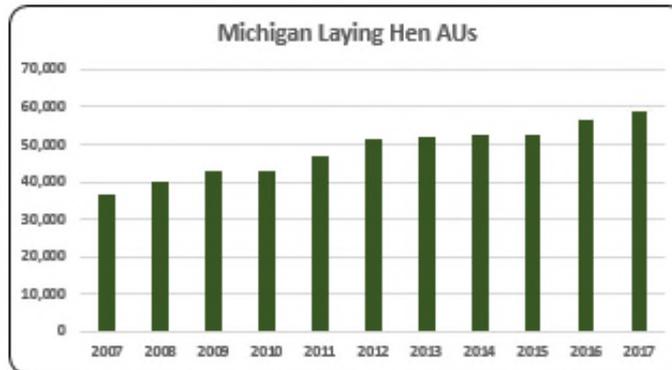
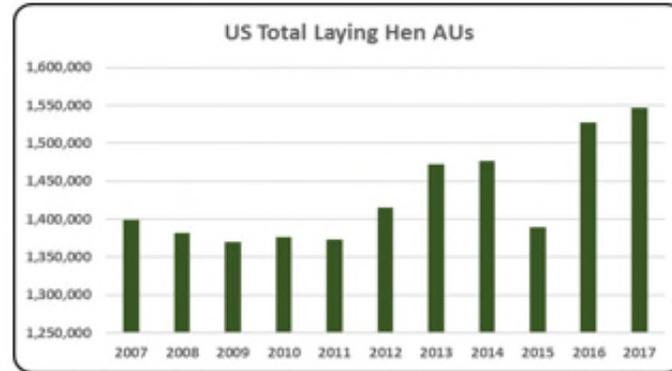
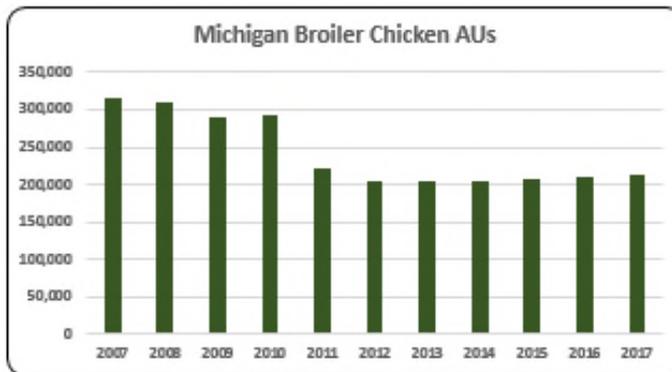
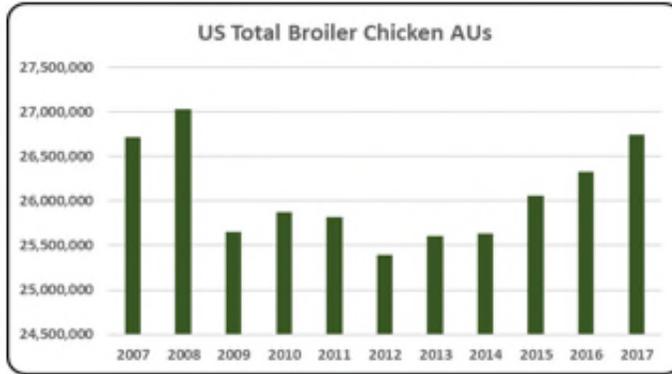
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Michigan. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

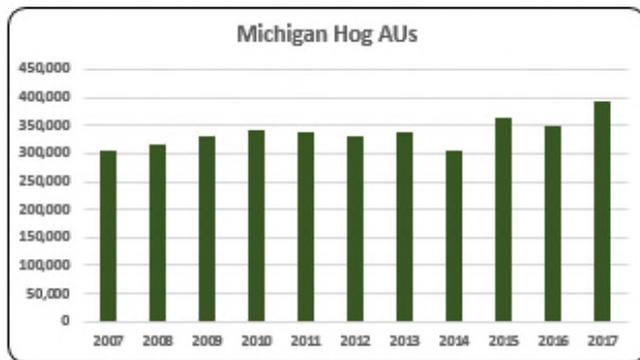
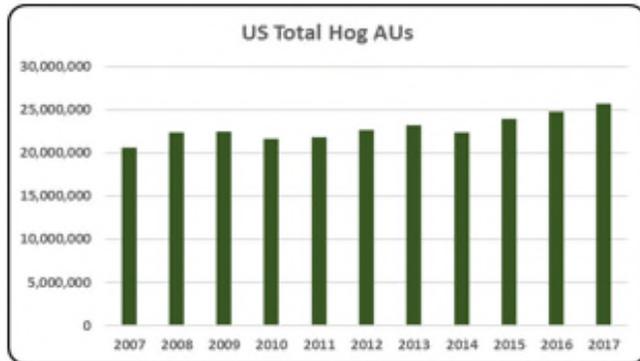
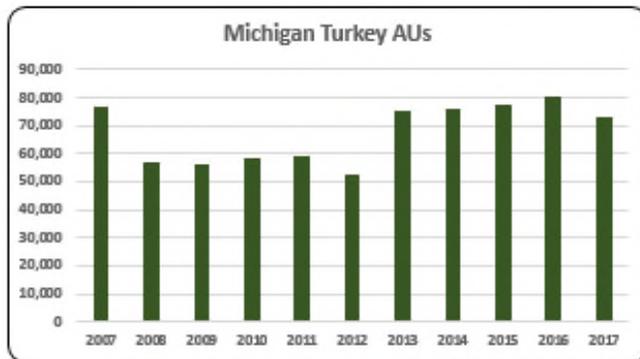
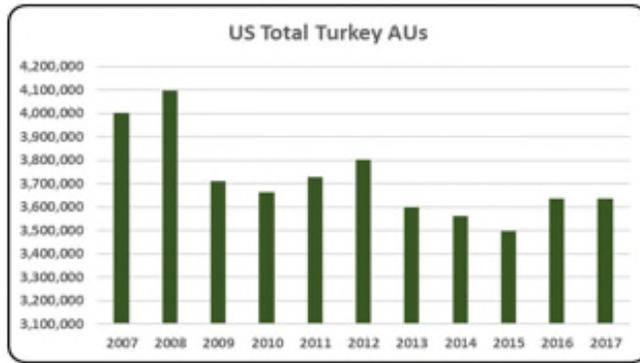
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Michigan, the largest three segments of animal agriculture in terms of AUs during 2017 were: Dairy Cows (595,000 AUs), Beef Cows (468,450 AUs), and Hogs (393,300 AUs). Total animal units in Michigan during 2017 were 1.8 million AUs.



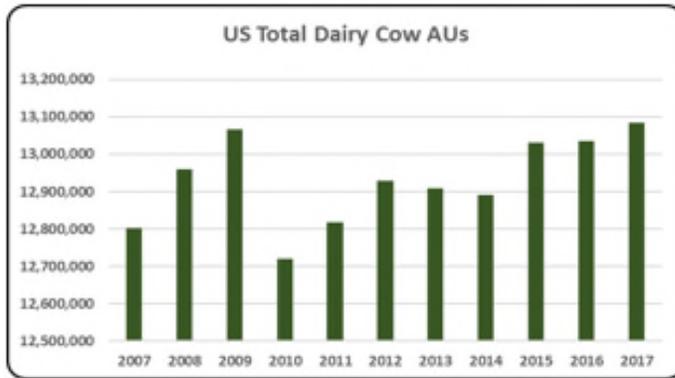
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- About 1.4% (1.8 million) of all AUs in the U.S. in 2017 were contributed by Michigan. The average total for Michigan in this decade was 1.65 million AUs.



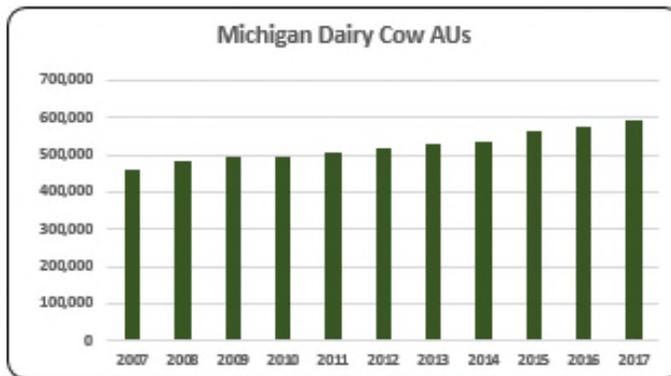
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Michigan’s broiler numbers began declining in 2009. Broiler AUs in 2017 were at 212,980.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Michigan’s egg sector substantially increased from 36,688 layer AUs in 2007 to 58,675 layer AUs in 2017.



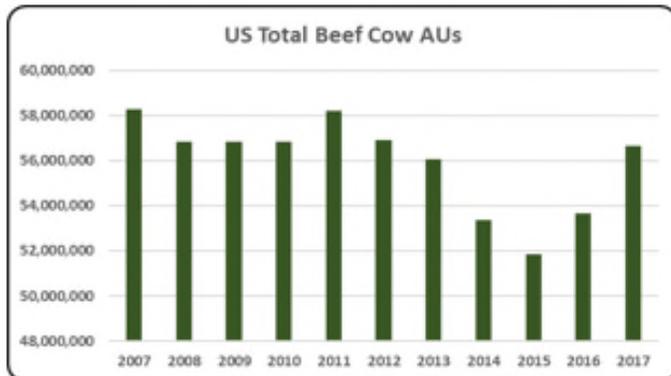
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- 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 67,462 turkey AUs.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Michigan’s hog sector represented about 21.8% (393,300) of all the state’s animal units in 2017.



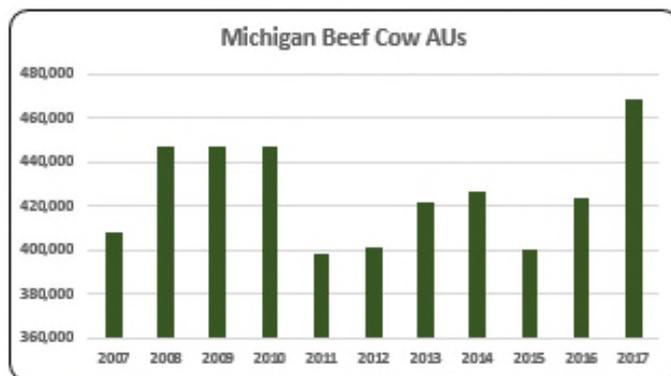
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cows made up 33% of the animal units in Michigan, 595,000 AUs in 2017. This is a 29% increase from 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- There were 468,450 beef cow AUs in 2017 representing 26% 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	408,300	447,660	447,660	447,660	398,700	401,400	421,950	427,050	400,050	424,050	468,450
	Hog and Pig AUs	303,600	314,550	330,750	340,350	337,800	330,150	339,450	306,600	363,600	349,050	393,300
	Broiler AUs	315,782	310,857	289,024	292,912	220,712	205,045	204,329	203,169	208,414	209,984	212,980
	Turkey AUs	77,006	57,103	55,934	58,262	59,301	52,682	75,311	75,982	77,320	80,198	72,978
	Egg Layer AUs	36,688	40,016	42,928	43,076	46,612	51,218	51,903	52,341	52,506	56,428	58,675
	Dairy AUs	457,800	481,600	494,200	495,600	505,400	519,400	527,800	533,400	564,200	576,800	595,000
	Total Animal Units	1,599,176	1,651,786	1,660,496	1,677,860	1,568,525	1,559,895	1,620,743	1,598,542	1,666,090	1,696,510	1,801,383
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 314,853	\$ 334,715	\$ 284,066	\$ 348,948	\$ 418,199	\$ 464,842	\$ 518,536	\$ 621,183	\$ 603,120	\$ 505,309	\$ 519,426
	Hogs and Pigs (\$1,000)	\$ 223,478	\$ 242,596	\$ 221,066	\$ 307,177	\$ 403,124	\$ 349,236	\$ 377,604	\$ 392,522	\$ 354,219	\$ 305,666	\$ 373,297
	Broilers (\$1,000)	\$ 243,702	\$ 248,976	\$ 214,813	\$ 224,486	\$ 196,536	\$ 204,310	\$ 248,948	\$ 261,165	\$ 227,844	\$ 202,582	\$ 237,880
	Turkeys (\$1,000)	\$ 88,210	\$ 87,445	\$ 83,662	\$ 86,911	\$ 94,111	\$ 101,190	\$ 134,594	\$ 152,027	\$ 166,875	\$ 178,356	\$ 131,357
	Eggs (\$1,000)	\$ 155,371	\$ 217,526	\$ 156,701	\$ 170,763	\$ 198,496	\$ 239,603	\$ 271,400	\$ 325,518	\$ 494,947	\$ 163,234	\$ 220,346
	Milk (\$1,000)	\$ 1,502,125	\$ 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
	Other	\$ 6,367	\$ 6,099	\$ 6,394	\$ 6,835	\$ 6,827	\$ 8,260	\$ 7,415	\$ 7,589	\$ 7,150	\$ 7,305	\$ 13,533
	Sheep and Lambs (\$1,000)	\$ 4,186	\$ 4,027	\$ 4,430	\$ 4,980	\$ 5,081	\$ 6,623	\$ 5,886	\$ 6,168	\$ 5,838	\$ 6,101	\$ 6,298
	Aquaculture (\$1,000)	\$ 2,181	\$ 2,072	\$ 1,964	\$ 1,855	\$ 1,746	\$ 1,638	\$ 1,529	\$ 1,420	\$ 1,312	\$ 1,203	\$ 7,236
	Total (\$1,000)	\$ 2,534,106	\$ 2,627,853	\$ 2,034,414	\$ 2,561,730	\$ 3,097,673	\$ 3,066,741	\$ 3,437,117	\$ 4,075,773	\$ 3,557,480	\$ 3,004,728	\$ 3,337,723

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	4,765	4,115	5,253	6,042	
	Cattle feedlots (112112)	1,791	2,232	1,481	344	
	Dairy cattle and milk production (11212)	3,177	2,489	1,971	1,672	
	Hog and pig farming (1122)	1,178	838	1,017	686	
	Poultry and egg production (1123)	400	604	1,635	1,146	
	Sheep and goat farming (1124)	681	942	1,241	1,419	
	Animal aquaculture and other animal production (1125,1129)	4,387	7,215	6,829	6,347	
Value of Sales (\$1,000)	Cattle and Calves	284,374	298,517	449,371	603,653	
	Hogs and Pigs	227,452	200,027	357,495	482,177	
	Poultry and Eggs	169,246	146,700	258,994	472,218	
	Milk and Other Dairy Products	646,771	697,920	1,285,571	1,540,609	
	Aquaculture	2,028	3,316	5,721	3,982	
	Other (calculated)	50,312	63,327	66,139	39,877	
	Total	1,380,183	1,409,807	2,423,291	3,142,516	
Input Purchases	Livestock and poultry purchased	(Farms) 11,086	11,647	11,151	12,053	
		\$1,000	175,474	196,578	308,543	326,573
	Breeding livestock purchased	(Farms) <i>n/a</i>	5,274	4,442	4,980	
		\$1,000	<i>n/a</i>	31,345	68,144	79,605
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	7,934	8,184	8,785	
		\$1,000	<i>n/a</i>	165,233	240,399	246,968
Feed purchased	(Farms)	17,888	24,297	22,314	24,389	
	\$1,000	414,770	390,264	740,126	1,240,433	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 925,773	\$ 190,629	5,345	\$ 45,656
	Hogs, Pigs, and Other	\$ 612,700	\$ 144,481	4,087	\$ 34,603
	Poultry and Eggs	\$ 1,172,679	\$ 260,419	6,533	\$ 62,370
	Dairy	\$ 3,585,227	\$ 839,531	23,787	\$ 201,068
	Total	\$ 6,296,380	\$ 1,435,060	39,752	\$ 343,697

Change from 2007 to 2017	Cattle and Calves	\$ 267,124	\$ 55,004	1,542	\$ 13,174
	Hogs, Pigs, and Other	\$ 185,405	\$ 43,721	1,237	\$ 10,471
	Poultry and Eggs	\$ 35,100	\$ 7,795	196	\$ 1,867
	Dairy	\$ 153,396	\$ 35,920	1,018	\$ 8,603
	Total	\$ 641,025	\$ 142,439	3,992	\$ 34,114

	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.3%
	Total	24.0%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$16.2 billion in economic output
- 75,224 jobs
- \$3.6 billion in earnings
- \$977.2 million in income taxes paid at local, state, and federal levels
- \$340.7 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Minnesota has increased economic output by over \$1.6 billion, boosted household earnings by \$341.1 million, contributed 7,024 additional jobs and paid \$93.1 million in additional tax revenues.

Minnesota's animal agriculture consumed almost 1.6 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (865.4 thousand tons)
- Turkeys (382.1 thousand tons)
- Dairy Cows (137.9 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 2017, Minnesota's animal agriculture contributed the following to the economy:

- About \$16.2 billion in economic output
- \$3.6 billion in household earnings
- 75,224 jobs
- \$977.2 million in income taxes

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

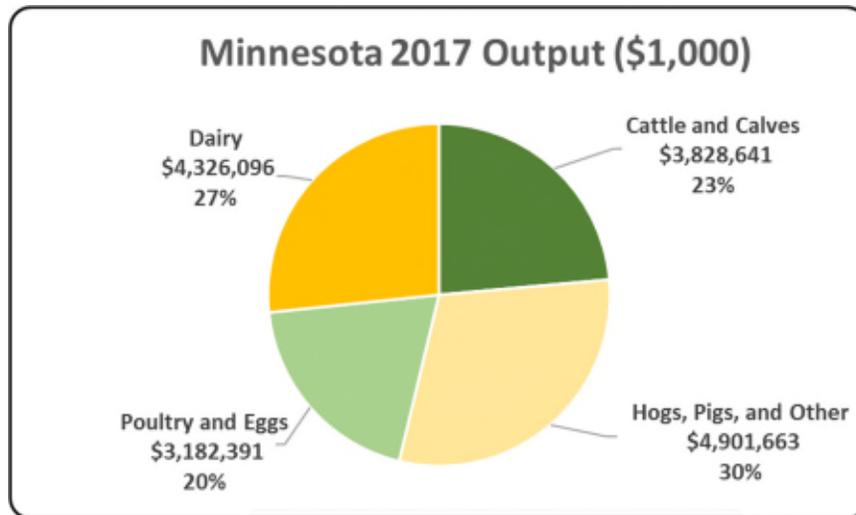
- Increased economic output by \$1.6 billion
- Boosted household earnings by \$341.1 million
- Added 7,024 jobs
- Paid an additional \$93.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 16,238,791	\$ 1,590,129	10.86%
Earnings (\$1,000)	\$ 3,579,655	\$ 341,097	10.53%
Employment (Jobs)	75,224	7,024	10.30%
Income Taxes Paid (\$1,000)	\$ 977,246	\$ 93,119	10.53%
Property Taxes Paid in 2012 (\$1,000)	\$ 340,686		

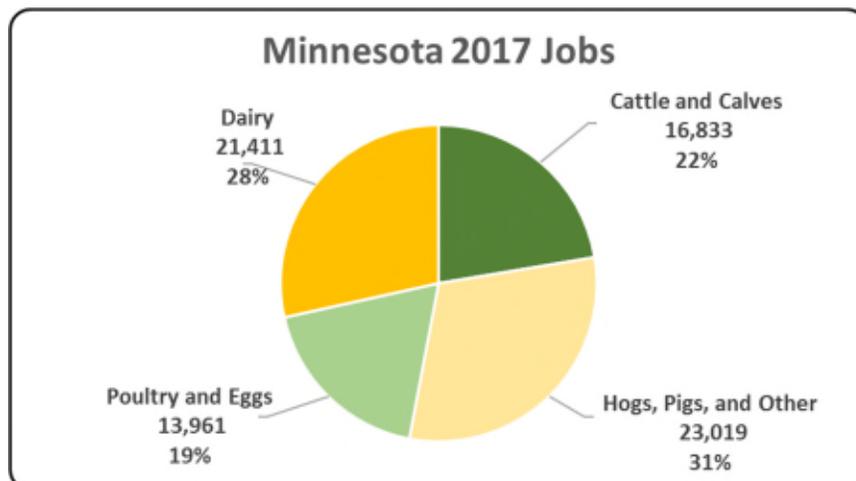
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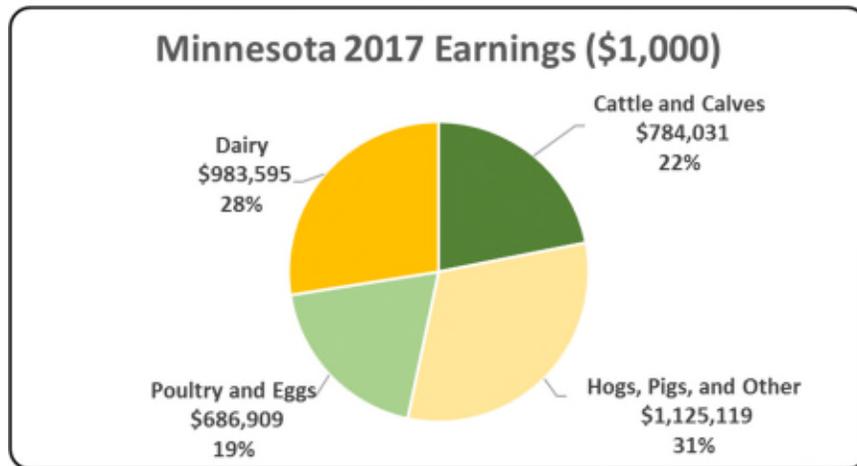
Minnesota Jobs

“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 75,224 jobs within and outside of animal agriculture.



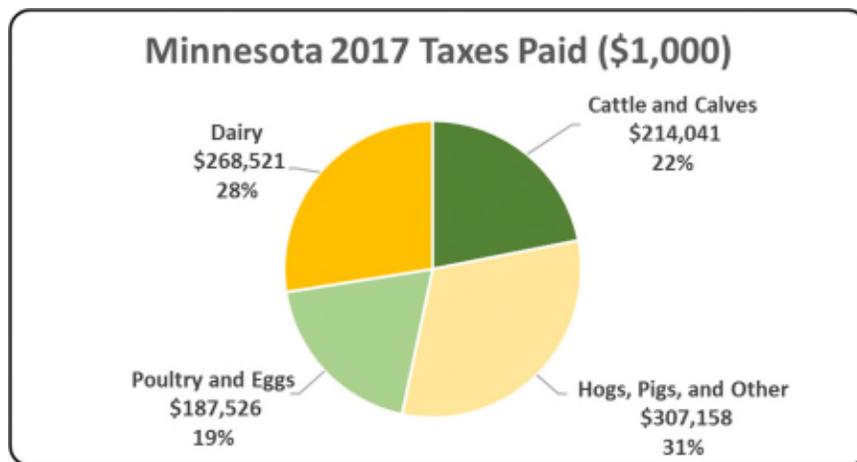
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Minnesota Taxes Paid by Animal Agriculture

Minnesota’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$977.2 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$340.7 million in property taxes paid by all of Minnesota agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



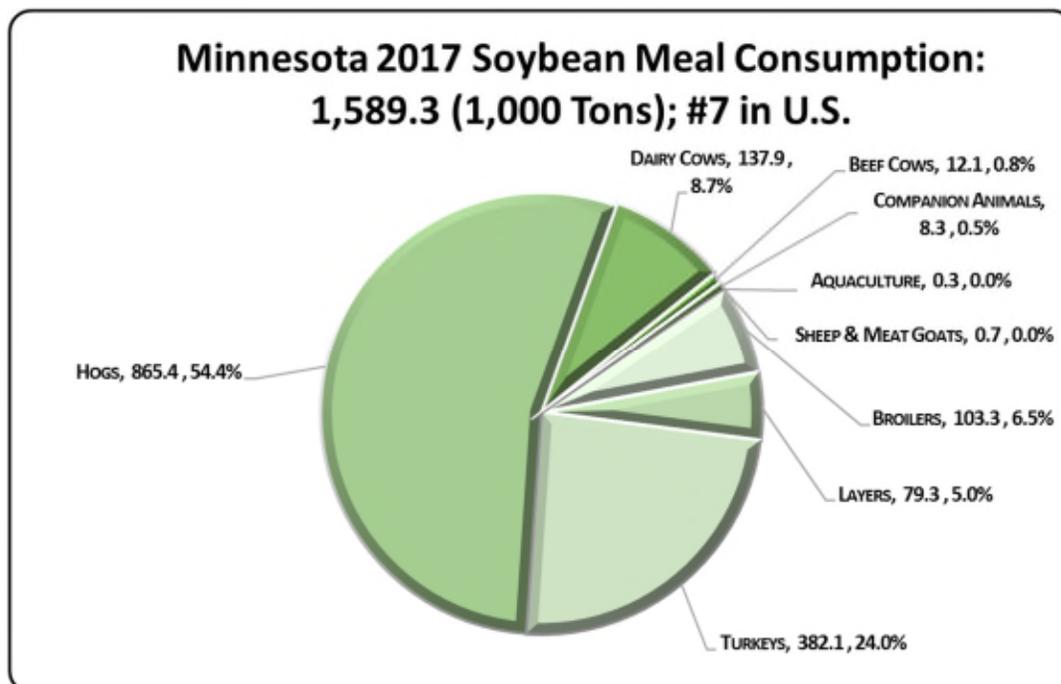
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The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with 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 2016-17 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 2017, placing the state as #7 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Minnesota consumed 177,875 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (865.4 thousand tons)
- Turkeys (382.1 thousand tons)
- Dairy Cows (137.9 thousand tons)

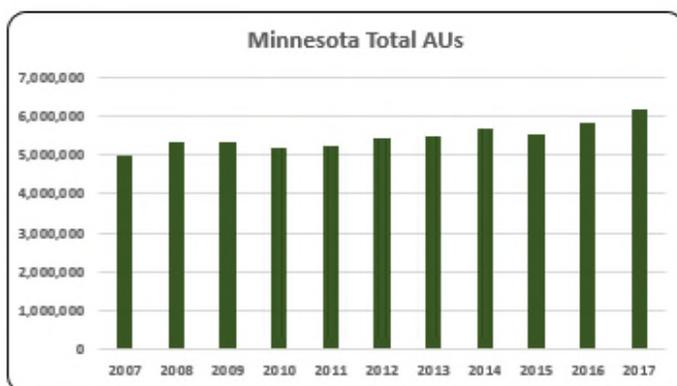
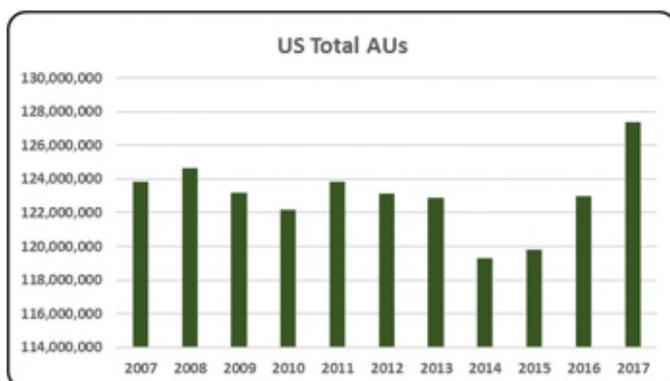


Minnesota Animal Unit (AU) Trends

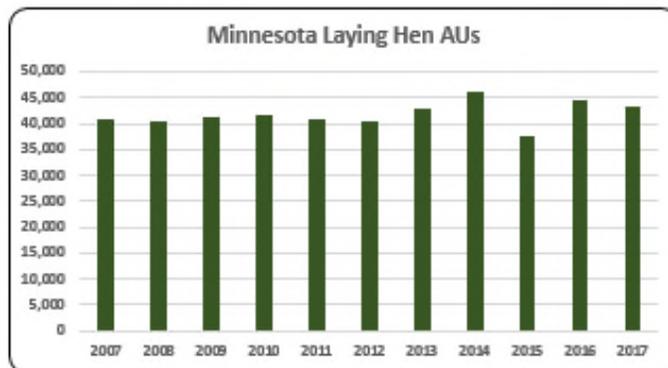
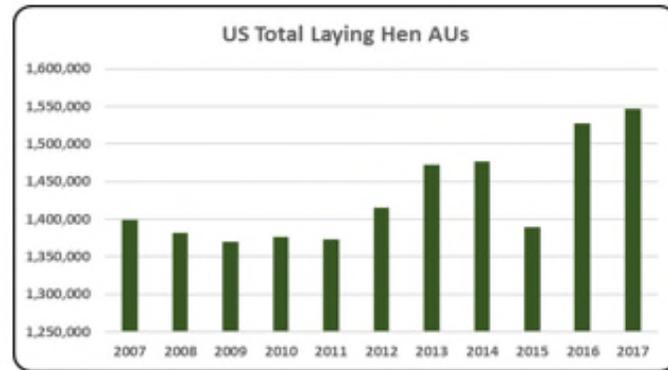
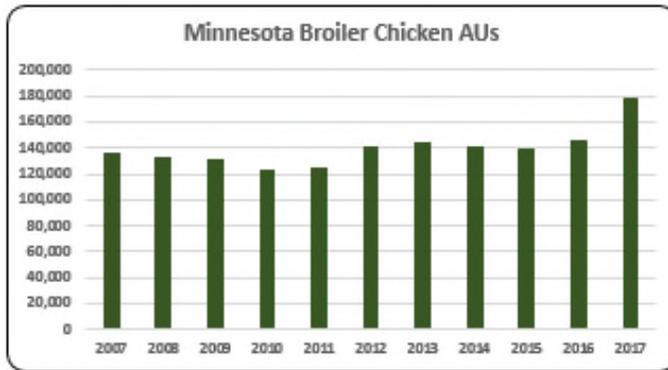
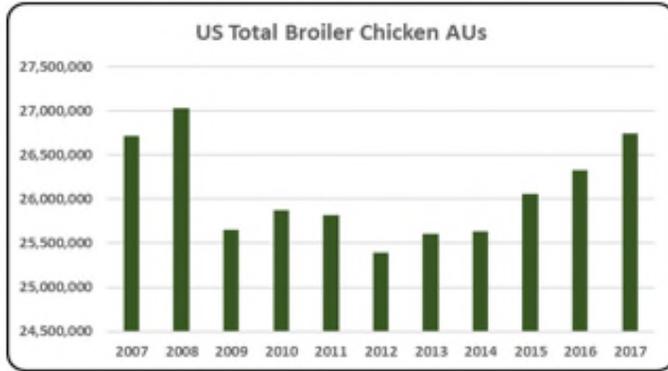
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Minnesota. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

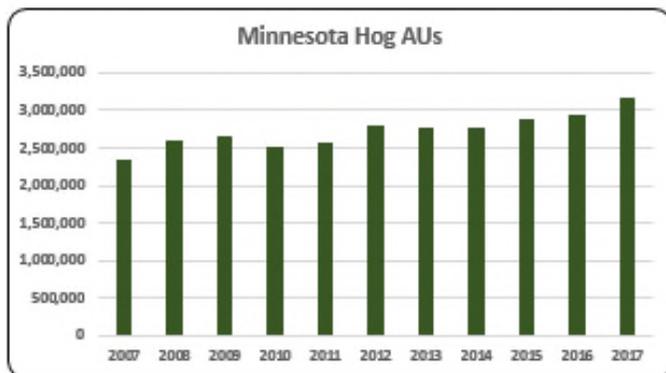
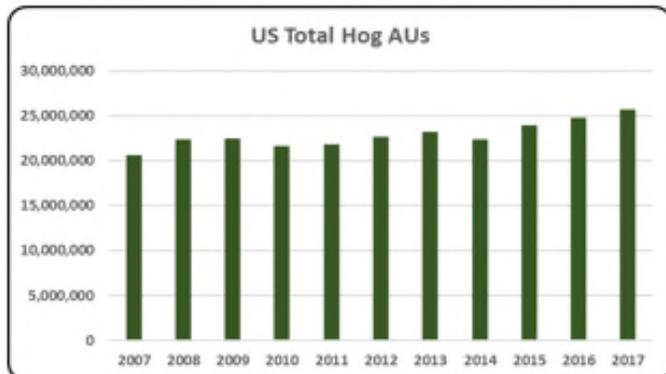
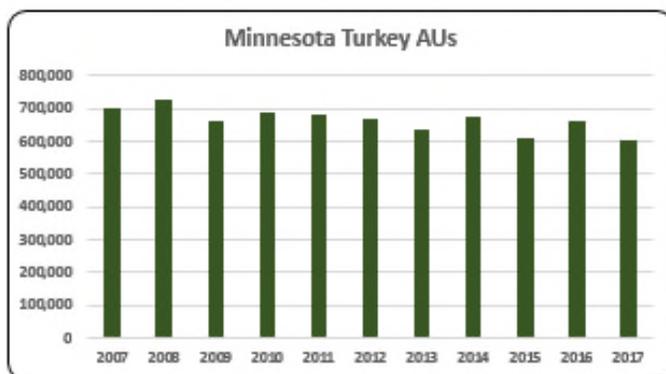
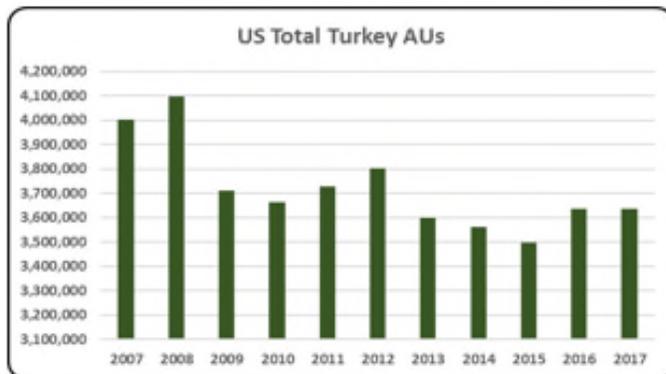
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Minnesota, the largest three segments of animal agriculture in terms of AUs during 2017 were: Hogs (3.2 million AUs), Beef Cows (1.6 million AUs), and Dairy Cows (644,000 AUs). Total animal units in Minnesota during 2017 were 6.2 million AUs.



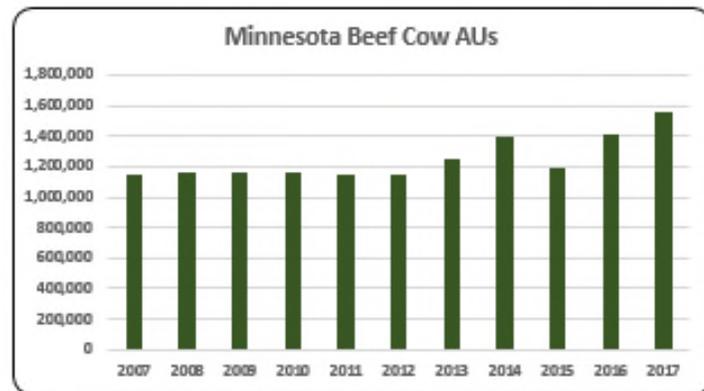
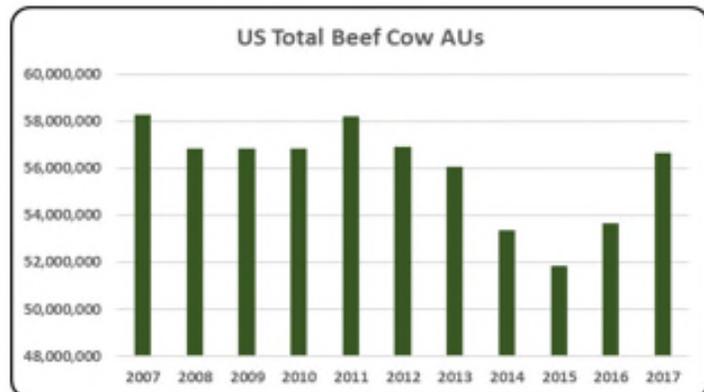
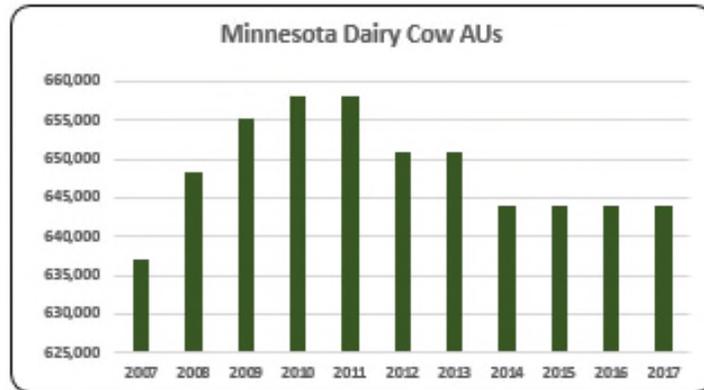
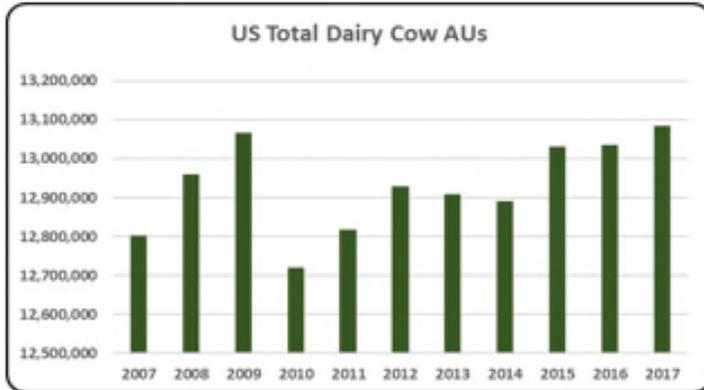
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- At the national level, Minnesota is the number one turkey producer. AUs in Minnesota increased steadily over the last decade. There were 6.2 million AUs in the state in 2017.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler numbers increased about 30.92% from the previous year to 179,427 broiler AUs in 2017. Broiler AUs averaged 140,065 from 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Minnesota was home to 43,205 laying hen AUs in 2017. Laying hen numbers have varied during the decade with 2014 (46,224) being a record high. The 2015 decline is due to avian influenza.



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- There were 600,995 turkey AUs in Minnesota in 2017 representing 16.5% of all turkey AUs in the country. The 2015 drop is due to avian influenza.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- About 51% (3.2 million) of Minnesota’s AUs in 2017 came from hogs. Hog numbers have increased 35% since 2007 and the overall trend during the decade has been positive.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- The dairy cow industry in Minnesota contributed 10.4% (644,000) of all animal units in the state in 2017. Dairy cow numbers in 2017 remained the same as the previous year.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- In 2017, there were 1.6 million beef cow AUs in Minnesota. Beef cow AUs during the decade have been steady at an average of 1.2 million.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,139,700	1,158,300	1,158,300	1,158,300	1,147,500	1,141,500	1,250,100	1,396,500	1,191,450	1,407,450	1,560,675
	Hog and Pig AUs	2,342,100	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
	Broiler AUs	137,053	132,392	131,820	123,892	124,988	140,671	144,872	140,659	139,459	145,476	179,427
	Turkey AUs	702,114	724,661	659,393	687,546	679,217	671,956	637,247	677,876	609,639	660,893	600,995
	Egg Layer AUs	40,928	40,256	41,324	41,796	40,868	40,568	42,994	46,224	37,639	44,514	43,205
	Dairy AUs	637,000	648,200	655,200	658,000	658,000	651,000	651,000	644,000	644,000	644,000	644,000
	Total Animal Units	4,998,896	5,318,309	5,314,387	5,192,235	5,231,173	5,443,494	5,497,163	5,670,509	5,507,137	5,844,432	6,189,253
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 886,145	\$ 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
	Hogs and Pigs (\$1,000)	\$ 1,645,781	\$ 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
	Broilers (\$1,000)	\$ 104,189	\$ 109,480	\$ 112,605	\$ 111,390	\$ 110,757	\$ 135,700	\$ 172,631	\$ 178,870	\$ 149,779	\$ 141,106	\$ 194,861
	Turkeys (\$1,000)	\$ 633,516	\$ 716,447	\$ 519,680	\$ 648,384	\$ 755,984	\$ 811,296	\$ 719,882	\$ 871,676	\$ 804,806	\$ 908,993	\$ 674,761
	Eggs (\$1,000)	\$ 193,219	\$ 237,237	\$ 165,025	\$ 167,922	\$ 185,335	\$ 199,865	\$ 214,011	\$ 266,139	\$ 366,897	\$ 126,454	\$ 173,204
	Milk (\$1,000)	\$ 1,713,888	\$ 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
	Other	\$ 22,434	\$ 22,458	\$ 20,893	\$ 24,191	\$ 23,942	\$ 30,927	\$ 22,527	\$ 25,088	\$ 29,100	\$ 24,412	\$ 27,645
	Sheep and Lambs (\$1,000)	\$ 14,721	\$ 15,094	\$ 13,879	\$ 17,526	\$ 17,627	\$ 24,962	\$ 16,911	\$ 19,822	\$ 24,183	\$ 19,845	\$ 20,840
	Aquaculture (\$1,000)	\$ 7,713	\$ 7,364	\$ 7,014	\$ 6,665	\$ 6,315	\$ 5,966	\$ 5,616	\$ 5,267	\$ 4,917	\$ 4,568	\$ 6,805
	Total (\$1,000)	\$ 5,199,172	\$ 5,412,441	\$ 4,073,053	\$ 5,224,213	\$ 6,215,562	\$ 6,576,382	\$ 6,803,270	\$ 8,310,372	\$ 7,212,247	\$ 6,537,064	\$ 6,901,669

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,243	8,917	9,921	8,083	
	Cattle feedlots (112112)	2,507	3,290	2,421	1,048	
	Dairy cattle and milk production (11212)	7,972	5,520	4,385	3,746	
	Hog and pig farming (1122)	3,800	3,051	2,462	1,442	
	Poultry and egg production (1123)	819	978	1,643	1,085	
	Sheep and goat farming (1124)	1,083	1,181	1,310	1,088	
	Animal aquaculture and other animal production (1125,1129)	3,172	6,006	5,105	4,245	
Value of Sales (\$1,000)	Cattle and Calves	737,972	873,074	1,385,740	1,639,634	
	Hogs and Pigs	1,436,247	1,398,234	2,139,877	2,783,049	
	Poultry and Eggs	744,509	750,088	1,045,674	1,230,625	
	Milk and Other Dairy Products	1,111,429	931,754	1,475,929	1,645,911	
	Aquaculture	3,221	8,991	12,492	12,678	
	Other (calculated)	58,910	50,604	71,842	73,874	
	Total	4,092,288	4,012,745	6,131,554	7,385,771	
Input Purchases	Livestock and poultry purchased	(Farms) 22,175	20,375	17,464	18,527	
		\$1,000	639,336	836,490	1,304,042	1,301,768
	Breeding livestock purchased	(Farms) <i>n/a</i>	9,757	8,243	9,241	
		\$1,000	<i>n/a</i>	75,727	115,218	163,055
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	12,945	11,354	11,859	
		\$1,000	<i>n/a</i>	760,762	1,188,825	1,138,713
Feed purchased	(Farms)	35,429	37,871	30,806	32,486	
	\$1,000	1,301,623	1,271,172	1,944,488	2,961,840	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 3,828,641	\$ 784,031	16,833	\$ 214,041
	Hogs, Pigs, and Other	\$ 4,901,663	\$ 1,125,119	23,019	\$ 307,158
	Poultry and Eggs	\$ 3,182,391	\$ 686,909	13,961	\$ 187,526
	Dairy	\$ 4,326,096	\$ 983,595	21,411	\$ 268,521
	Total	\$ 16,238,791	\$ 3,579,655	75,224	\$ 977,246

Change from 2007 to 2017	Cattle and Calves	\$ 1,104,753	\$ 226,232	4,857	\$ 61,761
	Hogs, Pigs, and Other	\$ 1,267,771	\$ 291,002	5,954	\$ 79,444
	Poultry and Eggs	\$ (152,038)	\$ (32,817)	(667)	\$ (8,959)
	Dairy	\$ (630,357)	\$ (143,320)	(3,120)	\$ (39,126)
	Total	\$ 1,590,129	\$ 341,097	7,024	\$ 93,119

	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	7.6%
	Total	27.3%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$8.7 billion in economic output
- 39,268 jobs
- \$1.8 billion in earnings
- \$430.2 million in income taxes paid at local, state, and federal levels
- \$78.3 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Mississippi has increased economic output by over \$446.7 million, boosted household earnings by \$89.4 million, contributed 1,887 additional jobs and paid \$21.2 million in additional tax revenues.

Mississippi's animal agriculture consumed over 1.4 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (1.2 million tons)
- Aquaculture (83.9 thousand tons)
- Hogs (54.2 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 part of Mississippi's economy. In 2017, Mississippi's animal agriculture contributed the following to the economy:

- About \$8.7 billion in economic output
- \$1.8 billion in household earnings
- 39,268 jobs
- \$430.2 million in income taxes

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

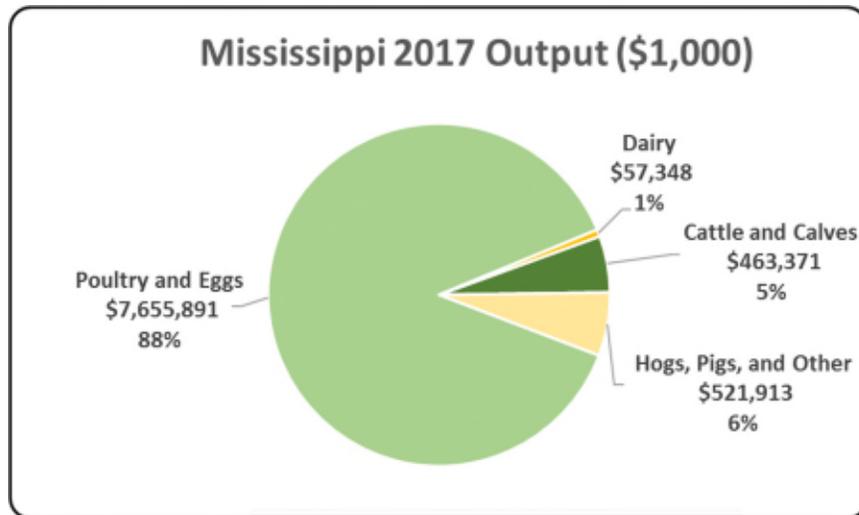
- Increased economic output by \$446.7 million
- Boosted household earnings by \$89.4 million
- Added 1,887 jobs
- Paid an additional \$21.2 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 8,698,524	\$ 446,731	5.41%
Earnings (\$1,000)	\$ 1,815,401	\$ 89,413	5.18%
Employment (Jobs)	39,268	1,887	5.05%
Income Taxes Paid (\$1,000)	\$ 430,250	\$ 21,191	5.18%
Property Taxes Paid in 2012 (\$1,000)	\$ 78,273		

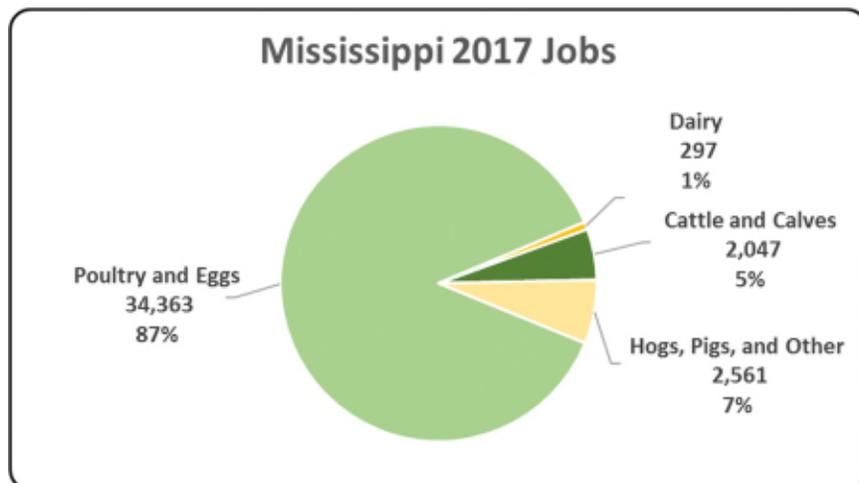
Mississippi Output

“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 \$8.7 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 39,268 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 \$1.8 billion to household earnings in 2017.



Mississippi Taxes Paid by Animal Agriculture

Mississippi’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$430.2 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$78.3 million in property taxes paid by all of Mississippi agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



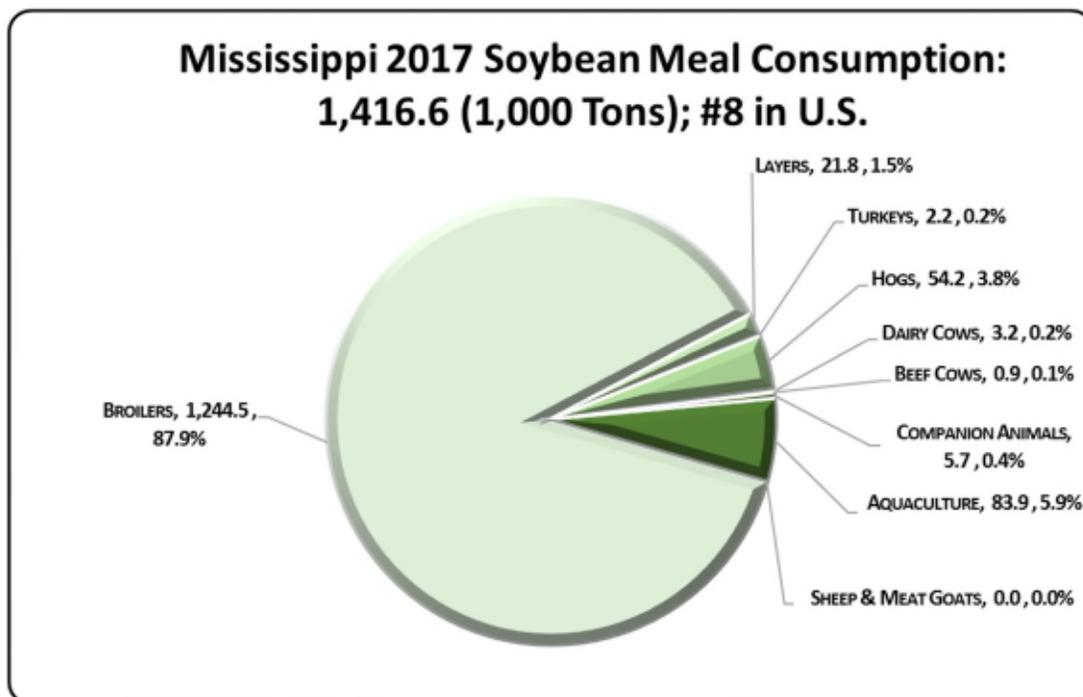
Mississippi Animal Agriculture Soybean Meal Consumption

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 2016-17 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 2017, placing the state as #8 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Mississippi consumed 4,810 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (1.2 million tons)
- Aquaculture (83.9 thousand tons)
- Hogs (54.2 thousand tons)

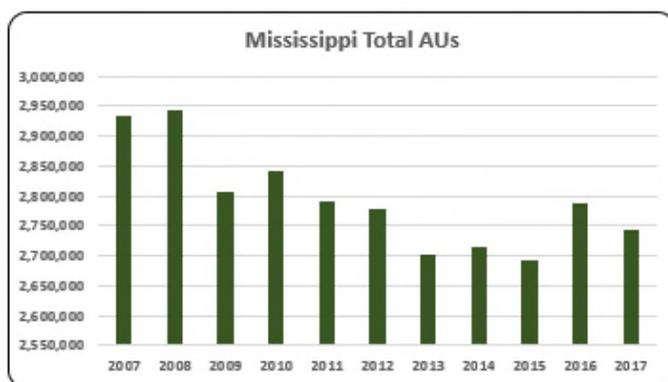
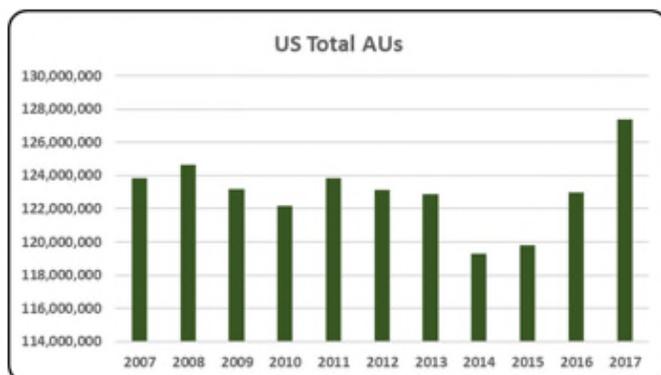


Mississippi Animal Unit (AU) Trends

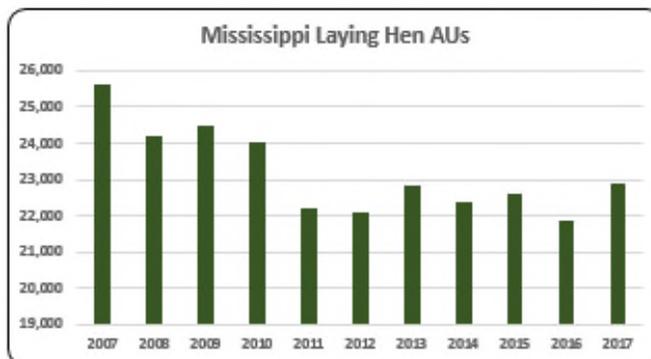
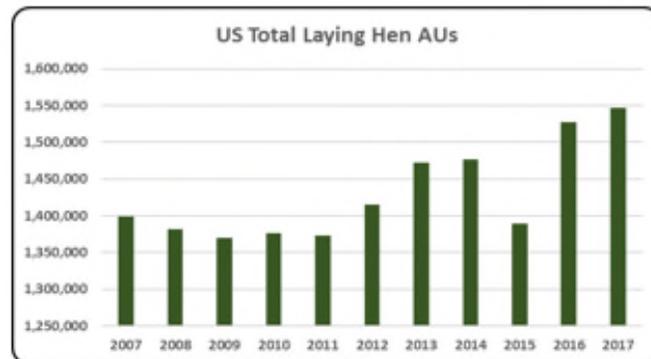
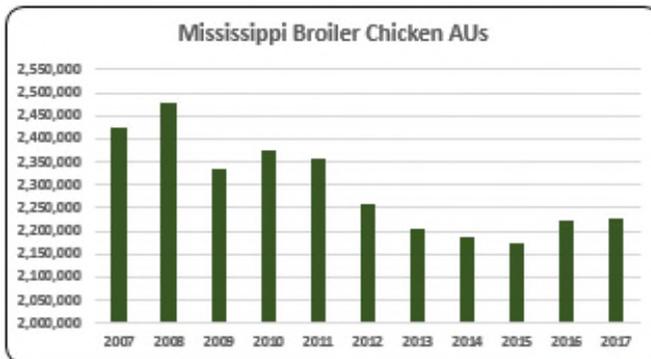
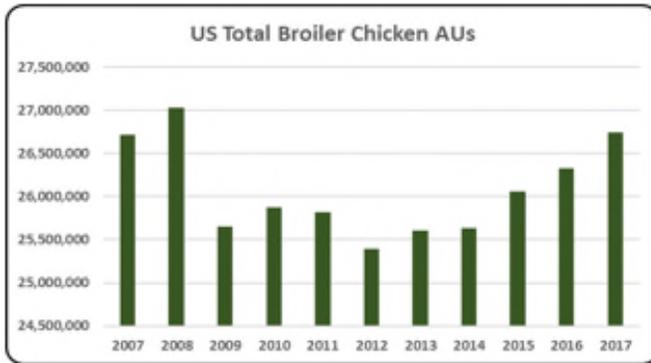
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Mississippi. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

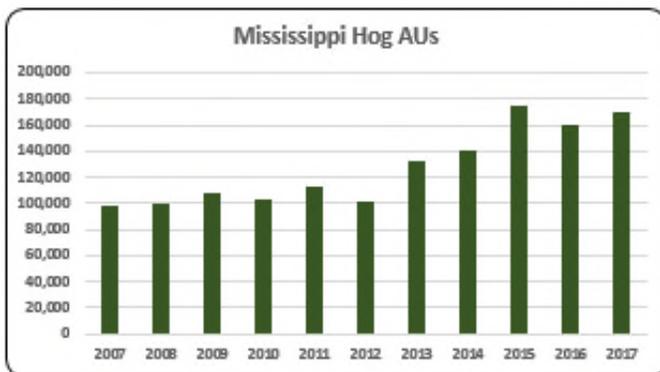
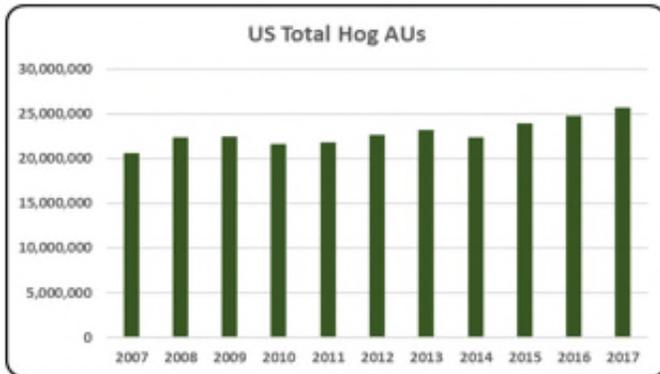
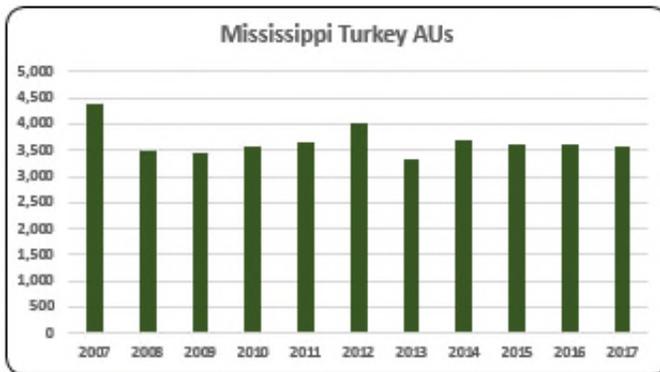
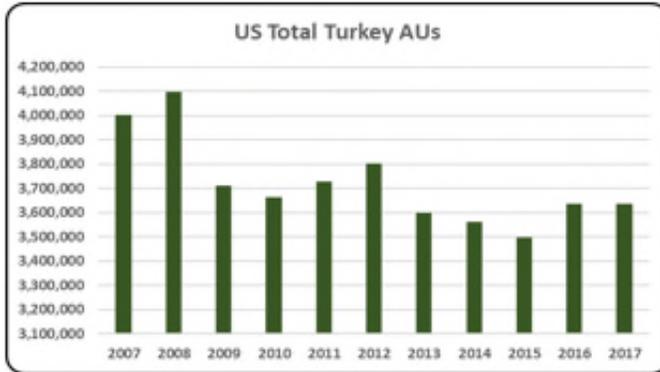
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Mississippi, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (2.2 million AUs), Beef Cows (307,200 AUs), and Hogs (170,400 AUs). Total animal units in Mississippi during 2017 were 2.7 million AUs



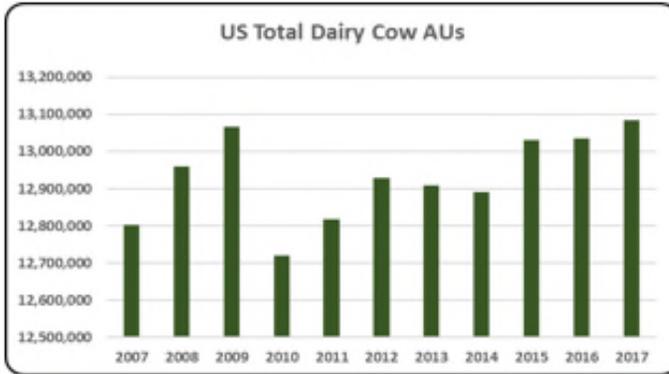
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- AUs in Mississippi have declined during the last decade from nearly 3 million in 2007 to 2.7 million in 2017. Mississippi makes up 2.15% of total U.S. AUs.



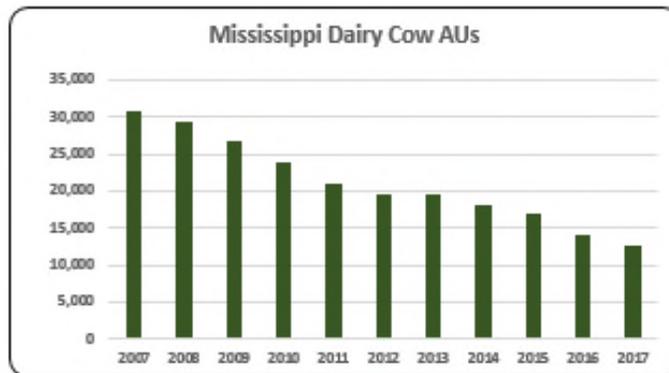
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- 81% (2.2 million) of Mississippi’s animal units in 2017 were broilers.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In 2016 laying hens represented less than 1% (22,889) of all animal units in the state of Mississippi. Numbers have declined 10.7% from 2007 to 2017.



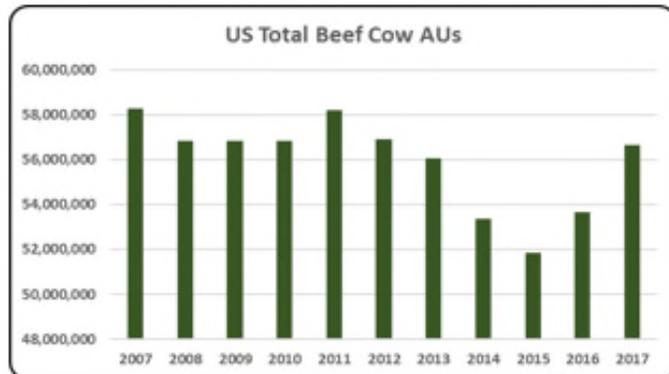
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- The smallest animal sector in Mississippi in terms of animal units is turkeys. In 2017 only 0.13% (3,578) of all AUs in the state were turkeys. Turkey AUs have fallen 18% since 2007.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- 170,400 of Mississippi’s animal units in 2017 came from hogs. Hog AUs in Mississippi have increased 74% since 2007.



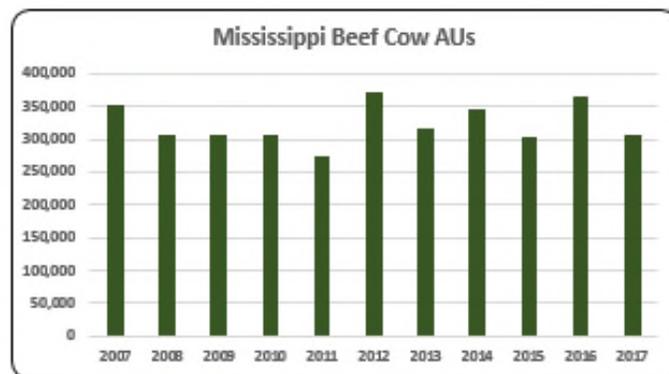
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cow numbers fell 59% from 2007 to 2017. Dairy cow AUs decreased to 12,600 in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- In 2017, Mississippi had 307,200 beef cow AUs. This was a 13% decrease from a decade earlier and 11% 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	352,650	308,550	308,550	308,550	274,650	372,750	317,700	345,750	303,600	366,000	307,200
	Hog and Pig AUs	97,500	99,450	108,450	103,725	113,325	102,075	131,850	139,800	174,600	159,900	170,400
	Broiler AUs	2,423,435	2,478,880	2,334,508	2,377,200	2,355,549	2,258,248	2,206,446	2,185,624	2,171,530	2,222,416	2,227,362
	Turkey AUs	4,387	3,506	3,435	3,578	3,641	4,011	3,346	3,693	3,614	3,602	3,578
	Egg Layer AUs	25,640	24,180	24,460	24,008	22,216	22,117	22,818	22,387	22,612	21,849	22,889
	Dairy AUs	30,800	29,400	26,600	23,800	21,000	19,600	19,600	18,200	16,800	14,000	12,600
	Total Animal Units	2,934,412	2,943,967	2,806,003	2,840,861	2,790,381	2,778,800	2,701,760	2,715,454	2,692,756	2,787,766	2,744,029
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 189,194	\$ 156,693	\$ 145,491	\$ 148,407	\$ 186,283	\$ 216,224	\$ 218,211	\$ 269,220	\$ 288,222	\$ 185,559	\$ 210,863
	Hogs and Pigs (\$1,000)	\$ 72,814	\$ 75,408	\$ 69,416	\$ 80,222	\$ 105,084	\$ 102,135	\$ 124,425	\$ 117,555	\$ 106,326	\$ 86,737	\$ 84,460
	Broilers (\$1,000)	\$ 1,984,192	\$ 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
	Turkeys (\$1,000)	\$ 11,720	\$ 14,301	\$ 13,553	\$ 7,349	\$ 5,779	\$ 6,213	\$ 4,504	\$ 2,980	\$ 3,383	\$ 3,825	\$ 2,590
	Eggs (\$1,000)	\$ 171,379	\$ 179,075	\$ 158,710	\$ 179,794	\$ 196,486	\$ 208,357	\$ 222,415	\$ 235,306	\$ 248,230	\$ 221,704	\$ 211,033
	Milk (\$1,000)	\$ 66,096	\$ 60,528	\$ 35,750	\$ 41,032	\$ 45,492	\$ 40,198	\$ 40,734	\$ 50,384	\$ 32,010	\$ 24,768	\$ 25,893
	Other	\$ 238,341	\$ 232,566	\$ 226,815	\$ 221,128	\$ 215,331	\$ 209,595	\$ 203,888	\$ 198,118	\$ 192,388	\$ 186,619	\$ 222,367
	Sheep and Lambs (\$1,000)	\$ 168	\$ 158	\$ 173	\$ 252	\$ 221	\$ 250	\$ 309	\$ 305	\$ 341	\$ 337	\$ 321
	Aquaculture (\$1,000)	\$ 238,173	\$ 232,407	\$ 226,642	\$ 220,876	\$ 215,110	\$ 209,345	\$ 203,579	\$ 197,813	\$ 192,048	\$ 186,282	\$ 222,046
	Total (\$1,000)	\$ 2,733,736	\$ 2,961,576	\$ 2,752,712	\$ 2,975,144	\$ 2,877,605	\$ 3,036,622	\$ 3,532,323	\$ 3,745,541	\$ 3,319,427	\$ 2,935,832	\$ 3,337,398

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	16,181	17,456	15,018	13,041	
	Cattle feedlots (112112)	389	124	-	8	
	Dairy cattle and milk production (11212)	424	388	187	144	
	Hog and pig farming (1122)	257	252	228	117	
	Poultry and egg production (1123)	1,786	2,420	2,449	2,071	
	Sheep and goat farming (1124)	216	421	704	796	
	Animal aquaculture and other animal production (1125,1129)	1,796	5,316	5,114	4,118	
Value of Sales (\$1,000)	Cattle and Calves	227,320	228,346	323,621	332,491	
	Hogs and Pigs	20,860	83,498	129,424	141,139	
	Poultry and Eggs	1,472,442	1,490,748	2,438,690	2,744,048	
	Milk and Other Dairy Products	83,683	67,954	62,875	42,690	
	Aquaculture	290,382	207,181	237,883	185,241	
	Other (calculated)	45,733	13,182	16,260	11,829	
	Total	2,140,420	2,090,909	3,208,753	3,457,438	
Input Purchases	Livestock and poultry purchased	(Farms)	8,789	9,917	7,762	8,434
		\$1,000	229,688	380,748	469,684	576,540
	Breeding livestock purchased	(Farms)	n/a	5,128	4,012	4,798
		\$1,000	n/a	18,496	31,192	53,038
	Other livestock and poultry purchased	(Farms)	n/a	5,894	4,616	4,690
		\$1,000	n/a	362,251	438,492	523,503
	Feed purchased	(Farms)	18,062	26,071	21,203	22,292
		\$1,000	845,628	804,106	1,468,308	1,715,141

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 463,371	\$ 92,632	2,047	\$ 21,954
	Hogs, Pigs, and Other	\$ 521,913	\$ 118,313	2,561	\$ 28,040
	Poultry and Eggs	\$ 7,655,891	\$ 1,591,636	34,363	\$ 377,218
	Dairy	\$ 57,348	\$ 12,820	297	\$ 3,038
	Total	\$ 8,698,524	\$ 1,815,401	39,268	\$ 430,250

Change from 2007 to 2017	Cattle and Calves	\$ (24,608)	\$ (4,919)	(109)	\$ (1,166)
	Hogs, Pigs, and Other	\$ (99,308)	\$ (22,512)	(487)	\$ (5,335)
	Poultry and Eggs	\$ 685,120	\$ 142,434	3,075	\$ 33,757
	Dairy	\$ (114,473)	\$ (25,589)	(592)	\$ (6,065)
	Total	\$ 446,731	\$ 89,413	1,887	\$ 21,191

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.0%
	Total	23.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$11.2 billion in economic output
- 64,589 jobs
- \$2.3 billion in earnings
- \$541.5 million in income taxes paid at local, state, and federal levels
- \$193.4 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Missouri has increased economic output by over \$2.1 billion, boosted household earnings by \$418.9 million, contributed 11,263 additional jobs and paid \$98.2 million in additional tax revenues.

Missouri's animal agriculture consumed 1.2 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (538.4 thousand tons)
- Hogs (371.9 thousand tons)
- Turkeys (168.3 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 major contributor to the economic well-being of the people of Missouri and beyond.

Missouri Economic Impact of Animal Agriculture

Animal agriculture is an integral part of Missouri's economy. In 2017, Missouri's animal agriculture contributed the following to the economy:

- About \$11.2 billion in economic output
- \$2.3 billion in household earnings
- 64,589 jobs
- \$541.5 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:

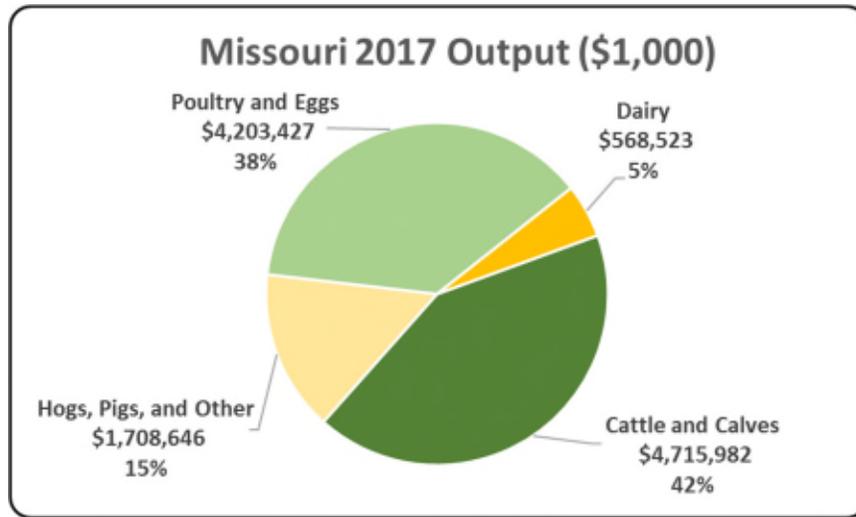
- Increased economic output by nearly \$2.1 billion
- Boosted household earnings by \$418.9 million
- Added 11,263 jobs
- Paid an additional \$98.2 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 11,196,578	\$ 2,070,286	22.68%
Earnings (\$1,000)	\$ 2,309,235	\$ 418,918	22.16%
Employment (Jobs)	64,589	11,263	21.12%
Income Taxes Paid (\$1,000)	\$ 541,515	\$ 98,236	22.16%
Property Taxes Paid in 2012 (\$1,000)	\$ 193,377		

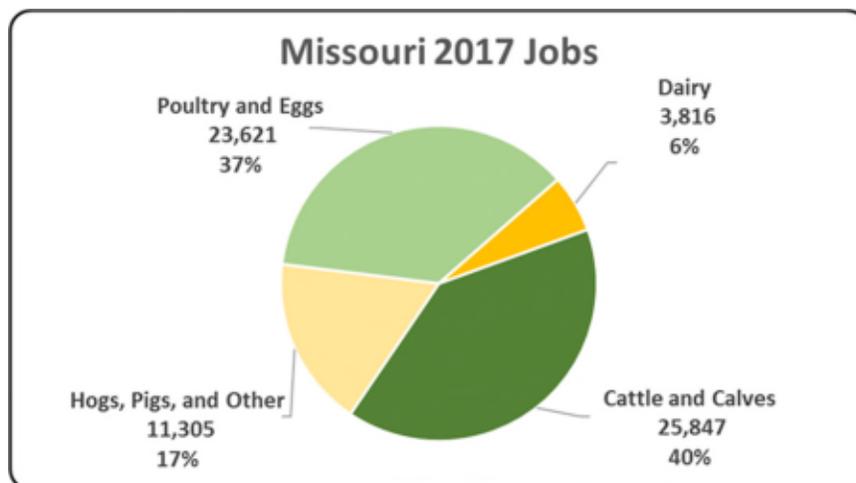
Missouri Output

“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 Missouri economy. Animal agriculture’s impact on Missouri total economic output is about \$11.2 billion.



Missouri 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 Missouri in terms of animal agriculture jobs. As shown, animal agriculture contributes significantly to Missouri total jobs, contributing 64,589 jobs within and outside of animal agriculture.



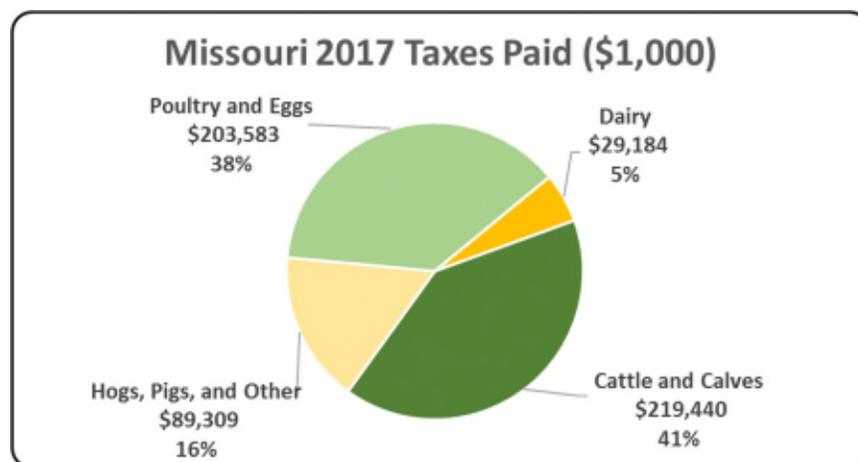
Missouri Earnings

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 Missouri economy in terms of earnings. Missouri's animal agriculture contributed about \$2.3 billion to household earnings in 2017.



Missouri Taxes Paid by Animal Agriculture

Missouri's animal agriculture is also a significant source of tax revenue. In 2017, the state's animal agriculture industry paid about \$541.5 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$193.4 million in property taxes paid by all of Missouri agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



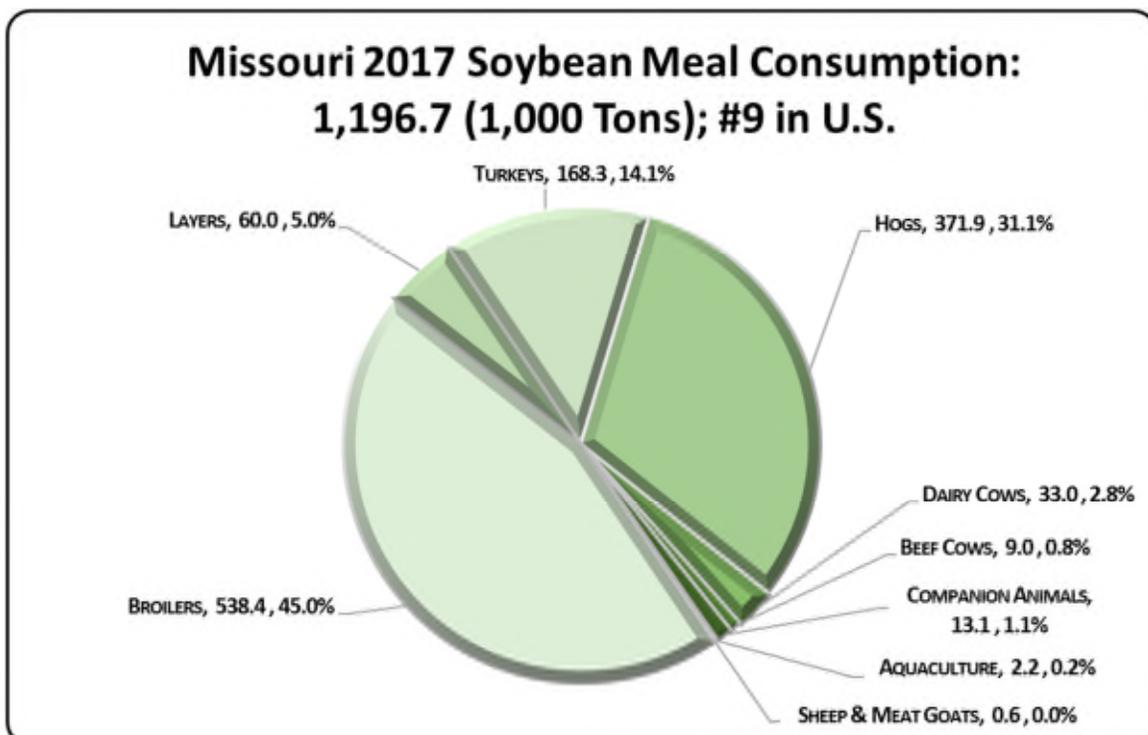
Missouri Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Missouri's animal agriculture consumed almost 1.2 million tons of soybean meal in 2017, placing the state as #9 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Missouri consumed 82,545 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (538.4 thousand tons)
- Hogs (371.9 thousand tons)
- Turkeys (168.3 thousand tons)

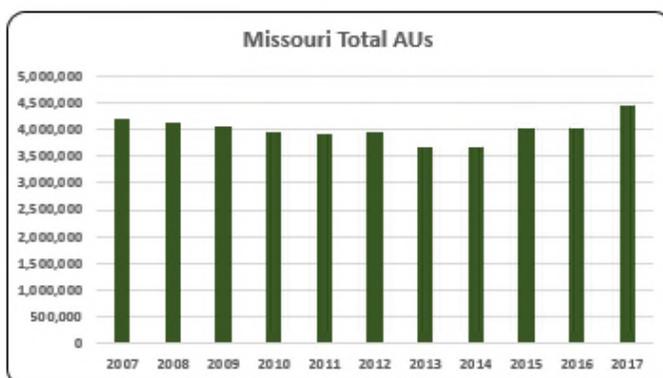
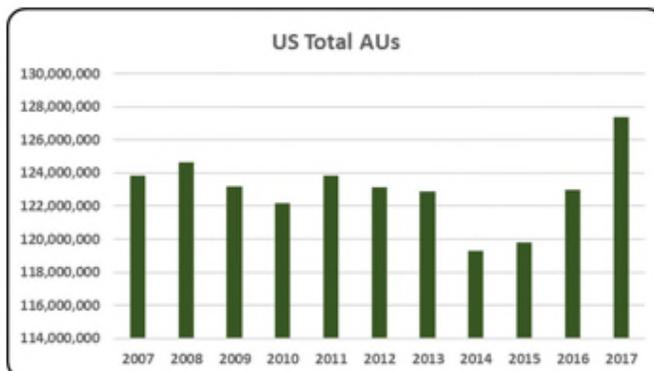


Missouri Animal Unit (AU) Trends

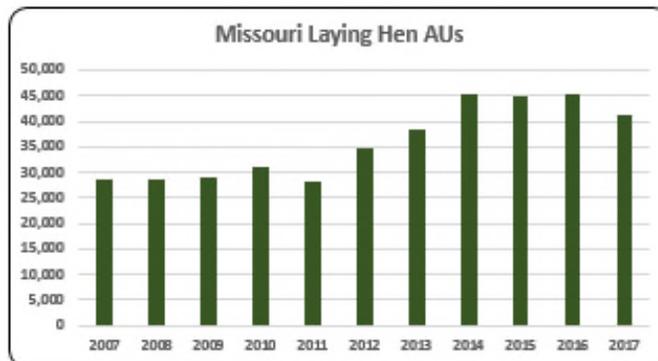
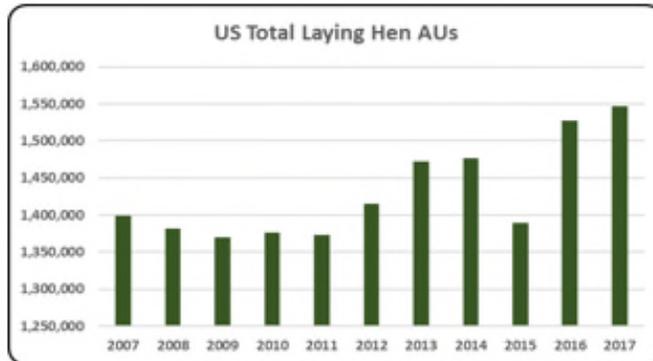
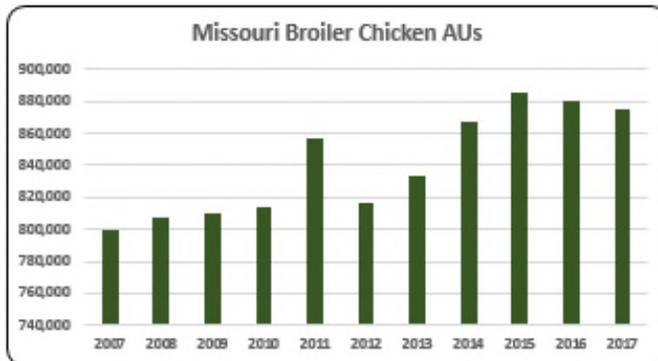
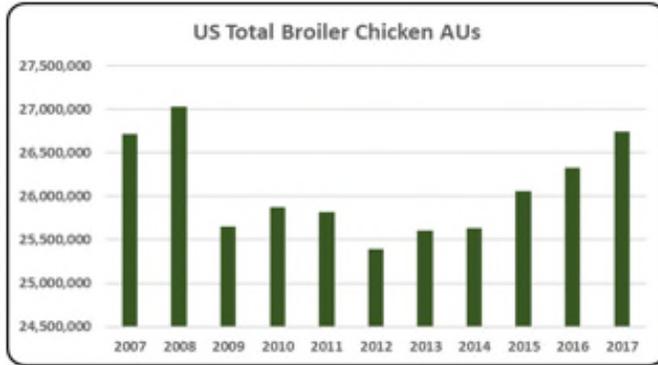
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Missouri. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

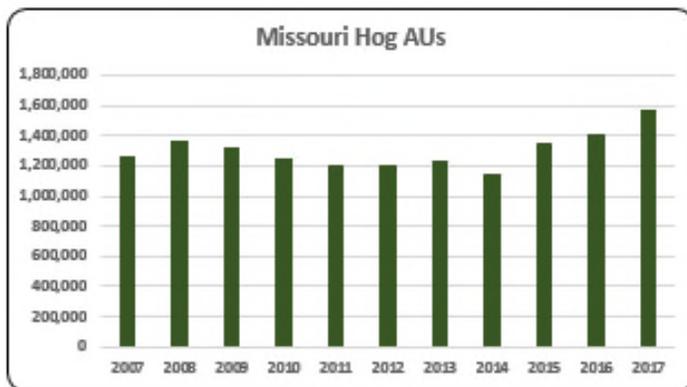
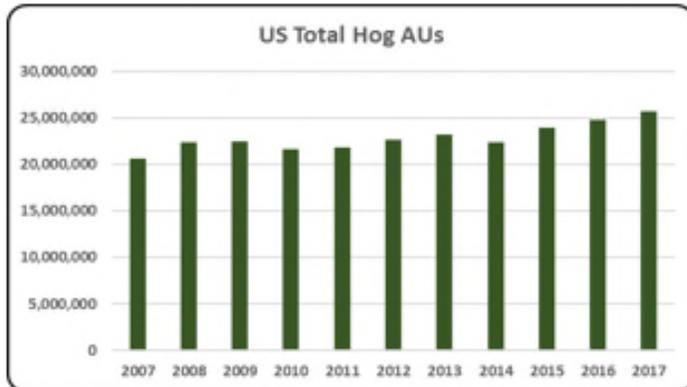
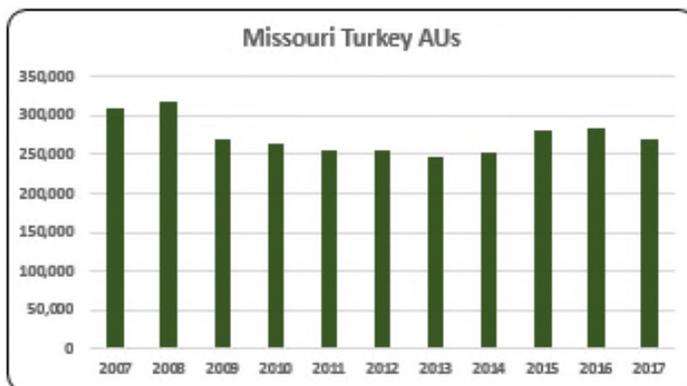
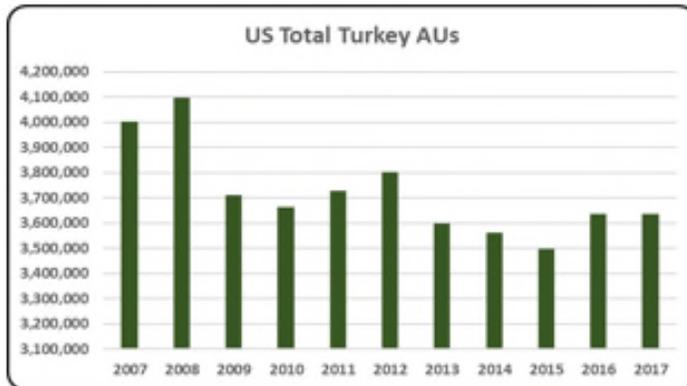
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Missouri, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (1.6 million AUs), Hogs (1.6 million AUs), and Broiler Chickens (874,896 AUs). Total animal units in Missouri during 2017 were 4.4 million AUs.



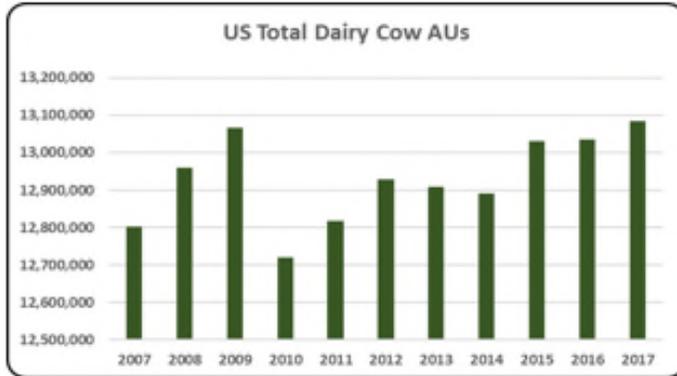
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The total AUs in Missouri in 2017 were 4.4 million. 35.4% of those AUs were from beef cows and about 35% were from hogs.



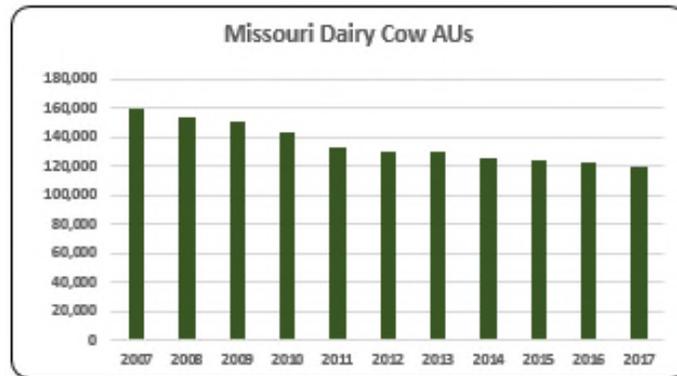
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- In 2017, there were 874,896 broiler AUs in Missouri. This is an increase of 9.4% since the beginning of the decade. Almost 20% of all broiler AUs in the U.S. were in Missouri in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens represented 0.92% of animal units in Missouri in 2017. Layer numbers have grown 44% from 2007 to 2017.



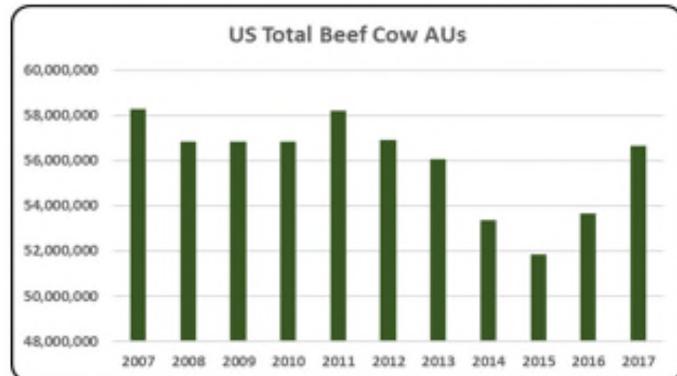
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- Turkey numbers had been decreasing throughout the decade but in 2015 and 2016 there was an increase in AUs, however AUs fell again in 2017 (269,017). About 7.4% of all turkey AUs in the country were in Missouri in 2017.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs rose 24% from the beginning of the decade to 1.6 million hog AUs in 2017 and established a new record high hog AU level in Missouri.



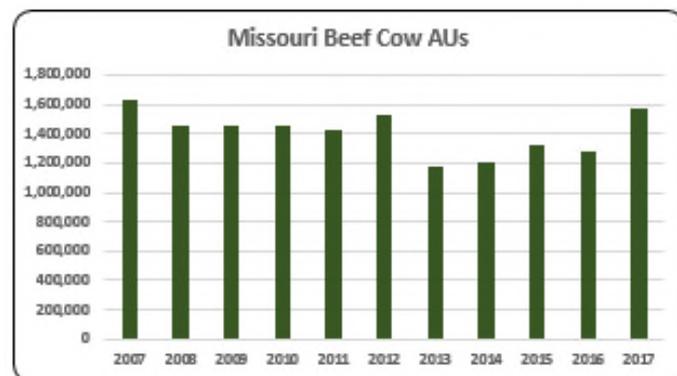
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- The average number of dairy cow AUs during 2007-2017 was 135,800. In general, Missouri dairy cow numbers have trended downward during the decade to 119,000 in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- There were 1.6 million beef cow AUs in 2017. Beef cow AUs have decreased 4% since the beginning of the decade.

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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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,637,700	1,456,950	1,456,950	1,456,950	1,425,450	1,522,500	1,183,050	1,205,850	1,325,850	1,276,650	1,573,800
	Hog and Pig AUs	1,264,950	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
	Broiler AUs	800,087	806,764	809,692	814,422	856,891	816,372	833,767	867,096	885,443	880,671	874,896
	Turkey AUs	309,534	317,039	271,084	263,316	255,619	255,635	246,209	253,272	282,516	285,149	269,017
	Egg Layer AUs	28,512	28,472	29,176	30,840	28,112	34,791	38,394	45,185	44,693	45,138	41,112
	Dairy AUs	159,600	154,000	151,200	142,800	133,000	130,200	130,200	126,000	124,600	123,200	119,000
	Total Animal Units	4,200,383	4,124,025	4,047,702	3,957,618	3,907,172	3,961,073	3,669,644	3,650,529	4,010,327	4,020,987	4,448,324
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,320,059	\$ 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
	Hogs and Pigs (\$1,000)	\$ 716,030	\$ 759,846	\$ 674,301	\$ 698,685	\$ 934,293	\$ 905,013	\$ 960,080	\$ 1,213,765	\$ 936,086	\$ 881,665	\$ 915,948
	Broilers (\$1,000)	\$ 263,961	\$ 351,426	\$ 428,727	\$ 510,928	\$ 628,371	\$ 651,850	\$ 808,221	\$ 882,118	\$ 760,786	\$ 686,265	\$ 775,962
	Turkeys (\$1,000)	\$ 361,620	\$ 357,236	\$ 273,268	\$ 327,095	\$ 367,587	\$ 404,642	\$ 347,670	\$ 403,644	\$ 489,025	\$ 515,546	\$ 397,920
	Eggs (\$1,000)	\$ 128,026	\$ 173,788	\$ 133,665	\$ 160,143	\$ 173,429	\$ 173,312	\$ 225,228	\$ 302,887	\$ 421,325	\$ 189,889	\$ 201,090
	Milk (\$1,000)	\$ 325,532	\$ 305,235	\$ 203,840	\$ 239,870	\$ 287,316	\$ 264,704	\$ 276,545	\$ 340,218	\$ 252,525	\$ 212,940	\$ 231,880
	Other	\$ 12,519	\$ 12,438	\$ 13,069	\$ 14,745	\$ 14,433	\$ 14,878	\$ 15,180	\$ 14,167	\$ 15,013	\$ 14,991	\$ 17,279
	Sheep and Lambs (\$1,000)	\$ 5,302	\$ 5,184	\$ 5,778	\$ 7,418	\$ 7,069	\$ 7,478	\$ 7,743	\$ 6,693	\$ 7,502	\$ 7,444	\$ 7,898
	Aquaculture (\$1,000)	\$ 7,217	\$ 7,254	\$ 7,291	\$ 7,327	\$ 7,364	\$ 7,400	\$ 7,437	\$ 7,474	\$ 7,510	\$ 7,547	\$ 9,381
	Total (\$1,000)	\$ 3,127,747	\$ 3,235,309	\$ 2,893,793	\$ 3,200,852	\$ 3,979,041	\$ 4,007,259	\$ 4,202,224	\$ 5,207,341	\$ 4,910,202	\$ 4,167,918	\$ 4,404,177

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	49,947	48,441	44,336	40,724	
	Cattle feedlots (112112)	2,024	3,029	1,300	730	
	Dairy cattle and milk production (11212)	2,599	2,664	1,705	1,153	
	Hog and pig farming (1122)	2,444	1,469	1,056	689	
	Poultry and egg production (1123)	1,162	1,362	2,245	1,645	
	Sheep and goat farming (1124)	646	922	1,595	2,086	
	Animal aquaculture and other animal production (1125,1129)	3,859	8,047	9,216	7,265	
Value of Sales (\$1,000)	Cattle and Calves	1,143,320	1,285,288	1,676,632	1,968,617	
	Hogs and Pigs	841,644	570,551	725,738	882,526	
	Poultry and Eggs	755,708	784,986	1,265,166	1,441,676	
	Milk and Other Dairy Products	293,411	300,460	302,684	246,358	
	Aquaculture	5,374	11,107	9,506	10,256	
	Other (calculated)	36,613	38,417	38,262	25,866	
	Total	3,076,070	2,990,809	4,017,988	4,575,299	
Input Purchases	Livestock and poultry purchased	(Farms) 29,162	30,120	25,620	27,112	
		\$1,000	574,610	546,196	761,333	906,474
	Breeding livestock purchased	(Farms) <i>n/a</i>	19,512	17,469	18,367	
		\$1,000	<i>n/a</i>	97,217	142,362	209,880
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	14,508	11,591	12,517	
		\$1,000	<i>n/a</i>	448,979	618,971	696,594
	Feed purchased	(Farms) 61,570	69,368	59,938	63,616	
	\$1,000	1,056,896	1,136,939	1,383,506	1,989,225	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 4,715,982	\$ 935,777	25,847	\$ 219,440
	Hogs, Pigs, and Other	\$ 1,708,646	\$ 380,850	11,305	\$ 89,309
	Poultry and Eggs	\$ 4,203,427	\$ 868,157	23,621	\$ 203,583
	Dairy	\$ 568,523	\$ 124,450	3,816	\$ 29,184
	Total	\$ 11,196,578	\$ 2,309,235	64,589	\$ 541,515
Change from 2007 to 2017	Cattle and Calves	\$ 796,197	\$ 157,987	4,364	\$ 37,048
	Hogs, Pigs, and Other	\$ 143,016	\$ 31,878	946	\$ 7,475
	Poultry and Eggs	\$ 1,499,343	\$ 309,668	8,425	\$ 72,617
	Dairy	\$ (368,271)	\$ (80,615)	(2,472)	\$ (18,904)
	Total	\$ 2,070,286	\$ 418,918	11,263	\$ 98,236
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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.8%	
	Total			23.5%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 factor 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 2017 animal agriculture contributed:

- \$3.4 billion in economic output
- 22,448 jobs
- \$709.8 million in earnings
- \$167.9 million in income taxes paid at local, state, and federal levels
- \$126.6 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Montana has increased economic output by over \$287.4 million, boosted household earnings by \$58.0 million, contributed 1,902 additional jobs and paid \$13.7 million in additional tax revenues.

Montana's animal agriculture consumed almost 61.3 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (24.1 thousand tons)
- Broilers (11.1 thousand tons)
- Egg-Laying Hens (10.0 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 2017, Montana's animal agriculture contributed the following to the economy:

- About \$3.4 billion in economic output
- \$709.8 million in household earnings
- 22,448 jobs
- \$167.9 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:

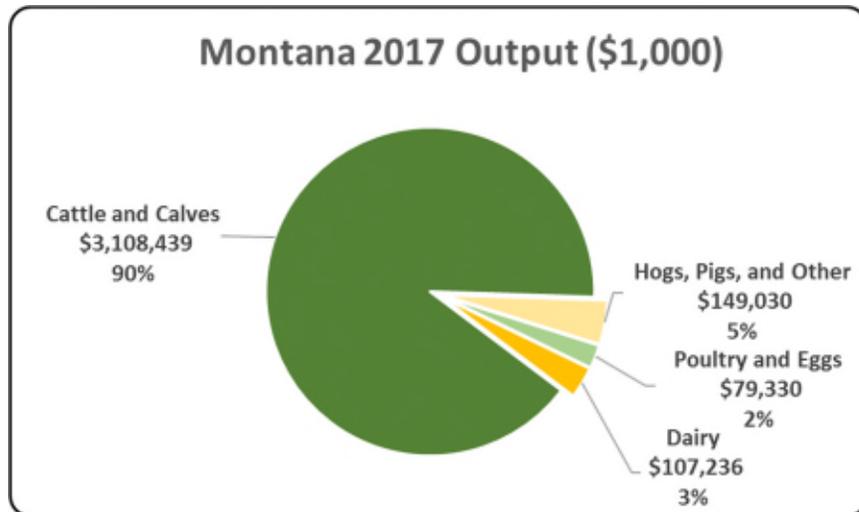
- Increased economic output by \$287.4 million
- Boosted household earnings by \$58.0 million
- Added 1,902 jobs
- Paid an additional \$13.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 3,444,035	\$ 287,446	9.11%
Earnings (\$1,000)	\$ 709,757	\$ 57,968	8.89%
Employment (Jobs)	22,448	1,902	9.26%
Income Taxes Paid (\$1,000)	\$ 167,858	\$ 13,709	8.89%
Property Taxes Paid in 2012 (\$1,000)	\$ 126,644		

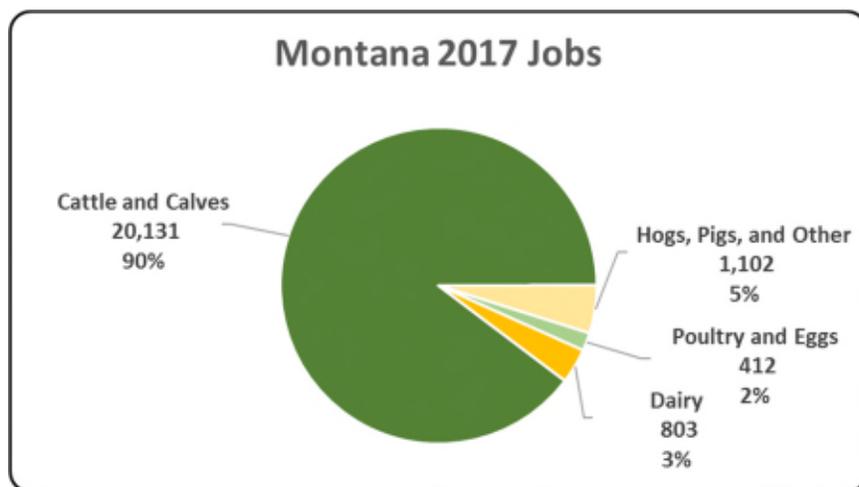
Montana Output

“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 \$3.4 billion.



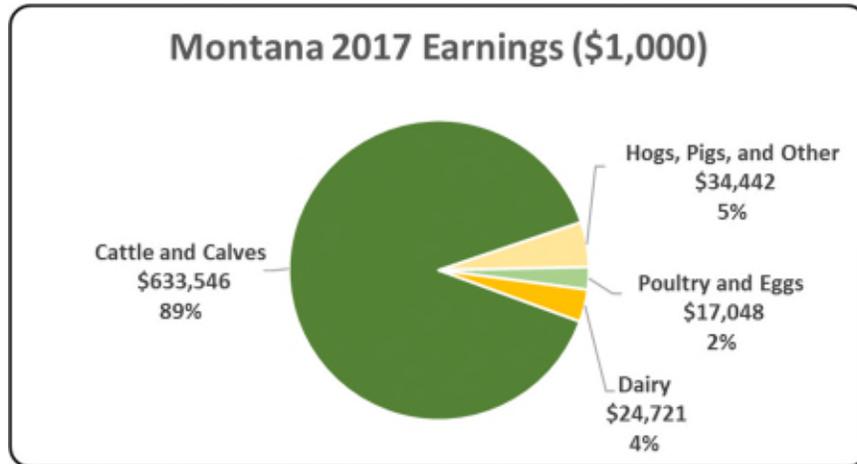
Montana Jobs

“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 22,448 jobs within and outside of animal agriculture.



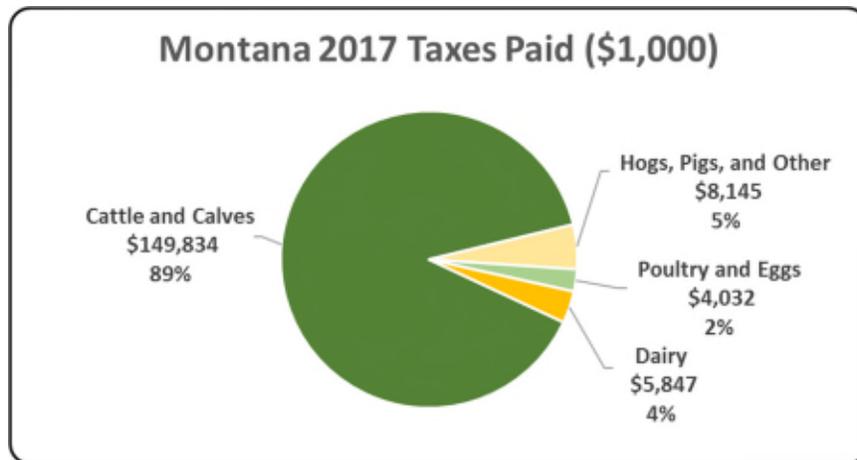
Montana Earnings

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 \$709.8 million to household earnings in 2017.



Montana Taxes Paid by Animal Agriculture

Montana’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$167.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$126.6 million in property taxes paid by all of Montana agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



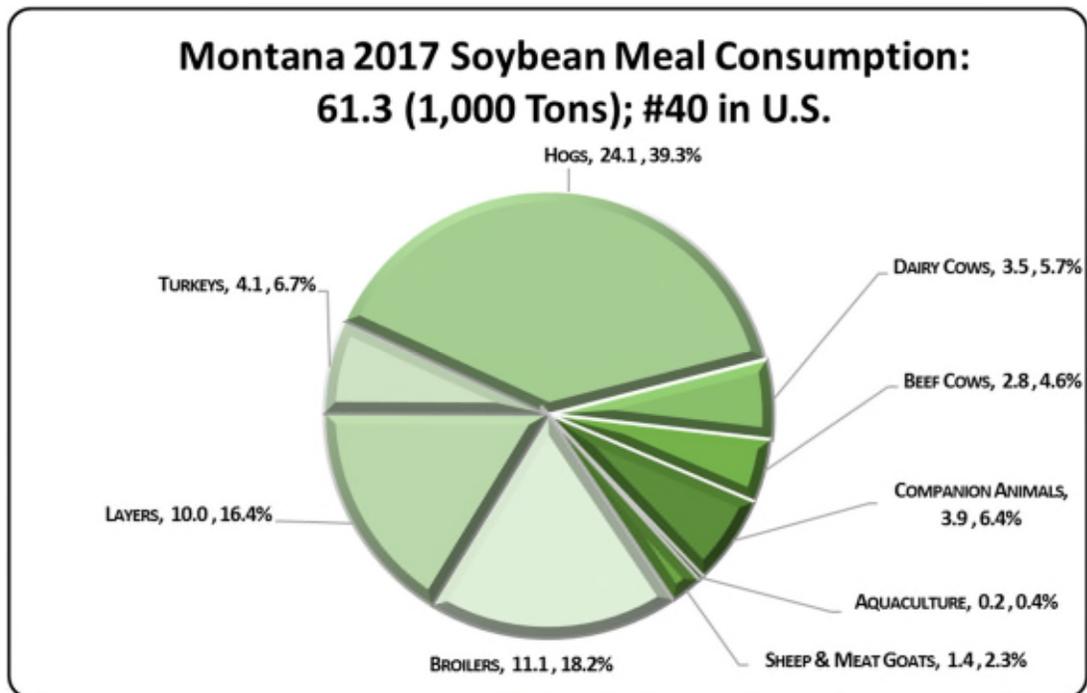
Montana Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Montana's animal agriculture consumed almost 61.3 thousand tons of soybean meal in 2017, placing the state as #40 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Montana consumed 13,952 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (24.1 thousand tons)
- Broilers (11.1 thousand tons)
- Egg-Laying Hens (10.0 thousand tons)

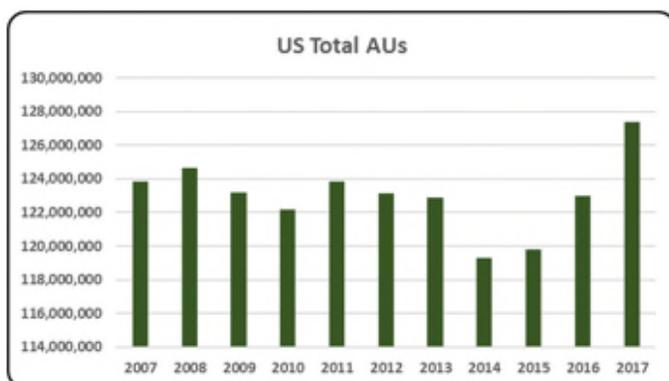


Montana Animal Unit (AU) Trends

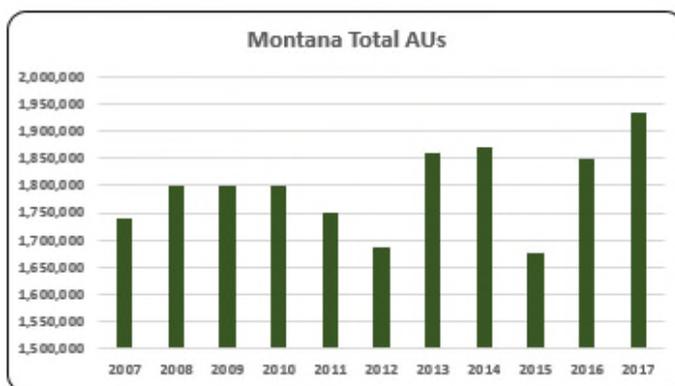
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Montana. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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 Montana and to give perspective on Montana'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.

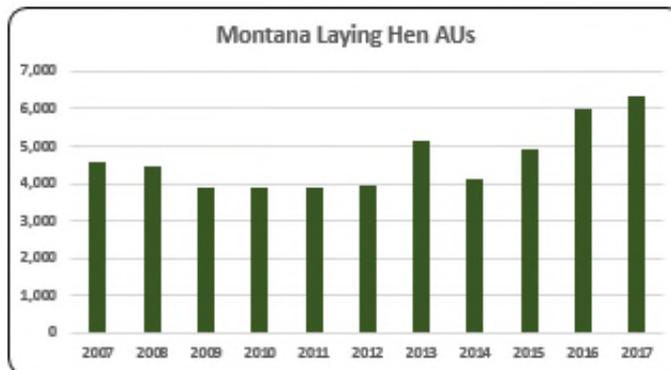
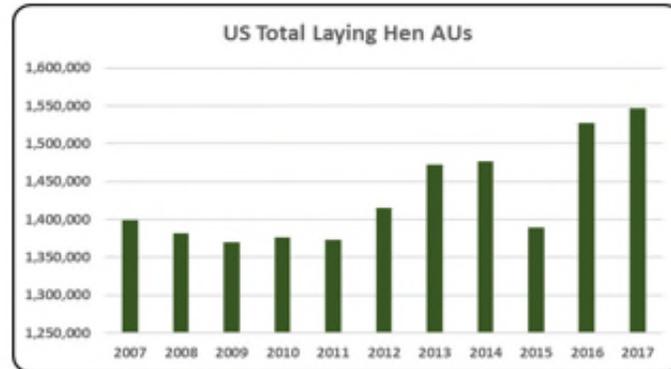
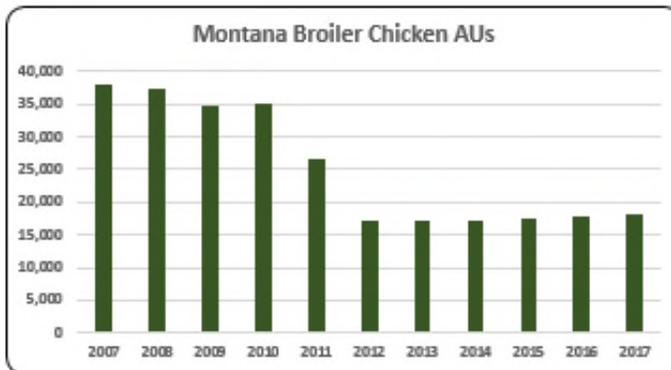
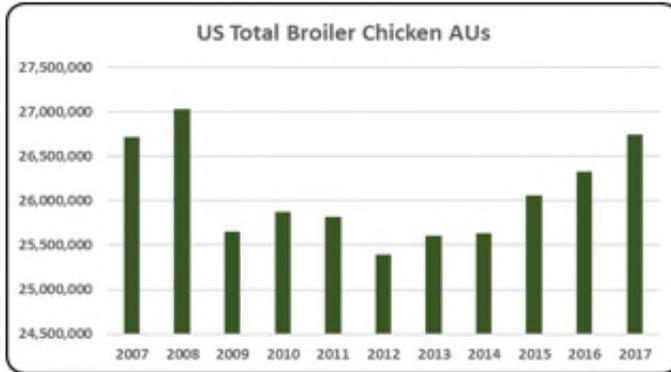
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Montana, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (1.8 million AUs), Hogs (76,125 AUs), and Dairy Cows (19,600 AUs). Total animal units in Montana during 2017 were 1.9 million AUs.



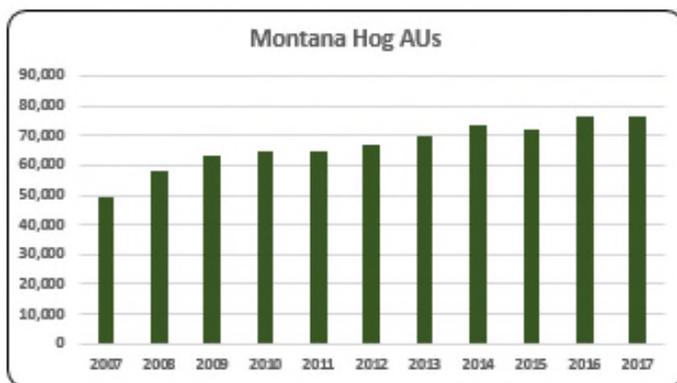
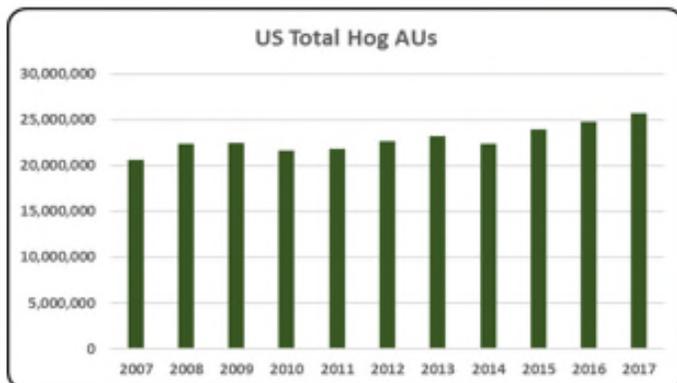
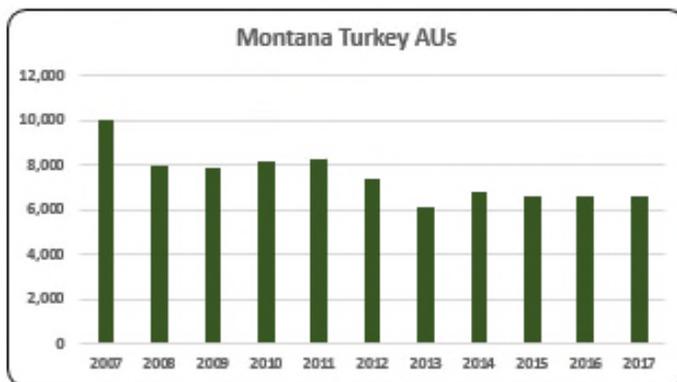
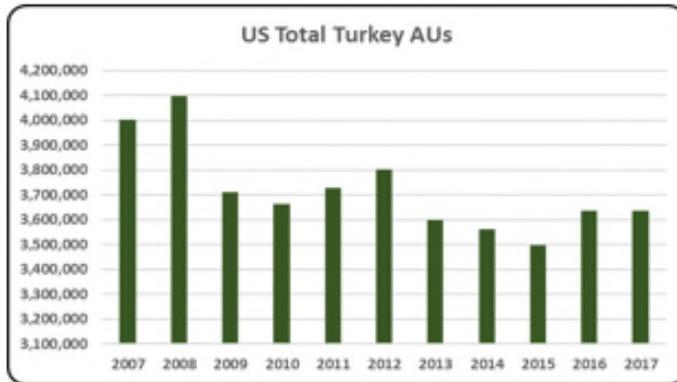
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.



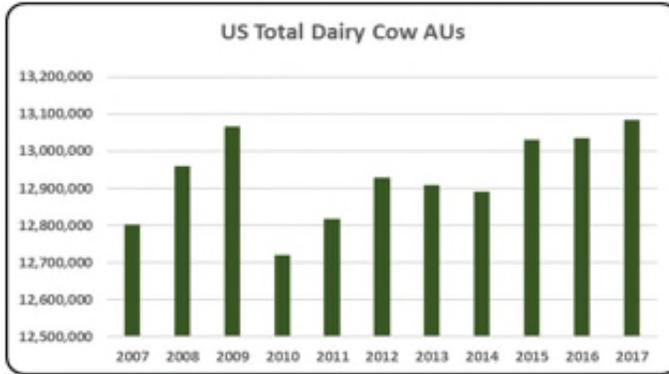
- Total AU numbers in Montana shifted irregularly during the decade with 1.9 million in 2017. This is the highest AUs measure of the decade.



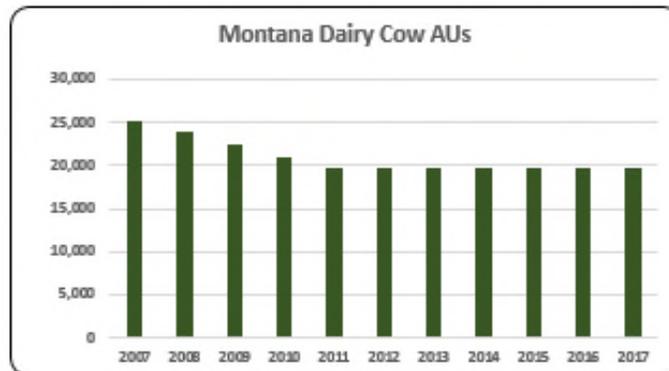
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There has been a sharp decline of 53% in broiler AUs in Montana to 18,001 broiler AUs in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Only 0.3% (6,316) of all animal units in Montana came from layers in 2017. On average from 2007 to 2017, there has been 4,655 laying hen AUs in the state.



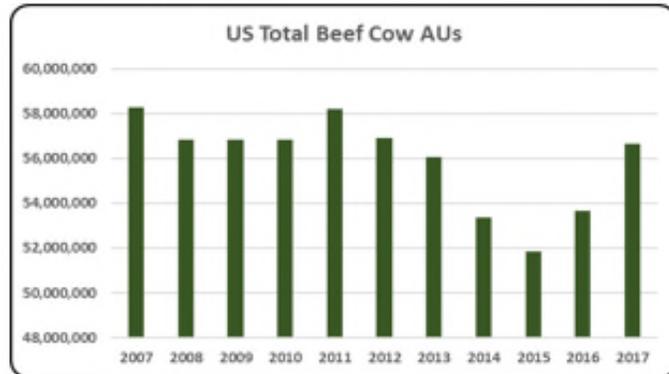
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- 2007 was a record year in turkey numbers in Montana with 10,027 turkey AUs. In 2017 there were only 6,576 AUs in the state.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog numbers represented about 3.94% of animal units in 2017. Hog AUs increased 54% to 76,125 hog AUs in 2017 relative to 2007.



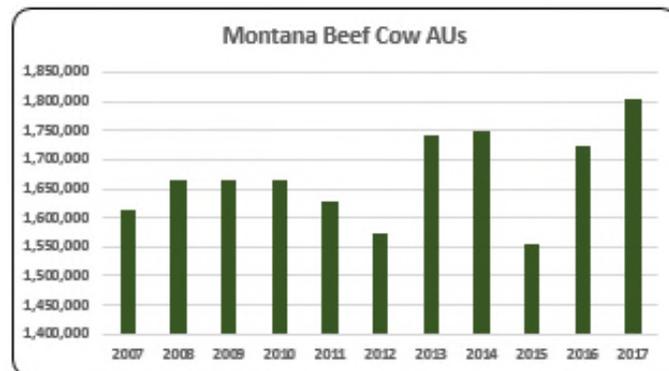
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cows in Montana have remained at an estimated 19,600 for the last 7 years. However, this is a 22% decrease from 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- About 93.5% (1.8 million) of all AUs in 2017 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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.

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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 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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,613,250	1,666,500	1,666,500	1,666,500	1,628,550	1,571,700	1,740,000	1,750,200	1,554,525	1,723,725	1,805,625	
	Hog and Pig AUs	49,170	58,170	63,150	64,350	64,815	67,170	69,630	73,695	72,000	76,200	76,125	
	Broiler AUs	37,894	37,303	34,683	35,149	26,485	17,330	17,270	17,172	17,615	17,748	18,001	
	Turkey AUs	10,027	8,014	7,850	8,177	8,323	7,371	6,149	6,788	6,642	6,619	6,576	
	Egg Layer AUs	4,594	4,463	3,904	3,878	3,900	3,975	5,146	4,101	4,934	5,993	6,316	
	Dairy AUs	25,200	23,800	22,400	21,000	19,600	19,600	19,600	19,600	19,600	19,600	19,600	19,600
	Total Animal Units	1,740,134	1,798,250	1,798,487	1,799,054	1,751,674	1,687,146	1,857,795	1,871,555	1,675,316	1,849,885	1,932,243	
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 999,384	\$ 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	
	Hogs and Pigs (\$1,000)	\$ 37,104	\$ 35,785	\$ 33,794	\$ 43,709	\$ 54,381	\$ 58,332	\$ 61,604	\$ 71,353	\$ 60,010	\$ 49,679	\$ 54,303	
	Broilers (\$1,000)	\$ 29,244	\$ 29,877	\$ 25,778	\$ 26,938	\$ 23,584	\$ 17,268	\$ 21,041	\$ 22,074	\$ 19,257	\$ 17,122	\$ 20,105	
	Turkeys (\$1,000)	\$ 8,991	\$ 10,970	\$ 10,397	\$ 16,798	\$ 13,209	\$ 14,202	\$ 10,294	\$ 6,810	\$ 6,217	\$ 7,030	\$ 4,760	
	Eggs (\$1,000)	\$ 8,059	\$ 9,567	\$ 6,890	\$ 6,619	\$ 8,682	\$ 8,642	\$ 10,705	\$ 12,965	\$ 22,500	\$ 7,870	\$ 11,192	
	Milk (\$1,000)	\$ 62,271	\$ 59,470	\$ 43,654	\$ 48,841	\$ 57,312	\$ 53,820	\$ 55,726	\$ 66,220	\$ 44,551	\$ 46,610	\$ 50,400	
	Other	\$ 18,714	\$ 17,026	\$ 18,453	\$ 22,522	\$ 23,486	\$ 33,867	\$ 26,023	\$ 24,125	\$ 30,443	\$ 30,649	\$ 36,024	
	Sheep and Lambs (\$1,000)	\$ 18,427	\$ 16,747	\$ 18,182	\$ 22,259	\$ 23,231	\$ 33,619	\$ 25,783	\$ 23,893	\$ 30,418	\$ 30,433	\$ 29,835	
	Aquaculture (\$1,000)	\$ 287	\$ 279	\$ 271	\$ 263	\$ 256	\$ 248	\$ 240	\$ 232	\$ 225	\$ 217	\$ 6,189	
	Total (\$1,000)	\$ 1,163,766	\$ 1,038,312	\$ 912,350	\$ 1,207,111	\$ 1,288,354	\$ 1,449,731	\$ 1,544,212	\$ 1,954,383	\$ 1,842,831	\$ 1,454,960	\$ 1,491,468	

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,373	9,859	9,804	8,703	
	Cattle feedlots (112112)	265	355	244	162	
	Dairy cattle and milk production (11212)	128	136	138	75	
	Hog and pig farming (1122)	163	142	118	88	
	Poultry and egg production (1123)	68	131	398	206	
	Sheep and goat farming (1124)	726	687	606	576	
	Animal aquaculture and other animal production (1125,1129)	1,982	4,500	5,294	5,261	
Value of Sales (\$1,000)	Cattle and Calves	831,621	1,015,169	1,368,699	1,783,908	
	Hogs and Pigs	33,029	26,531	36,331	54,091	
	Poultry and Eggs	5,665	5,243	7,975	withheld	
	Milk and Other Dairy Products	36,528	41,842	54,761	44,671	
	Aquaculture	withheld	4,185	3,188	3,172	
	Other (calculated)	62,460	55,821	58,386	31,233	
	Total	969,303	1,148,791	1,529,340	1,917,075	
Input Purchases	Livestock and poultry purchased	(Farms) 8,433	7,935	7,287	8,619	
		\$1,000	153,915	207,332	291,561	365,896
	Breeding livestock purchased	(Farms) withheld	5,514	5,523	6,466	
		\$1,000	withheld	41,400	90,394	117,977
	Other livestock and poultry purchased	(Farms) withheld	3,700	2,996	3,507	
		\$1,000	withheld	165,932	201,167	247,919
Feed purchased	(Farms) 13,389	15,381	13,716	16,861		
	\$1,000	153,271	192,619	219,242	439,672	

2017 Animal Agriculture	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 3,108,439	\$ 633,546	20,131	\$ 149,834
Hogs, Pigs, and Other	\$ 149,030	\$ 34,442	1,102	\$ 8,145	
Poultry and Eggs	\$ 79,330	\$ 17,048	412	\$ 4,032	
Dairy	\$ 107,236	\$ 24,721	803	\$ 5,847	
Total	\$ 3,444,035	\$ 709,757	22,448	\$ 167,858	

Change from 2007 to 2017	Cattle and Calves	\$ 334,999	\$ 68,278	2,170	\$ 16,148
	Hogs, Pigs, and Other	\$ 40,938	\$ 9,461	303	\$ 2,238
	Poultry and Eggs	\$ (40,216)	\$ (8,642)	(209)	\$ (2,044)
	Dairy	\$ (48,275)	\$ (11,129)	(361)	\$ (2,632)
	Total	\$ 287,446	\$ 57,968	1,902	\$ 13,709

RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.0%
	Total	23.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$17.0 billion in economic output
- 74,844 jobs
- \$3.6 billion in earnings
- \$865.2 million in income taxes paid at local, state, and federal levels
- \$479.0 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Nebraska has increased economic output by over \$2.5 billion, boosted household earnings by \$518.8 million, contributed 11,003 additional jobs and paid \$126.3 million in additional tax revenues.

Nebraska's animal agriculture consumed almost 587.4 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (377.2 thousand tons)
- Egg-Laying Hens (70.4 thousand tons)
- Beef Cows (65.0 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 2017, Nebraska's animal agriculture contributed the following to the economy:

- About \$17.0 billion in economic output
- \$3.6 billion in household earnings
- 74,844 jobs
- \$865.2 million in income taxes

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

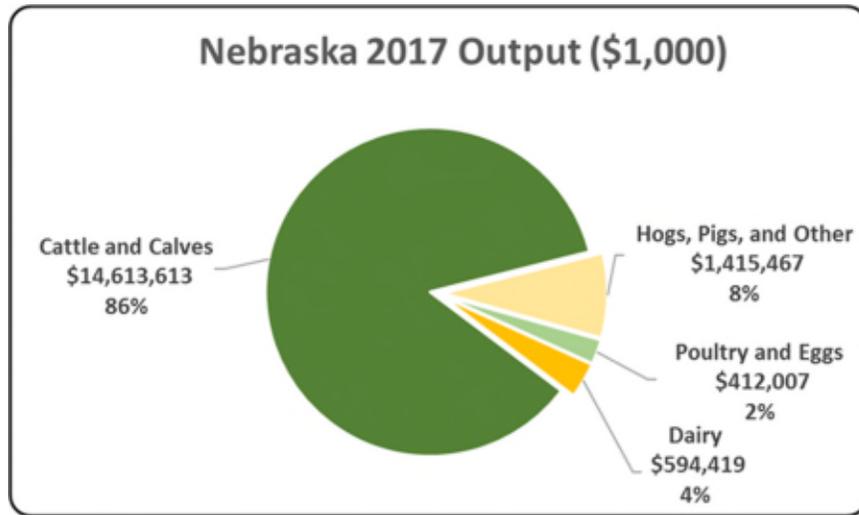
- Increased economic output by \$2.5 billion
- Boosted household earnings by \$518.8 million
- Added 11,003 jobs
- Paid an additional \$126.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 17,035,506	\$ 2,539,757	17.52%
Earnings (\$1,000)	\$ 3,553,322	\$ 518,794	17.10%
Employment (Jobs)	74,844	11,003	17.23%
Income Taxes Paid (\$1,000)	\$ 865,234	\$ 126,326	17.10%
Property Taxes Paid in 2012 (\$1,000)	\$ 478,972		

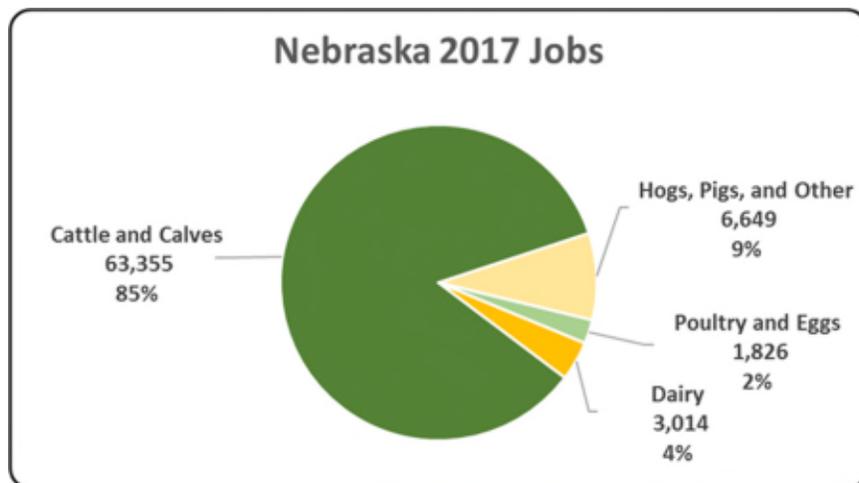
Nebraska Output

“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 \$17.0 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 74,844 jobs within and outside of animal agriculture.



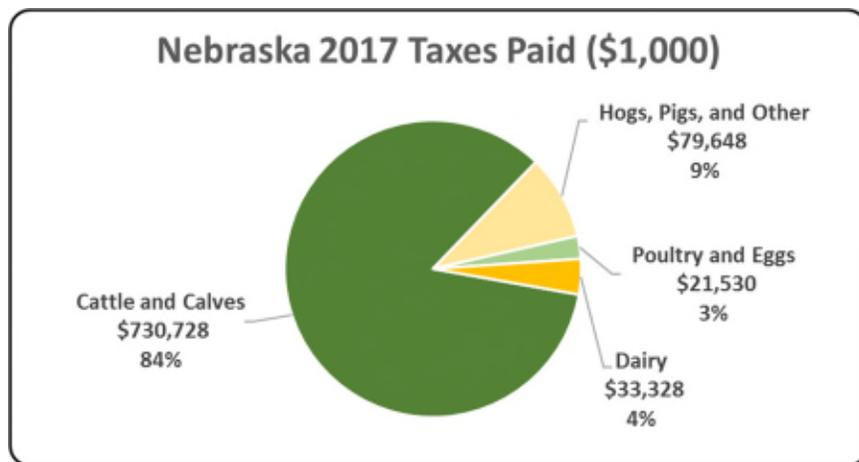
Nebraska Earnings

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 \$3.6 billion to household earnings in 2017.



Nebraska Taxes Paid by Animal Agriculture

Nebraska’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$865.2 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$479.0 million in property taxes paid by all of Nebraska agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



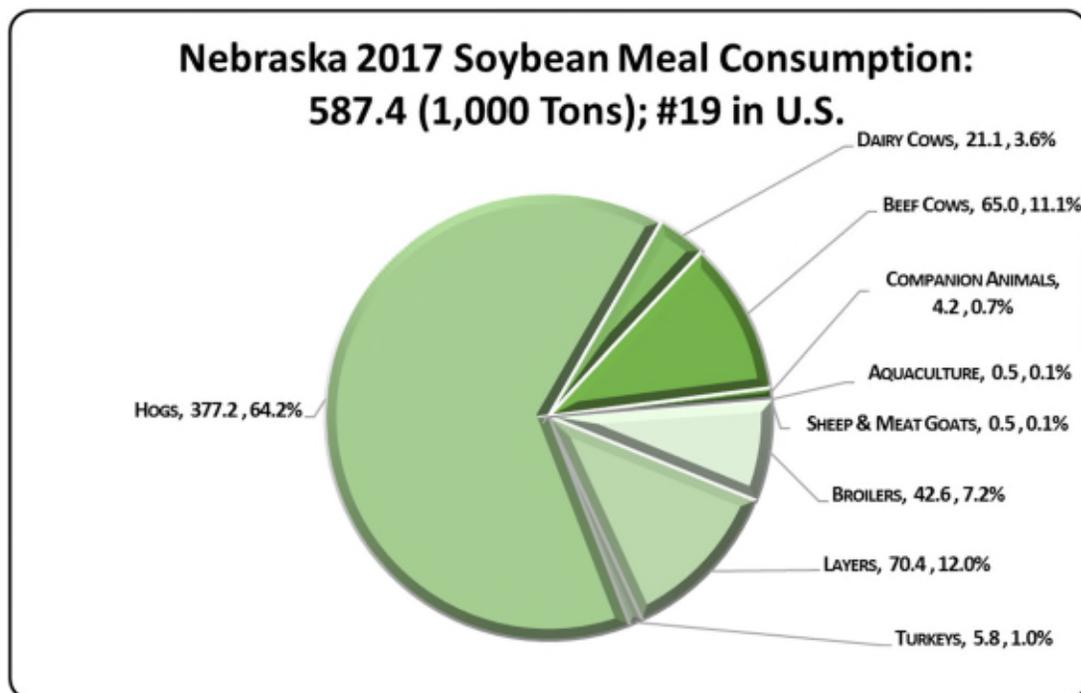
Nebraska Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Nebraska's animal agriculture consumed almost 587.4 thousand tons of soybean meal in 2017, placing the state as #19 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Nebraska consumed 322,925 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (377.2 thousand tons)
- Egg-Laying Hens (70.4 thousand tons)
- Beef Cows (65.0 thousand tons)

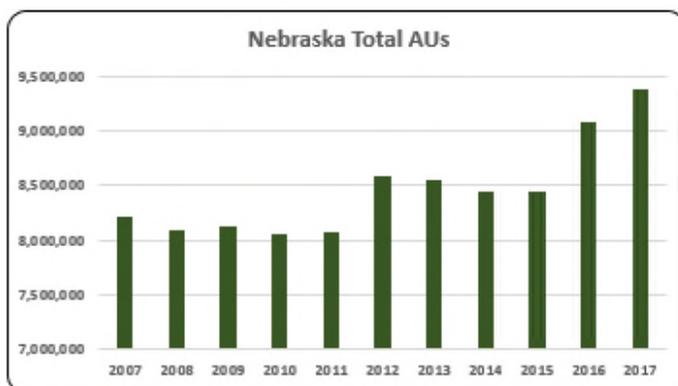
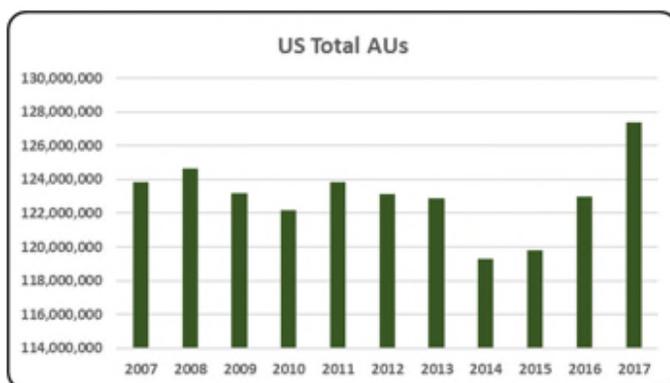


Nebraska Animal Unit (AU) Trends

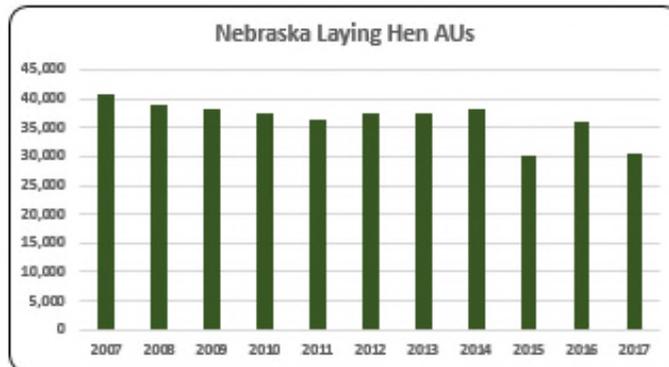
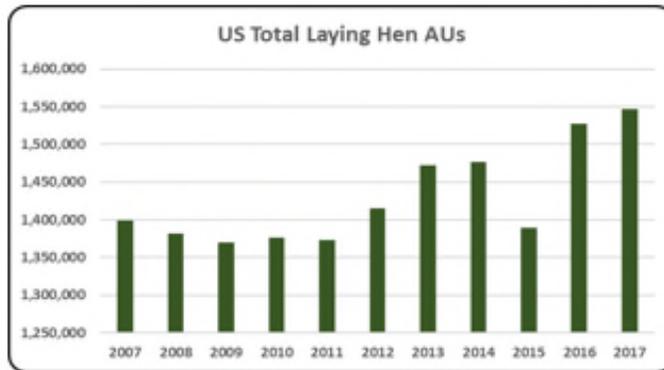
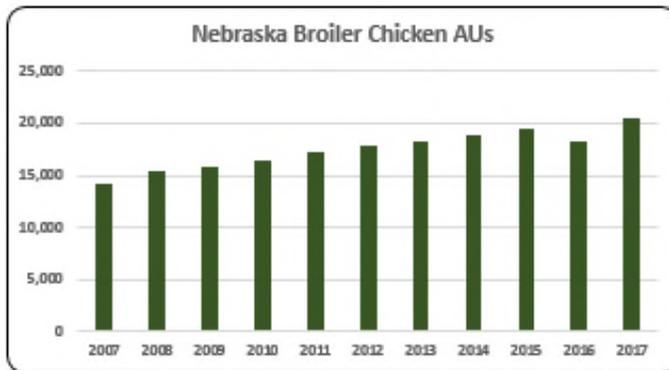
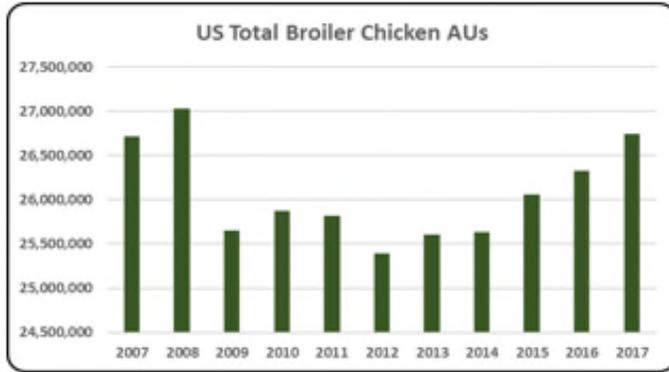
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Nebraska. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

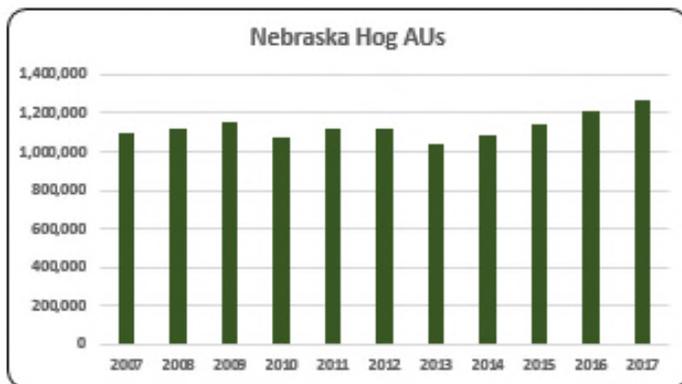
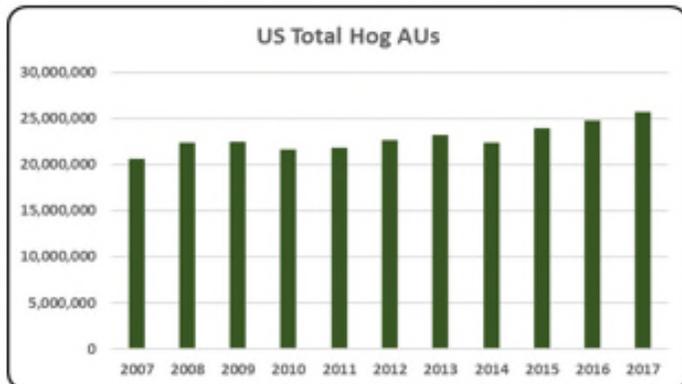
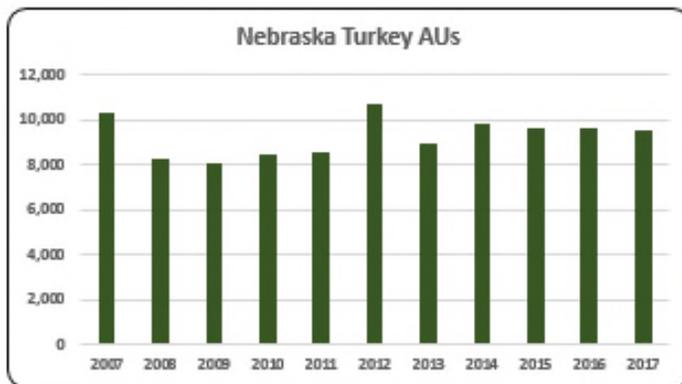
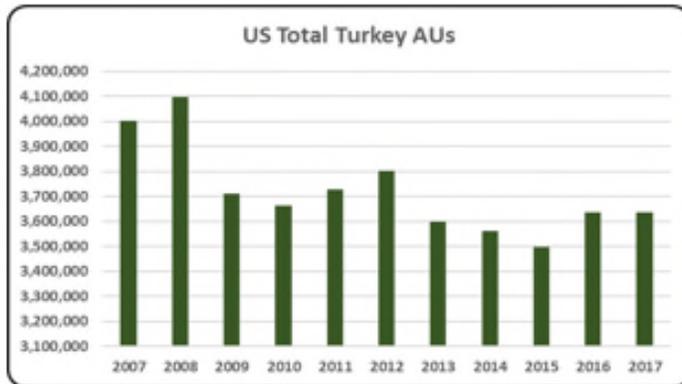
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Nebraska, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (8.0 million AUs), Hogs (1.3 million AUs), and Dairy Cows (84,000 AUs). Total animal units in Nebraska during 2017 were 9.4 million AUs.



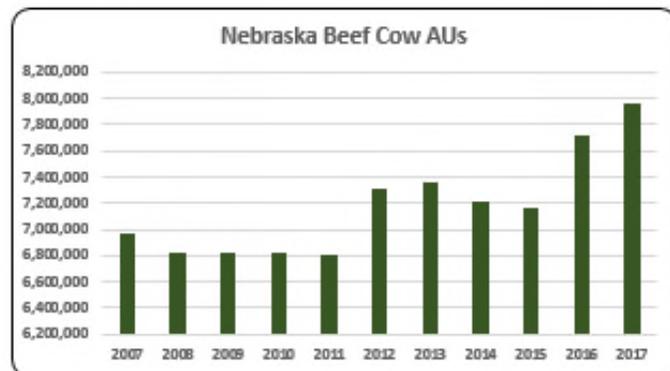
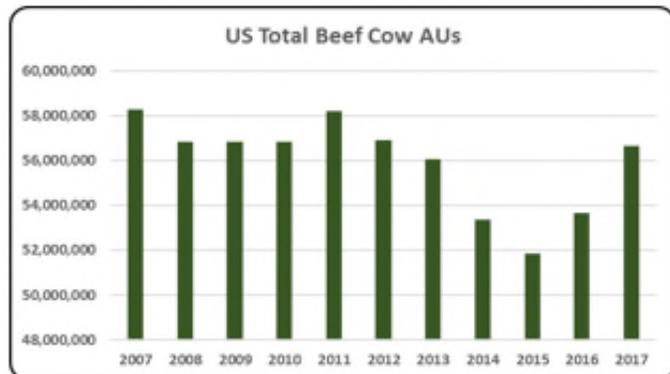
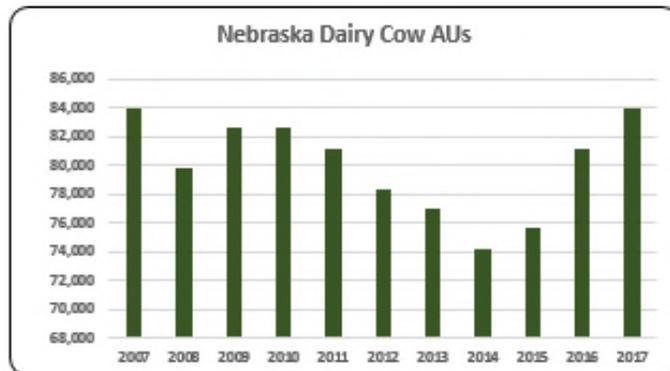
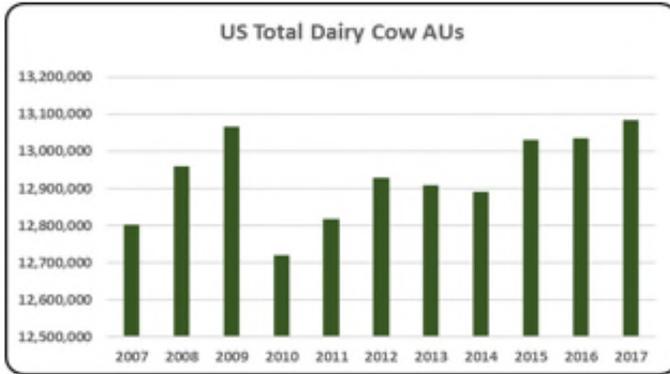
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The number of AUs in Nebraska in 2017 was 9.4 million. AUs have risen 14.2% during the 2007-2017 period.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broilers in Nebraska represented only 0.08% (20,497 broiler AUs) of all U.S. animal units in 2017. The average broiler AUs from 2007 to 2017 has been 17,467.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 0.3% (30,604) of all AUs in the state of Nebraska came from laying hens in 2017. Layer AUs have declined 25% since 2007.



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- From 2007 to 2017 Nebraska averaged about 9,287 turkey AUs remaining lower than the high record turkey production in 2012 (10,731 turkey AUs).
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- About 4.9% (1.3 million) of hog AUs in the U.S. came from Nebraska in 2017. Hog animal unit numbers in 2017 set a decade high in Nebraska.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- Dairy cows represented less than 1% (84,000 AUs) of all animal units in the state in 2017. Dairy cow numbers in 2017 are the same as they were in 2007. The decade low was in 2014 with 10,000 AUs less than this year.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- Beef cows in Nebraska represented 85% (8 million AUs) in 2017. The industry has climbed 14% since the beginning of the decade and represents 14% 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	6,965,850	6,827,850	6,827,850	6,827,850	6,813,900	7,318,650	7,367,100	7,220,550	7,160,550	7,723,350	7,969,800
	Hog and Pig AUs	1,102,350	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
	Broiler AUs	14,117	15,333	15,830	16,362	17,246	17,794	18,334	18,875	19,416	18,335	20,497
	Turkey AUs	10,340	8,265	8,096	8,433	8,583	10,731	8,952	9,883	9,669	9,637	9,574
	Egg Layer AUs	40,936	38,940	38,020	37,484	36,252	37,393	37,430	38,265	30,129	35,823	30,604
	Dairy AUs	84,000	79,800	82,600	82,600	81,200	78,400	77,000	74,200	75,600	81,200	84,000
	Total Animal Units	8,217,593	8,094,888	8,125,446	8,052,279	8,079,181	8,580,619	8,549,067	8,448,823	8,443,015	9,083,344	9,383,025
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 4,246,461	\$ 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
	Hogs and Pigs (\$1,000)	\$ 727,299	\$ 710,448	\$ 622,442	\$ 800,932	\$ 913,304	\$ 842,576	\$ 844,760	\$ 1,006,209	\$ 784,512	\$ 732,697	\$ 804,920
	Broilers (\$1,000)	\$ 12,330	\$ 9,615	\$ 5,676	\$ 3,305	\$ 13,635	\$ 14,344	\$ 14,967	\$ 15,168	\$ 14,795	\$ 14,523	\$ 15,015
	Turkeys (\$1,000)	\$ 12,202	\$ 14,888	\$ 14,110	\$ 17,323	\$ 13,621	\$ 14,646	\$ 10,616	\$ 7,023	\$ 9,051	\$ 10,235	\$ 6,930
	Eggs (\$1,000)	\$ 185,092	\$ 225,242	\$ 146,859	\$ 152,857	\$ 169,837	\$ 180,838	\$ 197,279	\$ 240,640	\$ 281,147	\$ 99,773	\$ 130,922
	Milk (\$1,000)	\$ 202,100	\$ 204,687	\$ 160,532	\$ 202,064	\$ 249,849	\$ 232,456	\$ 244,650	\$ 298,750	\$ 232,646	\$ 236,431	\$ 262,808
	Other	\$ 9,399	\$ 9,308	\$ 9,124	\$ 10,975	\$ 10,624	\$ 14,158	\$ 13,156	\$ 15,320	\$ 17,806	\$ 16,130	\$ 17,548
	Sheep and Lambs (\$1,000)	\$ 7,485	\$ 7,312	\$ 7,046	\$ 8,816	\$ 8,383	\$ 11,835	\$ 10,751	\$ 12,833	\$ 15,237	\$ 13,479	\$ 14,035
	Aquaculture (\$1,000)	\$ 1,914	\$ 1,996	\$ 2,078	\$ 2,159	\$ 2,241	\$ 2,323	\$ 2,405	\$ 2,487	\$ 2,569	\$ 2,651	\$ 3,513
	Total (\$1,000)	\$ 5,394,882	\$ 5,376,032	\$ 4,705,105	\$ 5,296,235	\$ 6,415,697	\$ 7,119,378	\$ 7,186,258	\$ 8,867,299	\$ 8,733,860	\$ 7,440,325	\$ 7,406,567

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	12,886	12,709	10,775	11,788	
	Cattle feedlots (112112)	2,371	2,511	1,534	1,083	
	Dairy cattle and milk production (11212)	603	507	267	247	
	Hog and pig farming (1122)	2,563	1,302	936	644	
	Poultry and egg production (1123)	149	173	489	282	
	Sheep and goat farming (1124)	428	464	558	837	
	Animal aquaculture and other animal production (1125,1129)	1,377	2,360	2,489	3,954	
Value of Sales (\$1,000)	Cattle and Calves	4,967,832	5,401,018	7,358,555	10,098,166	
	Hogs and Pigs	788,827	590,581	923,209	1,085,828	
	Poultry and Eggs	149,559	142,442	165,265	216,370	
	Milk and Other Dairy Products	124,134	148,941	172,066	219,724	
	Aquaculture	2,154	2,170	3,826	3,550	
	Other (calculated)	23,624	30,240	39,789	44,375	
	Total	6,056,130	6,315,392	8,662,710	11,668,013	
Input Purchases	Livestock and poultry purchased	(Farms)	19,837	16,074	13,253	16,094
		\$1,000	2,405,077	3,211,783	4,066,702	5,117,496
	Breeding livestock purchased	(Farms)	n/a	9,741	8,516	10,656
		\$1,000	n/a	90,966	175,943	251,297
	Other livestock and poultry purchased	(Farms)	n/a	9,173	6,927	8,217
		\$1,000	n/a	3,120,817	3,890,759	4,866,199
	Feed purchased	(Farms)	28,251	26,376	21,335	28,254
		\$1,000	1,408,802	1,490,523	2,045,635	3,981,917

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 14,613,613	\$ 3,000,938	63,355	\$ 730,728
	Hogs, Pigs, and Other	\$ 1,415,467	\$ 327,095	6,649	\$ 79,648
	Poultry and Eggs	\$ 412,007	\$ 88,418	1,826	\$ 21,530
	Dairy	\$ 594,419	\$ 136,870	3,014	\$ 33,328
	Total	\$ 17,035,506	\$ 3,553,322	74,844	\$ 865,234

Change from 2007 to 2017	Cattle and Calves	\$ 2,805,623	\$ 576,141	12,163	\$ 140,290
	Hogs, Pigs, and Other	\$ (72,646)	\$ (16,787)	(341)	\$ (4,088)
	Poultry and Eggs	\$ (251,120)	\$ (53,891)	(1,113)	\$ (13,123)
	Dairy	\$ 57,899	\$ 13,332	294	\$ 3,246
	Total	\$ 2,539,757	\$ 518,794	11,003	\$ 126,326

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	4.7%
	Total	24.4%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 Animal Agriculture: NEVADA

Nevada Executive Summary

The use of soybean meal as a key feed ingredient is an important 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's 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 2017 animal agriculture contributed:

- \$625.8 million in economic output
- 3,491 jobs
- \$129.8 million in earnings
- \$25.6 million in income taxes paid at local, state, and federal levels
- \$17.9 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Nevada has increased economic output by over \$140.0 million, boosted household earnings by \$28.3 million, contributed 767 additional jobs and paid \$5.6 million in additional tax revenues.

Nevada's animal agriculture consumed almost 24.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (7.2 thousand tons)
- Broilers (5.1 thousand tons)
- Companion Animals (4.2 thousand 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 minor contributor to the economic well-being of the people of Nevada and beyond.

Nevada Economic Impact of Animal Agriculture

Animal agriculture is a modest part of Nevada's economy. In 2017, Nevada's animal agriculture contributed the following to the economy:

- About \$625.8 million in economic output
- \$129.8 million in household earnings
- 3,491 jobs
- \$25.6 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:

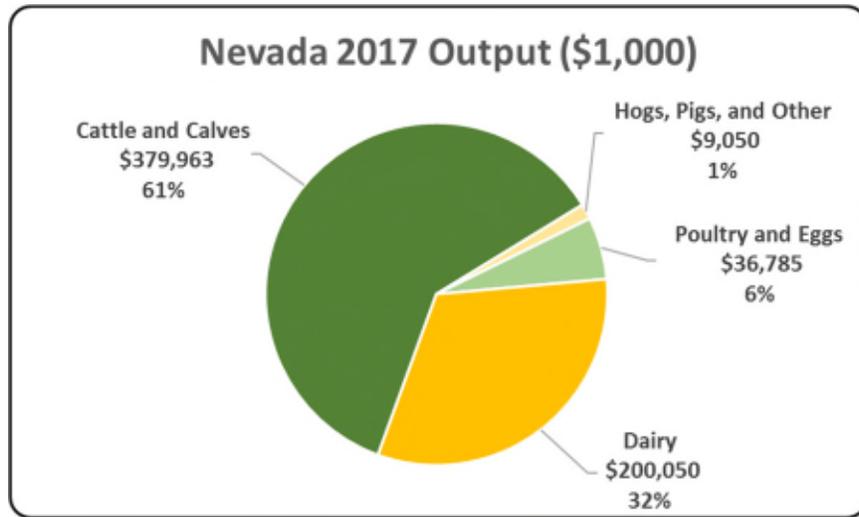
- Increased economic output by \$140.0 million
- Boosted household earnings by \$28.3 million
- Added 767 jobs
- Paid an additional \$5.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 625,848	\$ 140,038	28.83%
Earnings (\$1,000)	\$ 129,801	\$ 28,276	27.85%
Employment (Jobs)	3,491	767	28.17%
Income Taxes Paid (\$1,000)	\$ 25,571	\$ 5,570	27.85%
Property Taxes Paid in 2012 (\$1,000)	\$ 17,948		

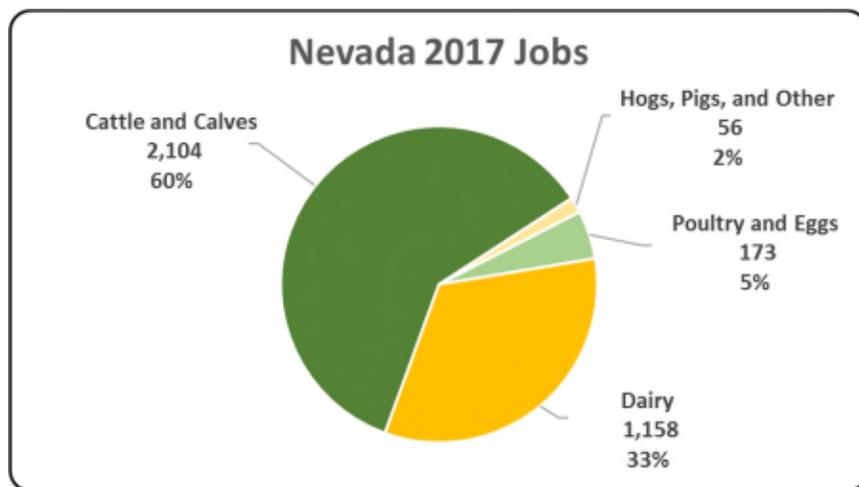
Nevada Output

“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 \$625.8 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 3,491 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 \$129.8 million to household earnings in 2017.



Nevada Taxes Paid by Animal Agriculture

Nevada’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$25.6 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$17.9 million in property taxes paid by all of Nevada agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



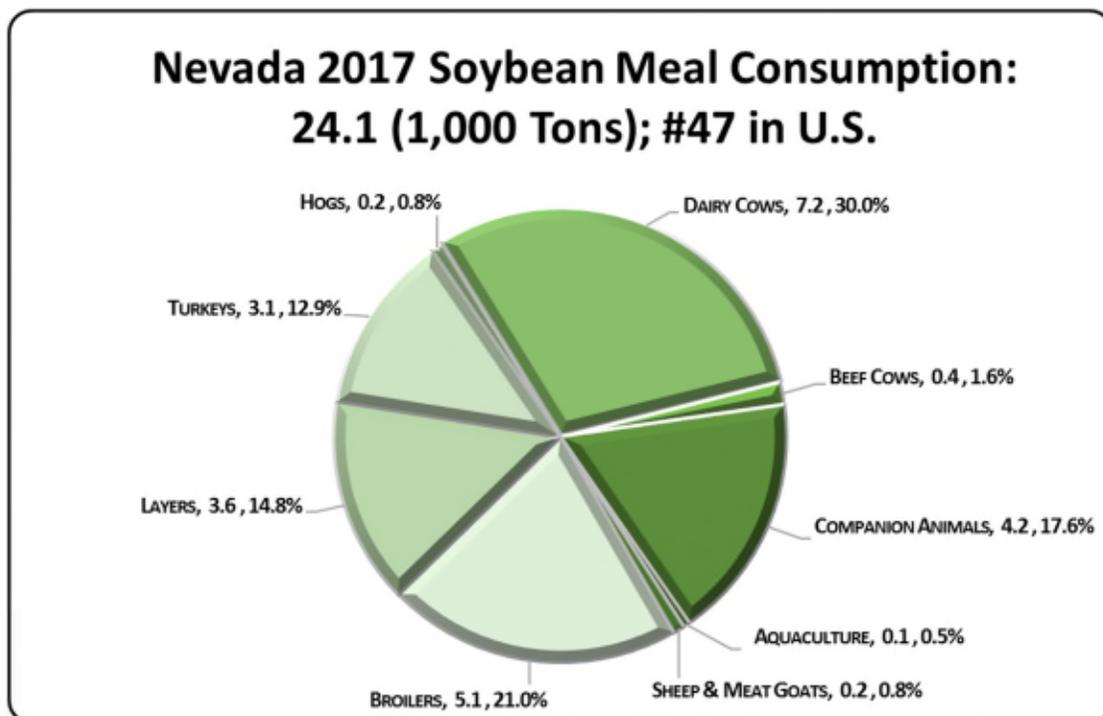
Nevada Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Nevada's animal agriculture consumed almost 24.1 thousand tons of soybean meal in 2017, placing the state as #47 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Nevada consumed 2,352 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (7.2 thousand tons)
- Broilers (5.1 thousand tons)
- Companion Animals (4.2 thousand tons)

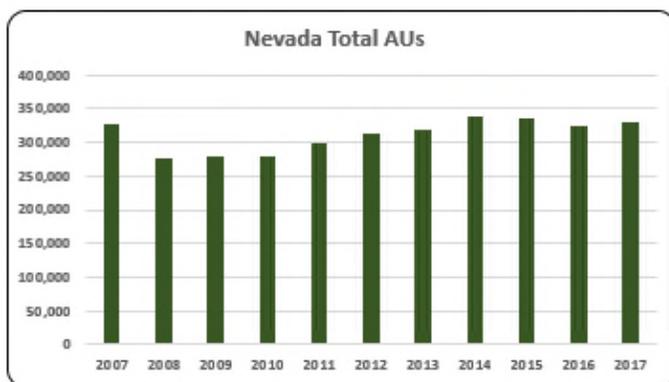
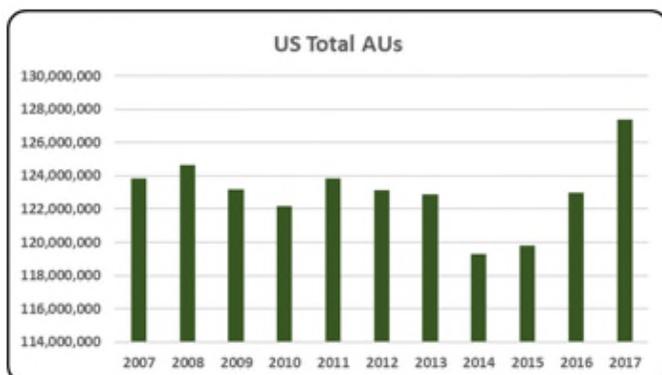


Nevada Animal Unit (AU) Trends

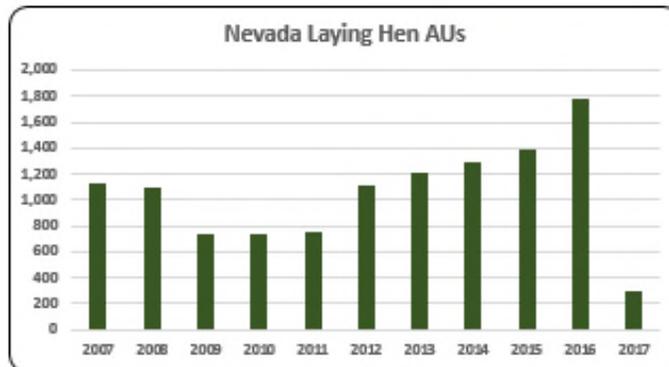
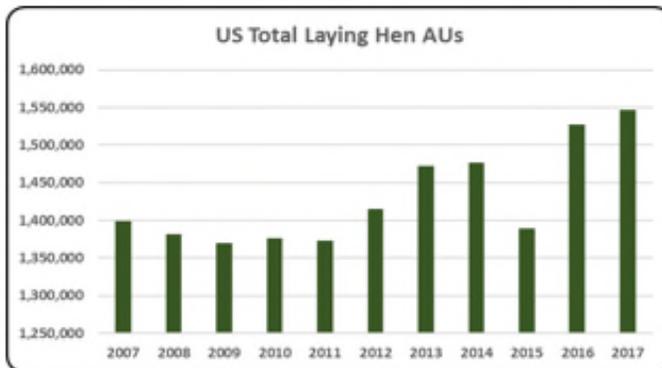
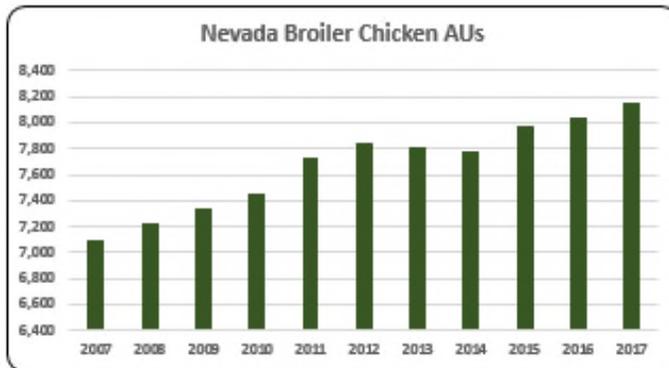
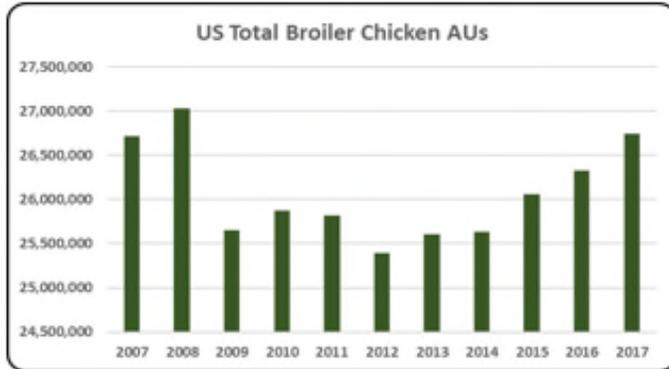
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Nevada. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

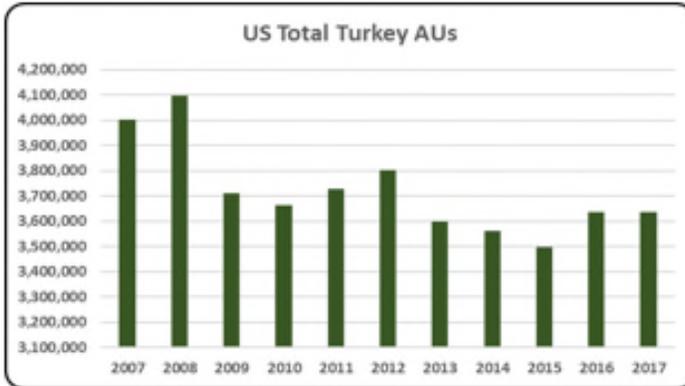
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Nevada, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (275,250 AUs), Dairy Cows (42,000 AUs), and Broiler Chickens (8,148 AUs). Total animal units in Nevada during 2017 were 331,175 AUs.



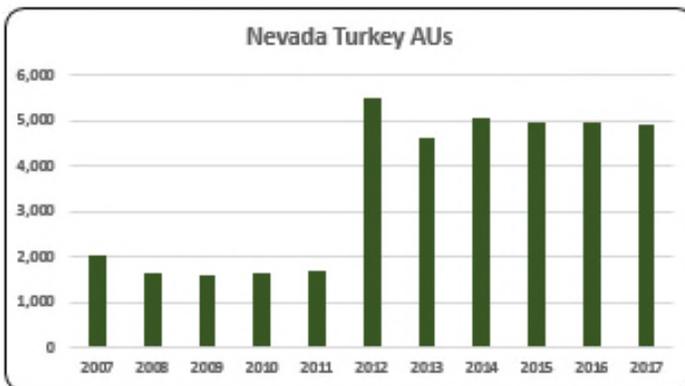
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- All 331,175 AUs in Nevada in 2017 represented 0.26% of all U.S. AUs. Beef cows account for the majority of the AUs in the state.



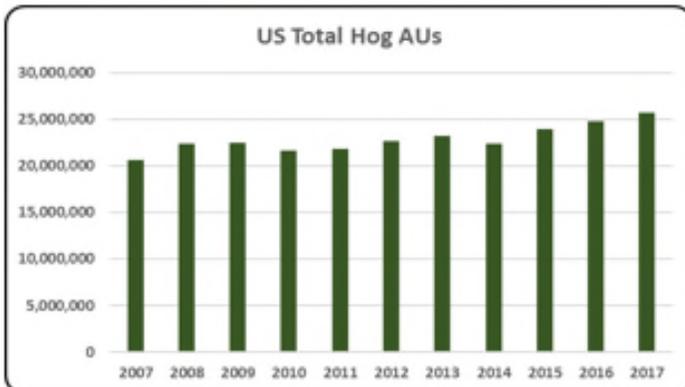
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There were 8,148 broiler AUs in 2017. Overall there has been an upward trend in broiler AUs in the state of Nevada and this has increased 14.8% from a decade ago.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 291 animal units were from laying hens in 2017. Laying hen AUs have decreased 74% since 2007 (1,135 layer AUs).



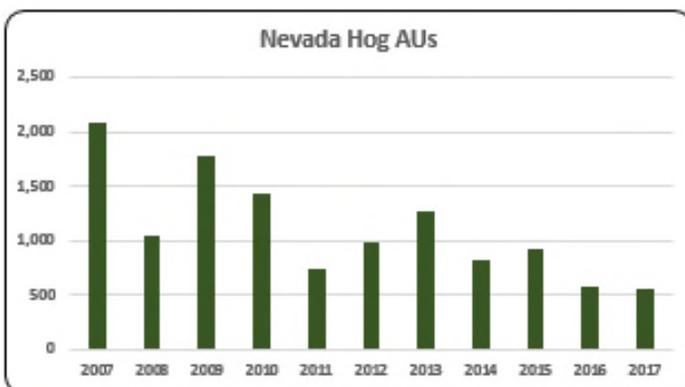
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.



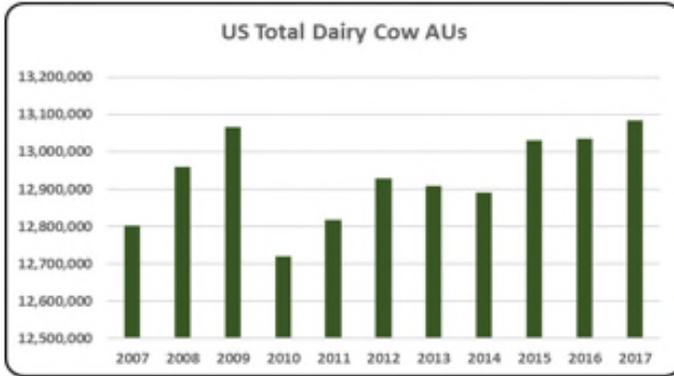
- Turkeys were 1.5% (4,932 turkey AUs) of total animal units in the state in 2017. Turkey numbers were up 142% compared to 2007 (2,037).



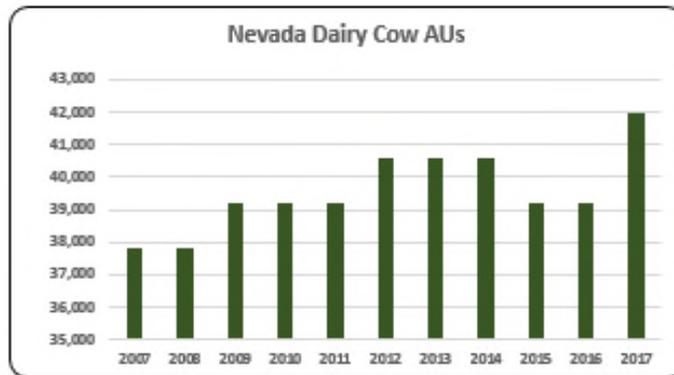
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.



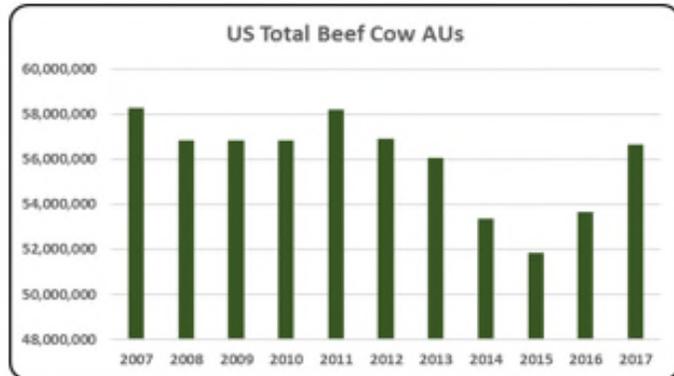
- Hog AUs in Nevada were irregular during 2007 to 2017 (average 1,106 AUs), but the general trend has been negative. Hog AUs were 555 AUs in 2017.



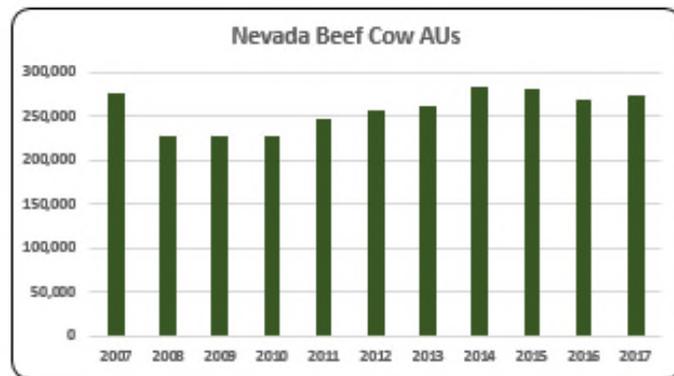
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Overall dairy cow AUs increased throughout the decade from 37,800 dairy cow AUs in 2007 to 42,000 dairy cow AUs in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- There were 275,250 beef cow AUs in Nevada in 2017. 2014 was a record year 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

Given the long-term presence of animal agriculture in Nevada, of interest is the degree to which the industry impacts the Nevada economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Nevada 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 Nevada'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 2007-2017 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 Nevada which have occurred. As shown in this state report, Nevada 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 Nevada. 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	275,700	228,750	228,750	228,750	247,950	258,150	262,650	283,800	280,350	268,350	275,250
	Hog and Pig AUs	2,085	1,050	1,770	1,425	735	990	1,260	810	915	570	555
	Broiler AUs	7,099	7,232	7,333	7,449	7,723	7,844	7,817	7,772	7,973	8,033	8,148
	Turkey AUs	2,037	1,628	1,595	1,661	1,691	5,528	4,612	5,091	4,981	4,964	4,932
	Egg Layer AUs	1,135	1,103	738	741	745	1,113	1,205	1,297	1,390	1,778	291
	Dairy AUs	37,800	37,800	39,200	39,200	39,200	40,600	40,600	40,600	39,200	39,200	42,000
	Total Animal Units	325,856	277,563	279,385	279,226	298,044	314,226	318,144	339,371	334,809	322,895	331,175
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 149,348	\$ 156,432	\$ 148,730	\$ 171,771	\$ 205,595	\$ 220,560	\$ 230,963	\$ 288,816	\$ 293,681	\$ 219,427	\$ 243,176
	Hogs and Pigs (\$1,000)	\$ 1,220	\$ 681	\$ 992	\$ 957	\$ 725	\$ 772	\$ 936	\$ 796	\$ 828	\$ 522	\$ 589
	Broilers (\$1,000)	\$ 1,345	\$ 2,636	\$ 3,864	\$ 5,122	\$ 6,628	\$ 8,151	\$ 9,524	\$ 9,991	\$ 8,716	\$ 7,750	\$ 9,100
	Turkeys (\$1,000)	\$ 3,693	\$ 4,506	\$ 4,270	\$ 3,412	\$ 2,683	\$ 2,885	\$ 2,091	\$ 1,383	\$ 4,662	\$ 5,273	\$ 3,570
	Eggs (\$1,000)	\$ 6,788	\$ 8,180	\$ 5,822	\$ 6,391	\$ 7,007	\$ 7,859	\$ 8,879	\$ 14,212	\$ 23,692	\$ 9,317	\$ 12,598
	Milk (\$1,000)	\$ 100,646	\$ 110,357	\$ 69,882	\$ 112,216	\$ 137,862	\$ 125,685	\$ 129,717	\$ 171,120	\$ 118,413	\$ 107,580	\$ 126,911
	Other	\$ 2,169	\$ 2,086	\$ 2,280	\$ 2,628	\$ 2,871	\$ 4,083	\$ 3,257	\$ 3,753	\$ 4,194	\$ 3,225	\$ 5,957
	Sheep and Lambs (\$1,000)	\$ 2,169	\$ 2,086	\$ 2,280	\$ 2,628	\$ 2,871	\$ 4,083	\$ 3,257	\$ 3,753	\$ 4,194	\$ 3,225	\$ 3,445
	Aquaculture (\$1,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,511
	Total (\$1,000)	\$ 265,208	\$ 284,878	\$ 235,840	\$ 302,498	\$ 363,371	\$ 369,994	\$ 385,366	\$ 490,072	\$ 454,188	\$ 353,094	\$ 401,901

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	1,235	1,093	1,067	1,242	
	Cattle feedlots (112112)	47	81	20	12	
	Dairy cattle and milk production (11212)	41	45	35	26	
	Hog and pig farming (1122)	24	27	15	22	
	Poultry and egg production (1123)	29	63	64	72	
	Sheep and goat farming (1124)	109	157	184	340	
	Animal aquaculture and other animal production (1125,1129)	410	640	717	1,177	
Value of Sales (\$1,000)	Cattle and Calves	135,410	215,054	181,758	241,611	
	Hogs and Pigs	700	930	withheld	516	
	Poultry and Eggs	178	withheld	withheld	731	
	Milk and Other Dairy Products	55,456	62,074	98,526	125,569	
	Aquaculture	n/a	withheld	withheld	4,030	
	Other (calculated)	13,899	11,201	13,644	18,174	
	Total	205,643	289,259	293,928	390,631	
Input Purchases	Livestock and poultry purchased	(Farms) 1,015	908	994	1,412	
		\$1,000	26,424	34,954	4,470	38,987
	Breeding livestock purchased	(Farms) n/a	574	360	943	
		\$1,000	n/a	8,620	1,786	13,345
	Other livestock and poultry purchased	(Farms) n/a	447	768	701	
		\$1,000	n/a	26,335	2,684	25,641
	Feed purchased	(Farms) 1,690	2,062	2,308	3,134	
	\$1,000	48,969	58,036	30,644	140,663	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 379,963	\$ 74,266	2,104	\$ 14,630
	Hogs, Pigs, and Other	\$ 9,050	\$ 2,096	56	\$ 413
	Poultry and Eggs	\$ 36,785	\$ 7,929	173	\$ 1,562
	Dairy	\$ 200,050	\$ 45,510	1,158	\$ 8,966
	Total	\$ 625,848	\$ 129,801	3,491	\$ 25,571

Change from 2007 to 2017	Cattle and Calves	\$ 106,067	\$ 20,731	587	\$ 4,084
	Hogs, Pigs, and Other	\$ 3,550	\$ 822	22	\$ 162
	Poultry and Eggs	\$ 16,580	\$ 3,574	78	\$ 704
	Dairy	\$ 13,841	\$ 3,149	80	\$ 620
	Total	\$ 140,038	\$ 28,276	767	\$ 5,570

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	0.0%
	Total	19.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$214.6 million in economic output
- 1,010 jobs
- \$46.0 million in earnings
- \$11.4 million in income taxes paid at local, state, and federal levels
- \$23.6 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in New Hampshire has increased economic output by over \$25.6 million, boosted household earnings by \$5.1 million, contributed 90 additional jobs and paid \$1.3 million in additional tax revenues.

New Hampshire's animal agriculture consumed almost 34.5 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (21.3 thousand tons)
- Egg-Laying Hens (6.2 thousand tons)
- Dairy Cows (5.2 thousand 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 minor 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 2017, New Hampshire's animal agriculture contributed the following to the economy:

- About \$214.6 million in economic output
- \$46.0 million in household earnings
- 1,010 jobs
- \$11.4 million in income taxes

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

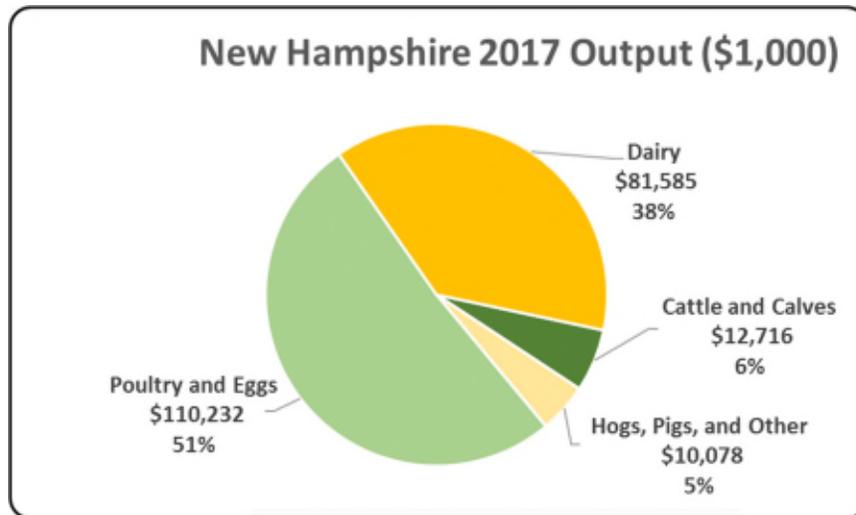
- Increased economic output by \$25.6 million
- Boosted household earnings by \$5.1 million
- Added 90 jobs
- Paid an additional \$1.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 214,611	\$ 25,598	13.54%
Earnings (\$1,000)	\$ 46,032	\$ 5,095	12.45%
Employment (Jobs)	1,010	90	9.83%
Income Taxes Paid (\$1,000)	\$ 11,370	\$ 1,258	12.45%
Property Taxes Paid in 2012 (\$1,000)	\$ 23,589		

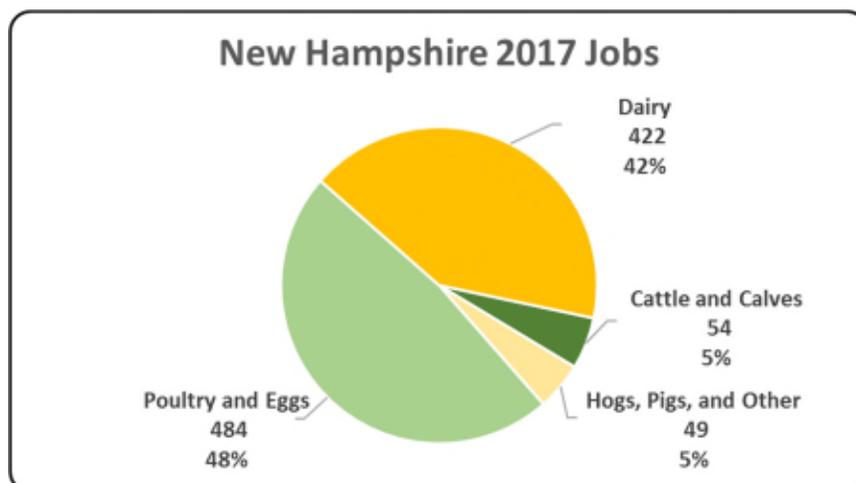
New Hampshire Output

“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 \$214.6 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 1,010 jobs within and outside of animal agriculture.



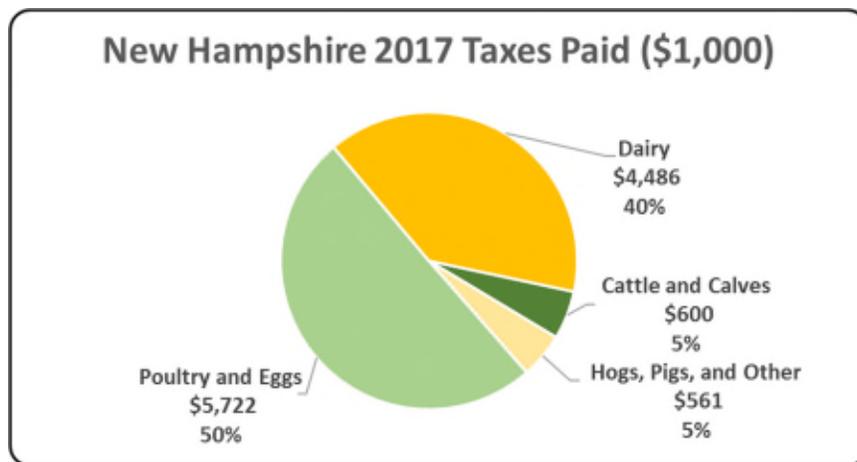
New Hampshire Earnings

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 \$46.0 million to household earnings in 2017.



New Hampshire Taxes Paid by Animal Agriculture

New Hampshire’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$11.4 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$23.6 million in property taxes paid by all of New Hampshire agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



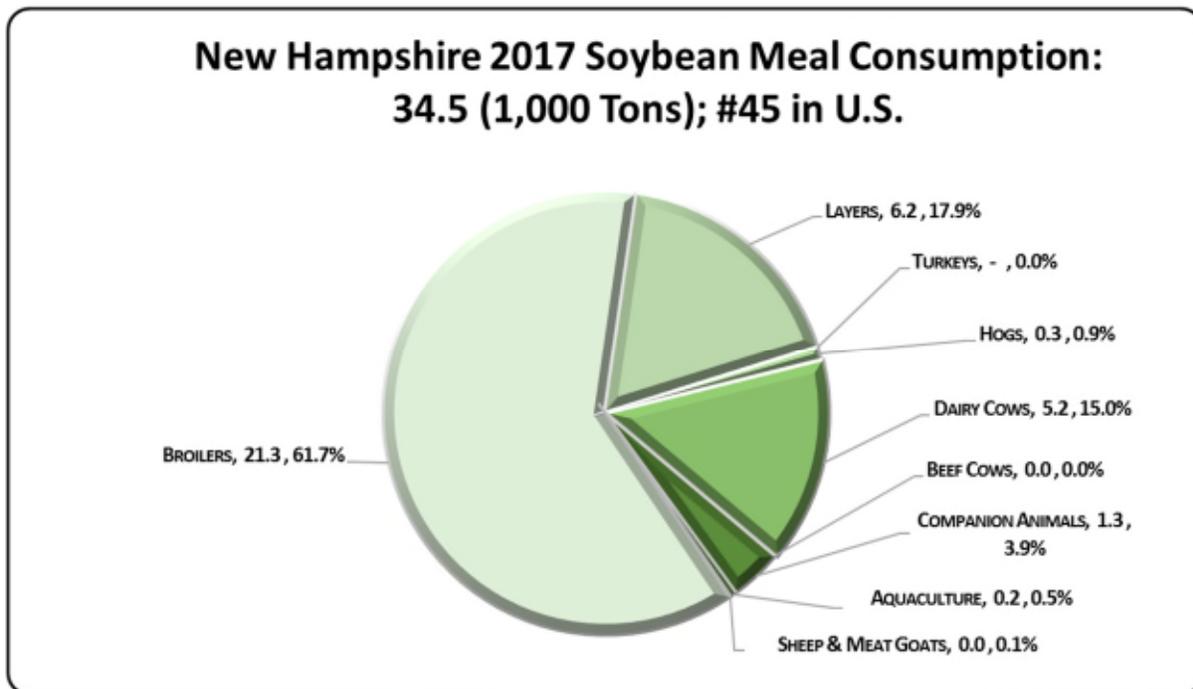
New Hampshire Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

New Hampshire's animal agriculture consumed almost 34.5 thousand tons of soybean meal in 2017, placing the state as #45 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:

- Broilers (21.3 thousand tons)
- Egg-Laying Hens (6.2 thousand tons)
- Dairy Cows (5.2 thousand tons)

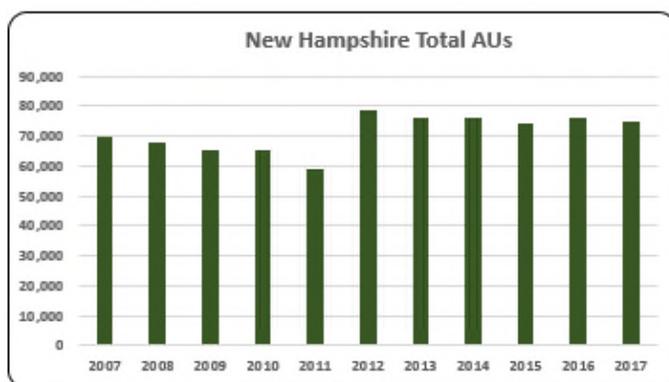
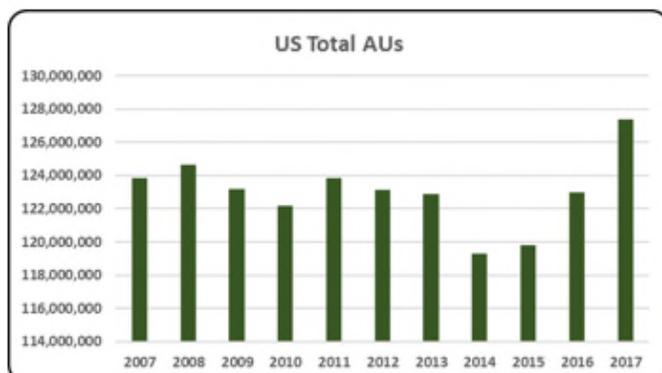


New Hampshire Animal Unit (AU) Trends

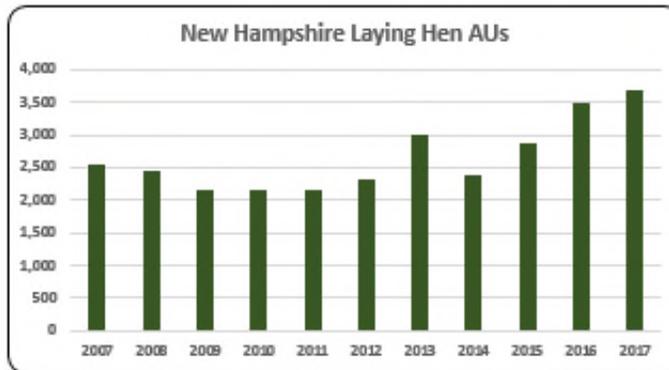
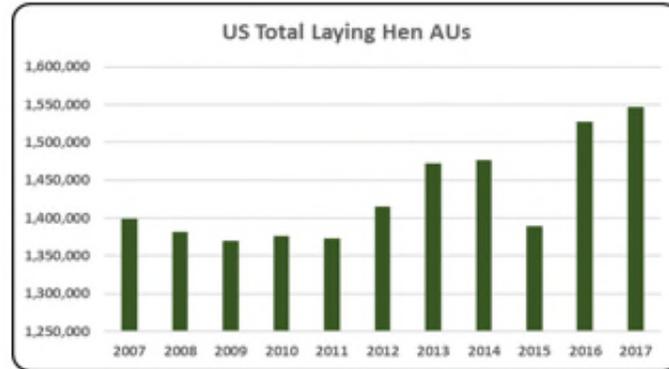
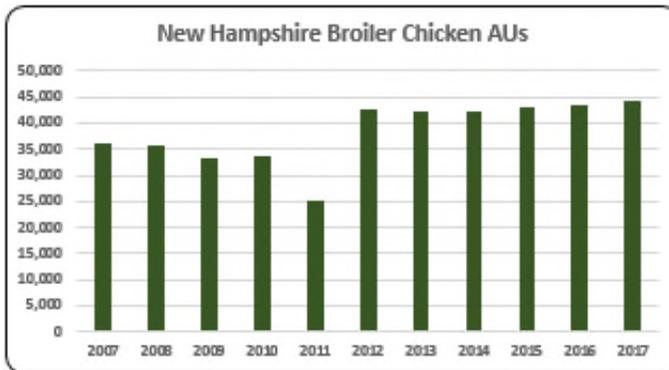
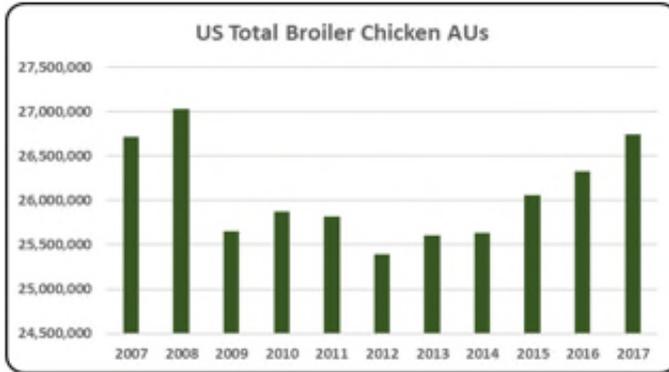
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New Hampshire. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

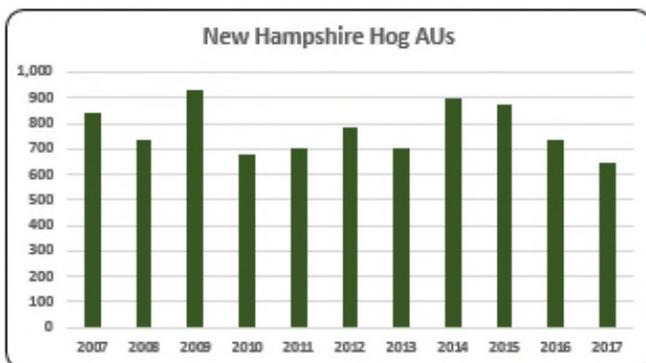
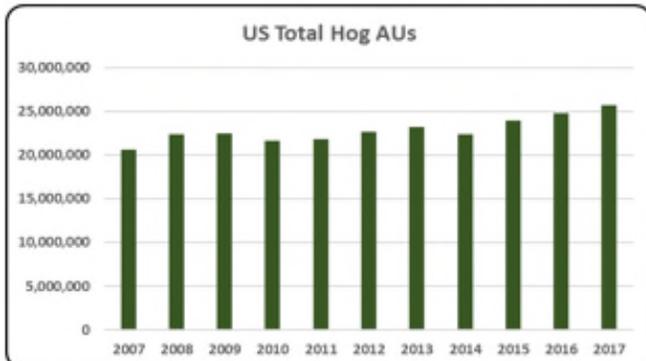
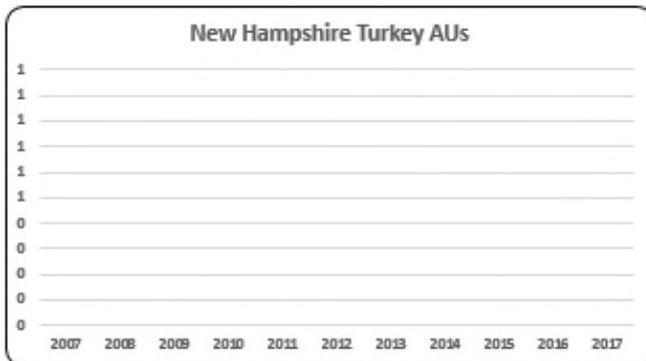
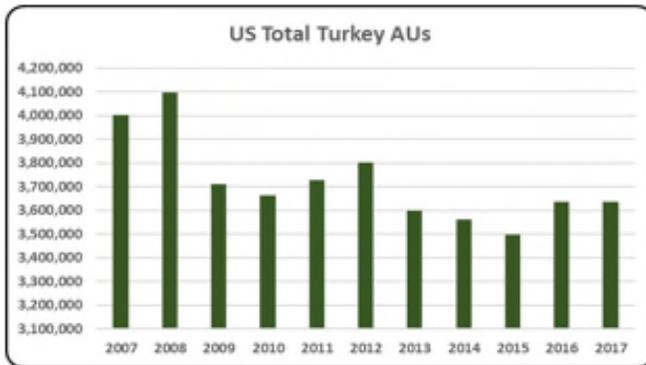
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New Hampshire, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (44,150 AUs), Dairy Cows (18,900 AUs), and Beef Cows (7,545 AUs). Total animal units in New Hampshire during 2017 were 74,926 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Animal production in New Hampshire is very small representing 0.06% (74,926 AUs) of all animal units in the U.S. in 2017. New Hampshire AUs have increased 7.4% since 2007.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Fifty-nine percent (44,150) of all AUs in the state of New Hampshire were broilers in 2017. Broiler AUs rose 22% in 2017 compared to 2007.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 3,686 laying hen AUs in 2017 in the state. Laying hen AUs in the state increased 45% during the past decade.

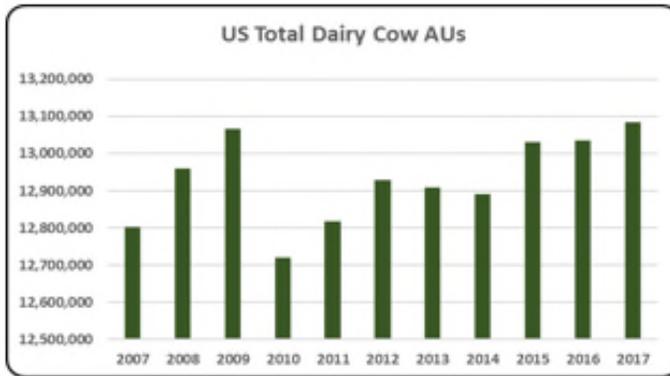


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

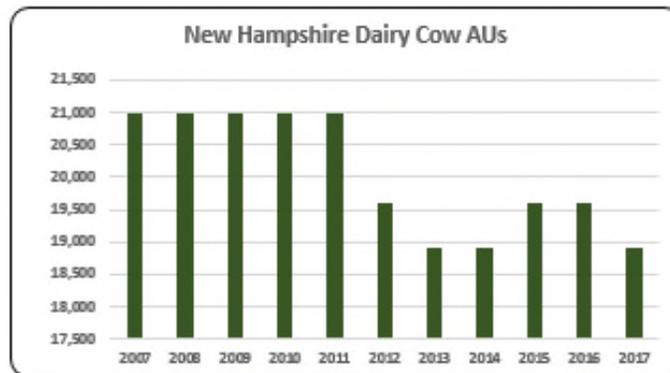
- Turkey production was non-existent in New Hampshire during the last decade.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

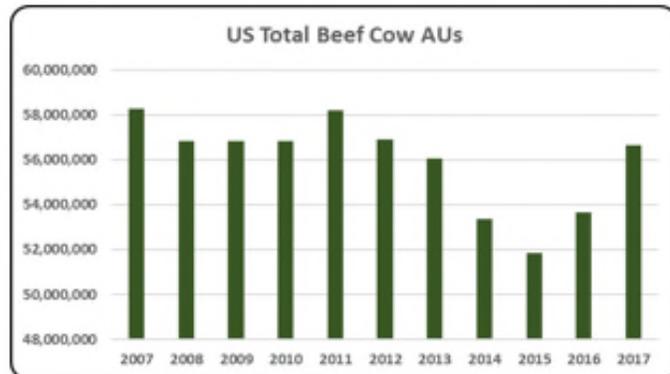
- Hog AUs represented 0.86% (645) of all animal units in the state of New Hampshire. Hog numbers dropped 23.2% since 2007.



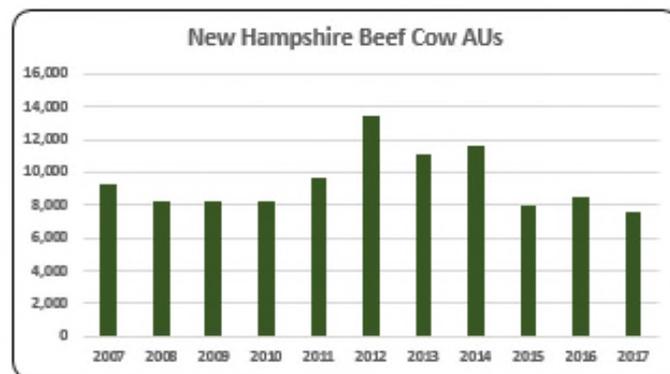
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Almost a quarter (18,900) of all AUs in New Hampshire were from dairy cows in 2017. However, dairy cow AUs have declined 10% since the beginning of the decade.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- New Hampshire had 7,545 beef cow AUs in 2017, an 18% decrease from 2007.

New Hampshire Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	9,240	8,175	8,175	8,175	9,660	13,455	11,130	11,670	7,950	8,550	7,545
	Hog and Pig AUs	840	735	930	675	705	780	705	900	870	735	645
	Broiler AUs	36,152	35,588	33,088	33,533	25,268	42,505	42,357	42,116	43,203	43,529	44,150
	Turkey AUs	-	-	-	-	-	-	-	-	-	-	-
	Egg Layer AUs	2,539	2,467	2,158	2,143	2,156	2,320	3,003	2,393	2,879	3,497	3,686
	Dairy AUs	21,000	21,000	21,000	21,000	21,000	19,600	18,900	18,900	19,600	19,600	18,900
	Total Animal Units	69,771	67,965	65,351	65,527	58,789	78,660	76,095	75,979	74,503	75,911	74,926
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 8,017	\$ 7,011	\$ 6,928	\$ 5,781	\$ 8,974	\$ 11,065	\$ 10,063	\$ 13,799	\$ 14,727	\$ 10,084	\$ 8,990
	Hogs and Pigs (\$1,000)	\$ 304	\$ 242	\$ 386	\$ 262	\$ 248	\$ 815	\$ 665	\$ 949	\$ 902	\$ 685	\$ 642
	Broilers (\$1,000)	\$ 27,900	\$ 28,503	\$ 24,592	\$ 25,700	\$ 22,500	\$ 42,353	\$ 51,606	\$ 54,138	\$ 47,231	\$ 41,994	\$ 49,311
	Turkeys (\$1,000)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Eggs (\$1,000)	\$ 4,373	\$ 14,354	\$ 10,216	\$ 11,215	\$ 12,296	\$ 13,790	\$ 15,579	\$ 24,938	\$ 41,573	\$ 16,349	\$ 22,106
	Milk (\$1,000)	\$ 60,900	\$ 59,501	\$ 41,020	\$ 52,332	\$ 62,062	\$ 53,900	\$ 58,480	\$ 73,038	\$ 52,170	\$ 49,938	\$ 50,778
	Other	\$ 1,155	\$ 1,108	\$ 1,086	\$ 1,131	\$ 1,062	\$ 1,056	\$ 1,080	\$ 1,038	\$ 1,039	\$ 998	\$ 6,580
	Sheep and Lambs (\$1,000)	\$ 175	\$ 164	\$ 180	\$ 261	\$ 229	\$ 260	\$ 321	\$ 316	\$ 353	\$ 349	\$ 333
	Aquaculture (\$1,000)	\$ 980	\$ 943	\$ 907	\$ 870	\$ 833	\$ 796	\$ 759	\$ 722	\$ 685	\$ 648	\$ 6,247
	Total (\$1,000)	\$ 102,649	\$ 110,719	\$ 84,229	\$ 96,420	\$ 107,142	\$ 122,978	\$ 137,473	\$ 167,900	\$ 157,642	\$ 120,048	\$ 138,407

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	324	242	328	383	
	Cattle feedlots (112112)	32	39	3	1	
	Dairy cattle and milk production (11212)	221	191	194	150	
	Hog and pig farming (1122)	58	64	62	88	
	Poultry and egg production (1123)	61	100	247	224	
	Sheep and goat farming (1124)	168	174	257	300	
	Animal aquaculture and other animal production (1125,1129)	330	749	864	1,003	
Value of Sales (\$1,000)	Cattle and Calves	5,116	5,140	6,743	9,477	
	Hogs and Pigs	1,441	withheld	518	846	
	Poultry and Eggs	19,311	6,251	15,390	13,488	
	Milk and Other Dairy Products	47,597	withheld	59,132	54,798	
	Aquaculture	n/a	3,340	3,734	3,376	
	Other (calculated)	4,200	46,955	7,067	4,124	
	Total	77,665	61,686	92,584	86,109	
Input Purchases	Livestock and poultry purchased	(Farms) 706	705	994	1,247	
		\$1,000	3,031	1,638	4,470	3,874
	Breeding livestock purchased	(Farms) n/a	227	360	526	
		\$1,000	n/a	522	1,786	1,842
	Other livestock and poultry purchased	(Farms) n/a	537	768	989	
		\$1,000	n/a	1,116	2,684	2,033
	Feed purchased	(Farms) 1,415	2,010	2,308	2,787	
	\$1,000	22,257	20,933	30,644	44,756	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 12,716	\$ 2,428	54	\$ 600
	Hogs, Pigs, and Other	\$ 10,078	\$ 2,273	49	\$ 561
	Poultry and Eggs	\$ 110,232	\$ 23,168	484	\$ 5,722
	Dairy	\$ 81,585	\$ 18,163	422	\$ 4,486
	Total	\$ 214,611	\$ 46,032	1,010	\$ 11,370
Change from 2007 to 2017	Cattle and Calves	\$ (594)	\$ (113)	(2)	\$ (28)
	Hogs, Pigs, and Other	\$ 7,688	\$ 1,734	38	\$ 428
	Poultry and Eggs	\$ 51,765	\$ 10,880	227	\$ 2,687
	Dairy	\$ (33,261)	\$ (7,405)	(172)	\$ (1,829)
	Total	\$ 25,598	\$ 5,095	90	\$ 1,258
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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.0%	
	Total			24.7%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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. For example, in the State of New Jersey during 2017 animal agriculture contributed:

- \$145.4 million in economic output
- 850 jobs
- \$31.0 million in earnings
- \$7.7 million in income taxes paid at local, state, and federal levels
- \$55.3 million in the form of property taxes

New Jersey's animal agriculture consumed almost 33.7 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (12.0 thousand tons)
- Companion Animals (7.2 thousand tons)
- Egg-Laying Hens (6.4 thousand 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 minor 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 small part of New Jersey's economy. In 2017, New Jersey's animal agriculture contributed the following to the economy:

- About \$145.4 million in economic output
- \$31.0 million in household earnings
- 850 jobs
- \$7.7 million in income taxes

During the last decade contractions in New Jersey's animal agriculture has:

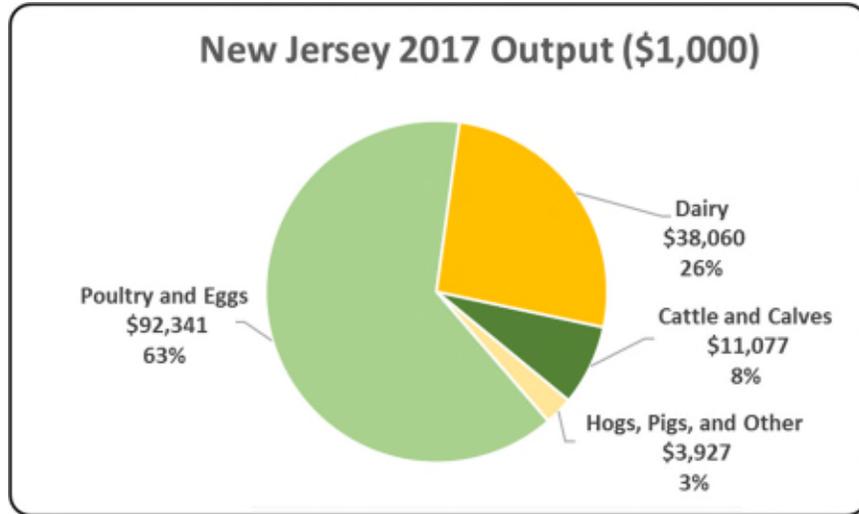
- Decreased economic output by \$96.2 million
- Reduced household earnings by \$20.8 million
- Shrunk by 571 jobs
- Paid \$5.2 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 145,405	\$ (96,197)	-39.82%
Earnings (\$1,000)	\$ 31,036	\$ (20,792)	-40.12%
Employment (Jobs)	850	(571)	-40.17%
Income Taxes Paid (\$1,000)	\$ 7,723	\$ (5,174)	-40.12%
Property Taxes Paid in 2012 (\$1,000)	\$ 55,277		

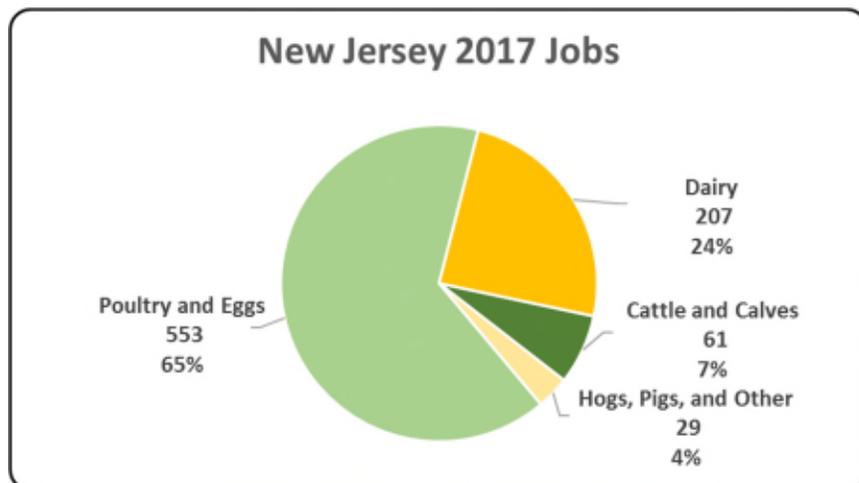
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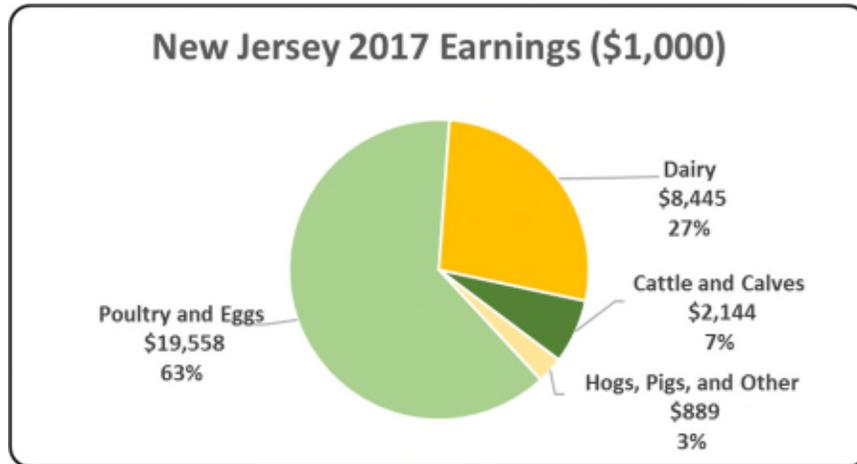
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“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to New Jersey in terms of animal agriculture jobs. As shown, animal agriculture contributes 850 jobs within and outside of animal agriculture.



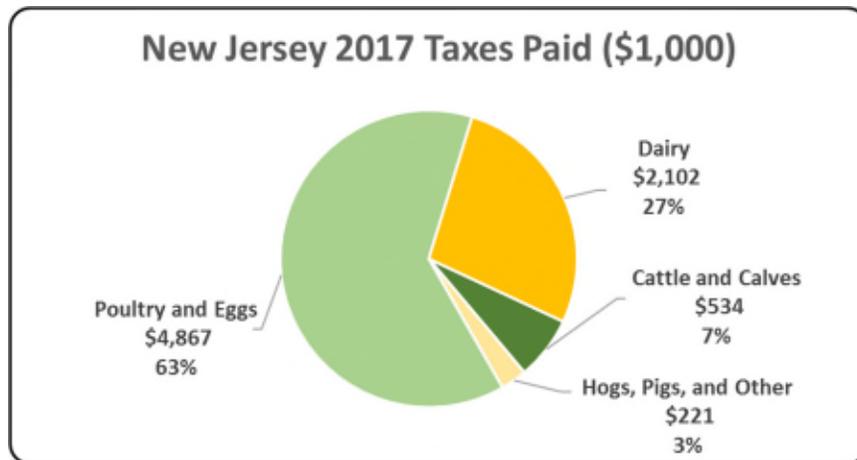
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New Jersey’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$7.7 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$55.3 million in property taxes paid by all of New Jersey agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



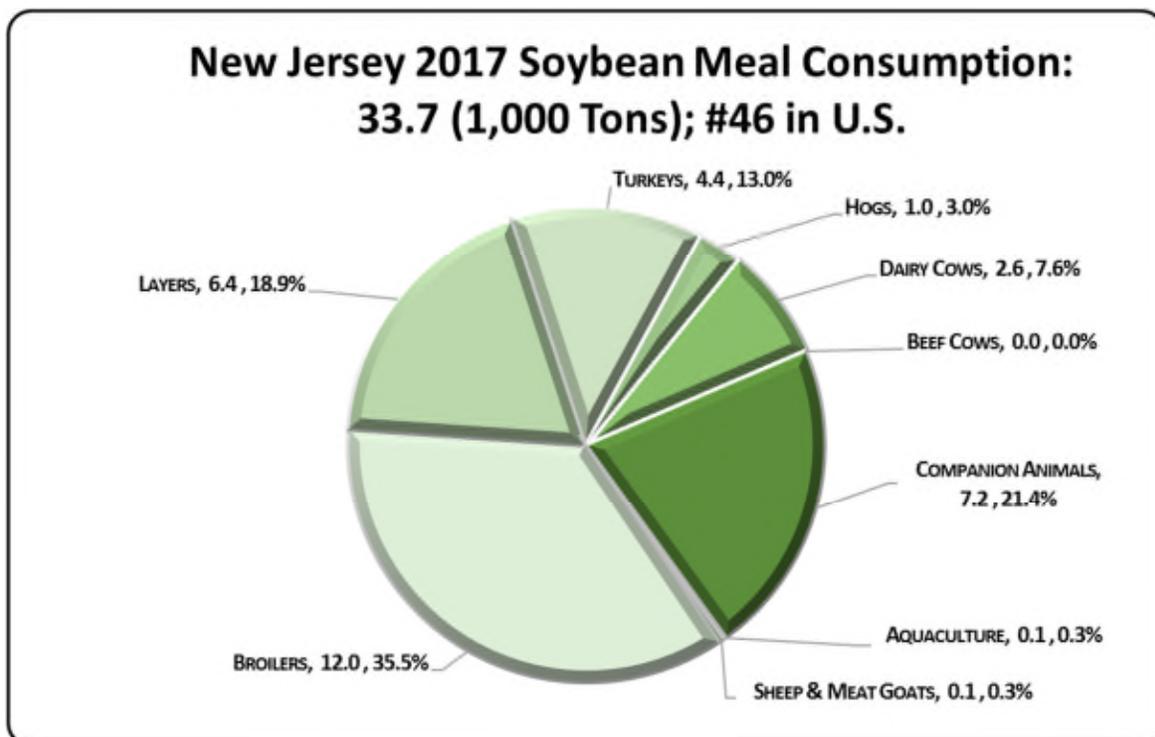
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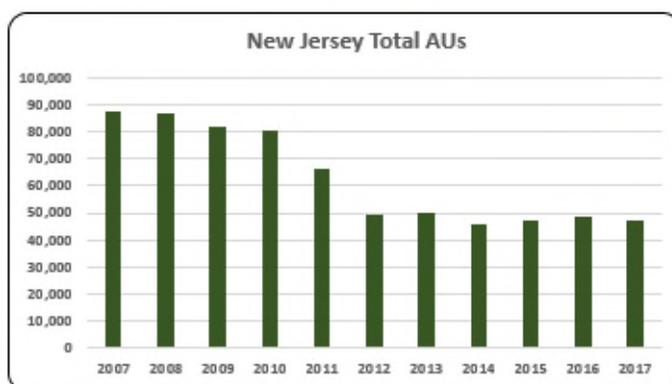
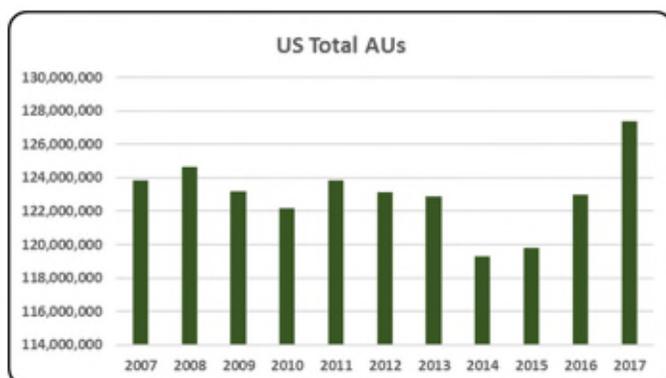


New Jersey Animal Unit (AU) Trends

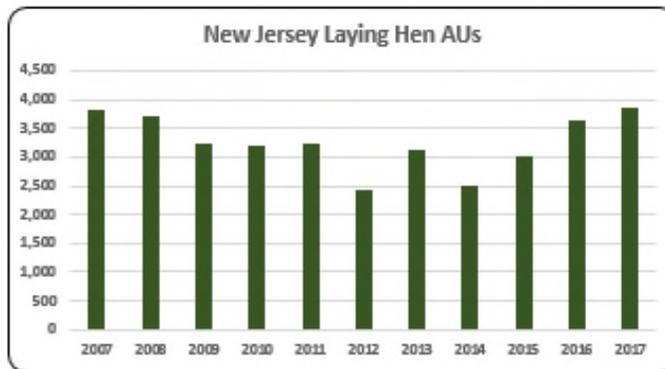
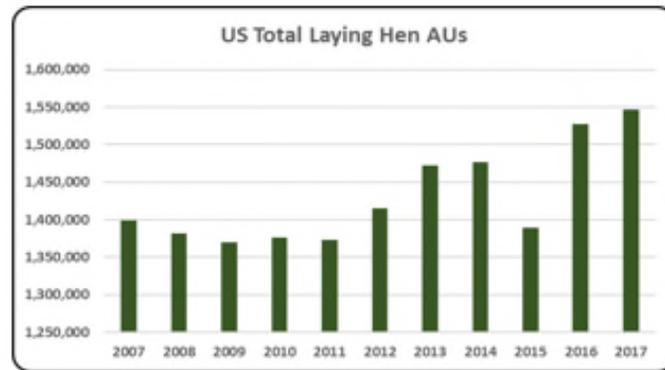
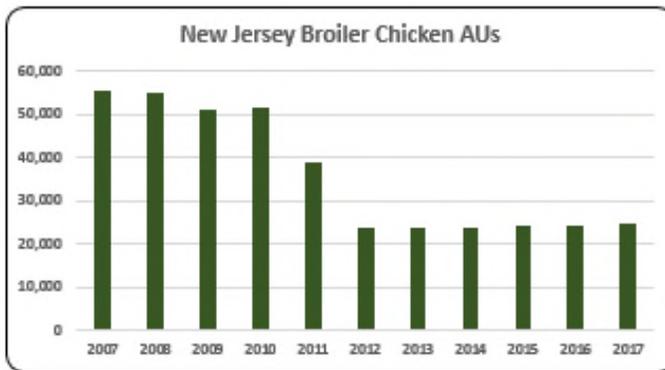
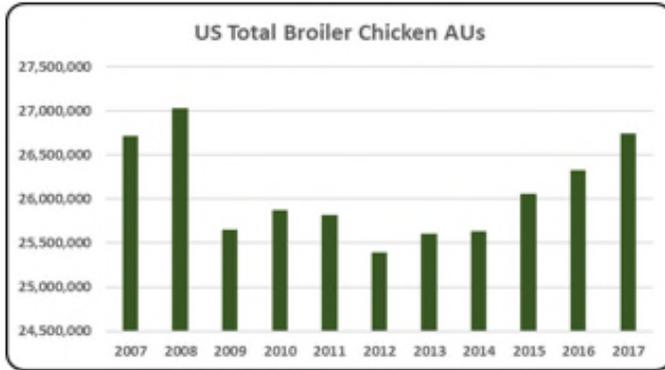
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New Jersey. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

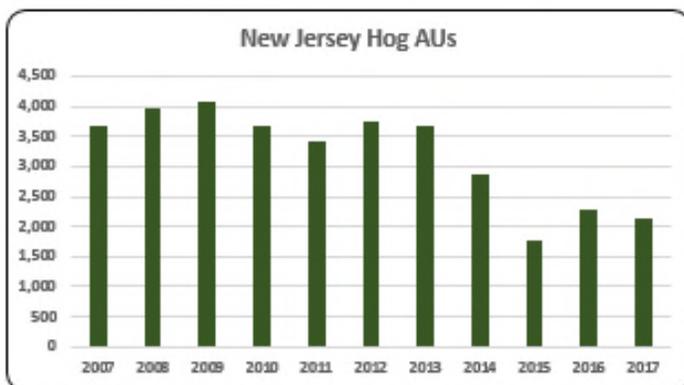
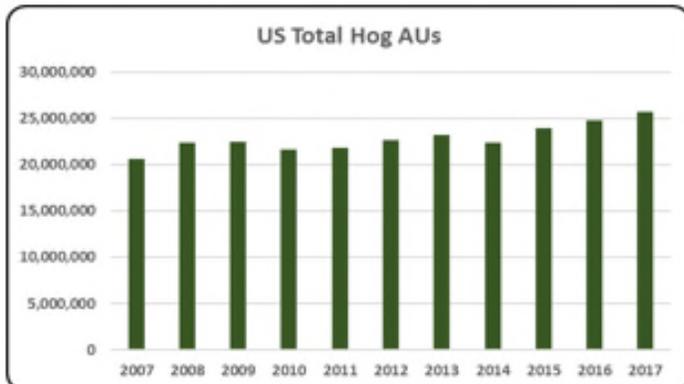
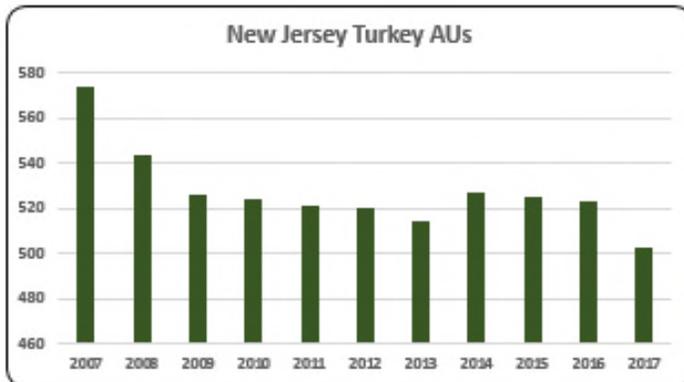
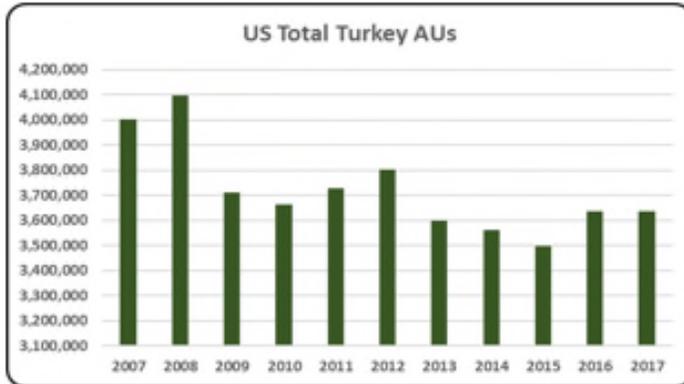
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New Jersey, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (24,822 AUs), Dairy Cows (9,100 AUs), and Beef Cows (6,570 AUs). Total animal units in New Jersey during 2017 were 46,971 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Only 0.04% (46,971) of all AUs in 2017 were in New Jersey, and total animal units in the state have declined 46.2% throughout the last decade.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- About 53% (24,822) of animal units in New Jersey in 2017 were broilers. Broiler AUs substantially decreased (55.5%) during 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 3,847 in 2017. A 1% increase from a decade earlier, and 8.2% of total AUs in New Jersey in 2017.

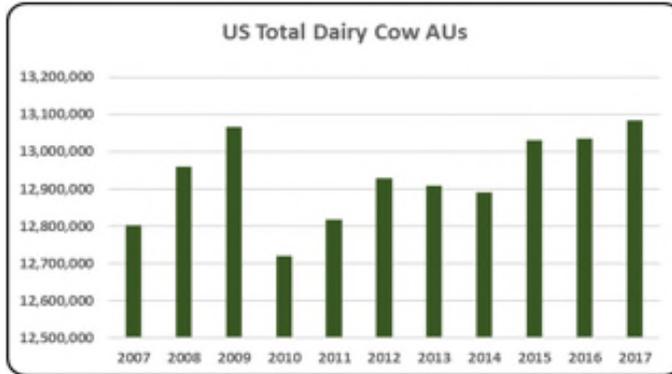


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

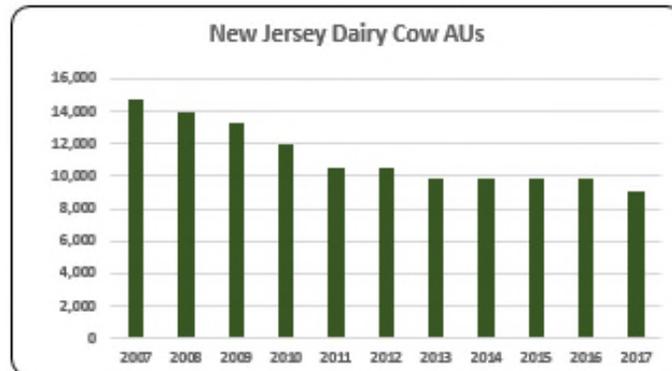
- With only 502 turkey AUs in 2017 and an average of 527 turkey AUs from 2007 to 2017, the turkey sector is small in New Jersey.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

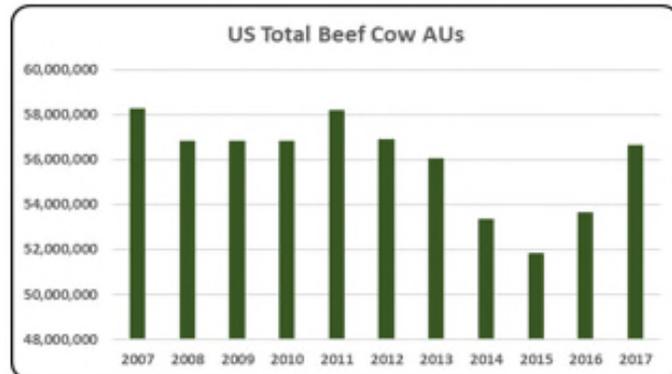
- Hogs in 2017 (2,130 hog AUs) represented about 4.53% of all animal units in the state. Hog AUs in 2017 decreased 42% compared to the high level in 2009 (4,095 hog AUs).



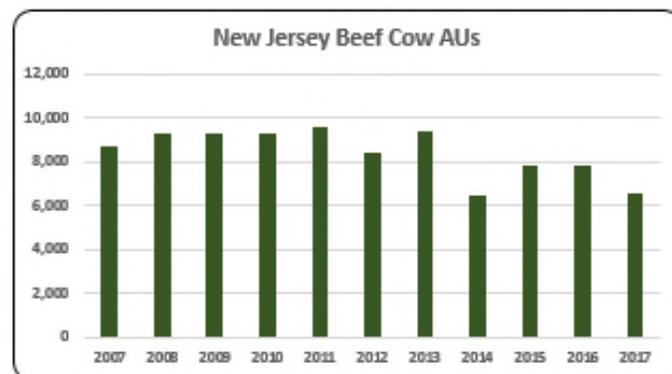
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cow AUs in New Jersey consistently decreased from 2007 to 2017, from 14,700 dairy cow AUs in 2007 to 9,100 dairy cow AUs in 2017.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Although beef cows are the third largest animal unit sector in New Jersey, AU units declined 24% since 2007. Beef cow AUs were 6,570 in 2017.

New Jersey Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Animal Units (AUs)	Beef Cattle AUs	8,730	9,300	9,300	9,300	9,570	8,460	9,405	6,495	7,815	7,815	6,570
	Hog and Pig AUs	3,675	3,960	4,095	3,675	3,405	3,765	3,675	2,880	1,770	2,280	2,130
	Broiler AUs	55,752	54,882	51,028	51,714	38,967	23,898	23,814	23,679	24,290	24,473	24,822
	Turkey AUs	574	543	526	524	521	520	514	527	525	523	502
	Egg Layer AUs	3,806	3,697	3,234	3,213	3,231	2,421	3,134	2,497	3,005	3,650	3,847
	Dairy AUs	14,700	14,000	13,300	11,900	10,500	10,500	9,800	9,800	9,800	9,800	9,100
	Total Animal Units	87,237	86,383	81,483	80,325	66,195	49,563	50,342	45,879	47,205	48,541	46,971
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 6,116	\$ 5,717	\$ 5,014	\$ 5,178	\$ 7,859	\$ 8,734	\$ 7,340	\$ 10,549	\$ 11,893	\$ 7,436	\$ 7,143
	Hogs and Pigs (\$1,000)	\$ 415	\$ 376	\$ 426	\$ 554	\$ 716	\$ 581	\$ 372	\$ 262	\$ 733	\$ 836	\$ 762
	Broilers (\$1,000)	\$ 43,026	\$ 43,957	\$ 37,926	\$ 39,633	\$ 34,699	\$ 23,812	\$ 29,014	\$ 30,438	\$ 26,555	\$ 23,611	\$ 27,724
	Turkeys (\$1,000)	\$ 1,248	\$ 1,437	\$ 1,591	\$ 1,866	\$ 2,239	\$ 2,535	\$ 2,804	\$ 3,223	\$ 3,503	\$ 3,762	\$ 5,040
	Eggs (\$1,000)	\$ 33,373	\$ 14,979	\$ 10,661	\$ 11,703	\$ 12,831	\$ 14,390	\$ 16,258	\$ 26,024	\$ 43,383	\$ 17,061	\$ 23,068
	Milk (\$1,000)	\$ 32,928	\$ 31,265	\$ 20,224	\$ 23,520	\$ 28,215	\$ 24,570	\$ 26,162	\$ 31,623	\$ 22,352	\$ 20,008	\$ 21,777
	Other	\$ 6,601	\$ 7,845	\$ 9,141	\$ 10,573	\$ 11,772	\$ 13,100	\$ 14,490	\$ 15,746	\$ 17,087	\$ 18,344	\$ 1,890
	Sheep and Lambs (\$1,000)	\$ 357	\$ 336	\$ 367	\$ 534	\$ 468	\$ 531	\$ 655	\$ 646	\$ 722	\$ 714	\$ 681
	Aquaculture (\$1,000)	\$ 6,244	\$ 7,509	\$ 8,775	\$ 10,040	\$ 11,305	\$ 12,570	\$ 13,835	\$ 15,100	\$ 16,365	\$ 17,630	\$ 1,209
	Total (\$1,000)	\$ 123,707	\$ 105,576	\$ 84,984	\$ 93,027	\$ 98,331	\$ 87,723	\$ 96,440	\$ 117,865	\$ 125,506	\$ 91,057	\$ 87,404

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	620	657	704	701	
	Cattle feedlots (112112)	202	214	75	9	
	Dairy cattle and milk production (11212)	207	129	123	76	
	Hog and pig farming (1122)	118	133	95	60	
	Poultry and egg production (1123)	188	283	405	455	
	Sheep and goat farming (1124)	318	503	669	630	
	Animal aquaculture and other animal production (1125,1129)	1,180	1,831	1,962	1,611	
Value of Sales (\$1,000)	Cattle and Calves	9,194	7,094	9,559	8,829	
	Hogs and Pigs	4,475	2,313	2,349	1,682	
	Poultry and Eggs	35,856	26,041	33,044	40,081	
	Milk and Other Dairy Products	37,891	29,154	34,091	26,119	
	Aquaculture	n/a	2,223	6,637	12,396	
	Other (calculated)	withheld	25,553	49,553	10,048	
	Total		87,416	92,378	135,233	99,155
Input Purchases	Livestock and poultry purchased	(Farms)	1,671	1,819	1,768	1,876
		\$1,000	10,339	8,265	11,977	14,758
	Breeding livestock purchased	(Farms)	n/a	562	572	621
		\$1,000	n/a	1,971	4,681	4,087
	Other livestock and poultry purchased	(Farms)	n/a	1,397	1,380	1,473
		\$1,000	n/a	6,294	7,296	10,671
	Feed purchased	(Farms)	3,290	4,654	4,669	4,683
		\$1,000	38,309	31,277	41,361	54,047

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 11,077	\$ 2,144	61	\$ 534
	Hogs, Pigs, and Other	\$ 3,927	\$ 889	29	\$ 221
	Poultry and Eggs	\$ 92,341	\$ 19,558	553	\$ 4,867
	Dairy	\$ 38,060	\$ 8,445	207	\$ 2,102
	Total	\$ 145,405	\$ 31,036	850	\$ 7,723
Change from 2007 to 2017	Cattle and Calves	\$ (55)	\$ (11)	(0)	\$ (3)
	Hogs, Pigs, and Other	\$ (8,267)	\$ (1,871)	(60)	\$ (466)
	Poultry and Eggs	\$ (58,389)	\$ (12,367)	(350)	\$ (3,078)
	Dairy	\$ (29,486)	\$ (6,543)	(160)	\$ (1,628)
	Total	\$ (96,197)	\$ (20,792)	(571)	\$ (5,174)
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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.2%	
	Total			24.9%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 Animal Agriculture: NEW MEXICO

New Mexico Executive Summary

The use of soybean meal as a key feed ingredient is a small 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 2017 animal agriculture contributed:

- \$4.0 billion in economic output
- 20,629 jobs
- \$856.6 million in earnings
- \$197.0 million in income taxes paid at local, state, and federal levels
- \$36.2 million in the form of property taxes

New Mexico's animal agriculture consumed almost 109.0 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (84.0 thousand tons)
- Egg-Laying Hens (8.4 thousand tons)
- Broilers (6.4 thousand 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 an important part of New Mexico's economy. In 2017, New Mexico's animal agriculture contributed the following to the economy:

- About \$4.0 billion in economic output
- \$856.6 million in household earnings
- 20,629 jobs
- \$197.0 million in income taxes

During the last decade contractions in New Mexico's animal agriculture has:

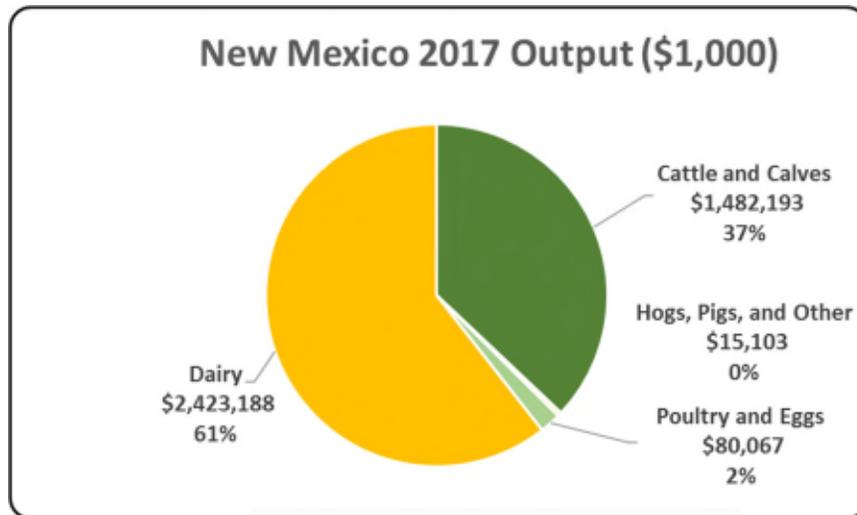
- Decreased economic output by \$277.1 million
- Reduced household earnings by \$68.1 million
- Shrunk by 1,752 jobs
- Paid \$15.7 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 4,000,551	\$ (277,116)	-6.48%
Earnings (\$1,000)	\$ 856,585	\$ (68,112)	-7.37%
Employment (Jobs)	20,629	(1,752)	-7.83%
Income Taxes Paid (\$1,000)	\$ 197,015	\$ (15,666)	-7.37%
Property Taxes Paid in 2012 (\$1,000)	\$ 36,159		

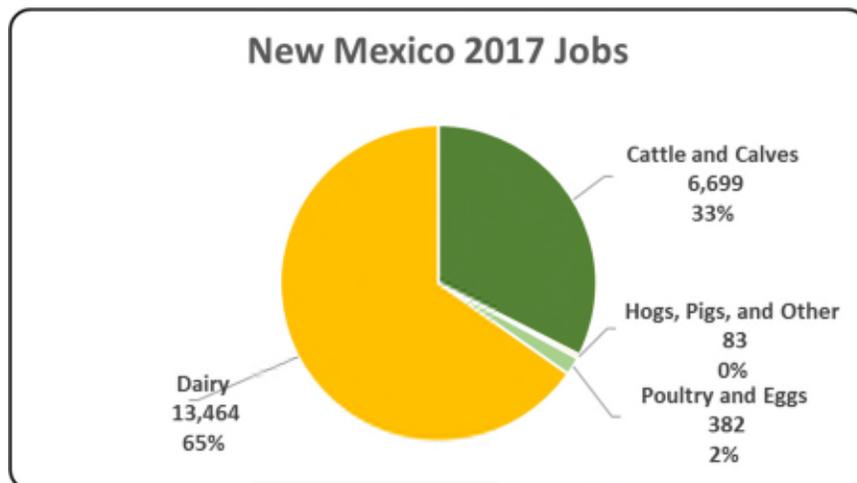
New Mexico Output

“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 \$4.0 billion.



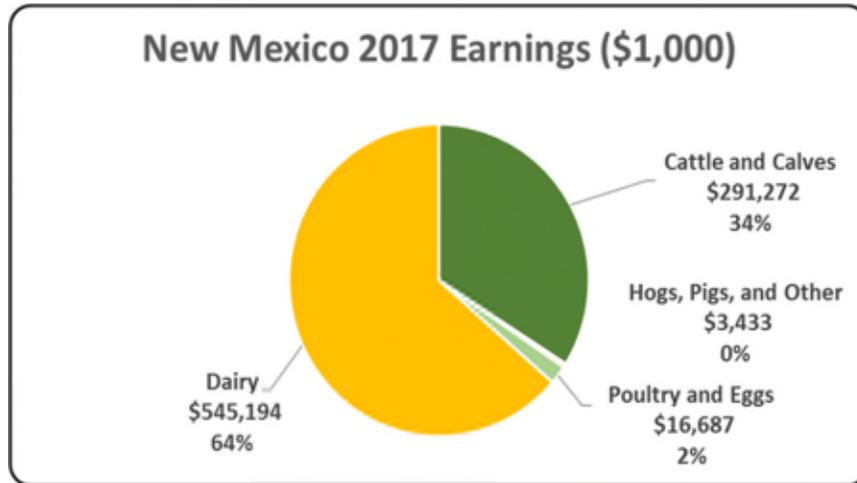
New Mexico Jobs

“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 20,629 jobs within and outside of animal agriculture.



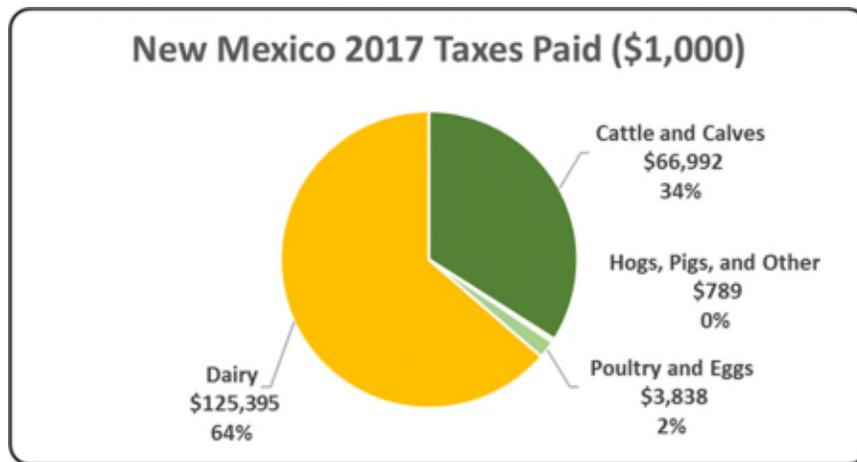
New Mexico Earnings

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 \$856.6 million to household earnings in 2017.



New Mexico Taxes Paid by Animal Agriculture

New Mexico’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$197.0 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$36.2 million in property taxes paid by all of New Mexico agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



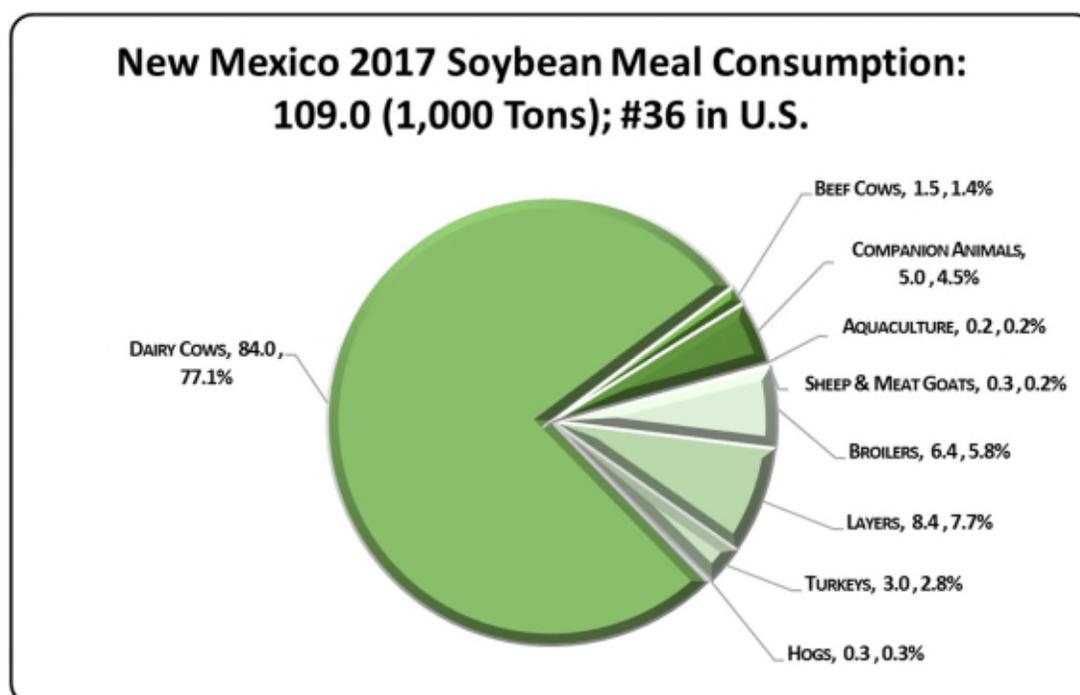
New Mexico Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

New Mexico's animal agriculture consumed almost 109.0 thousand tons of soybean meal in 2017, placing the state as #36 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in New Mexico consumed 20,459 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (84.0 thousand tons)
- Egg-Laying Hens (8.4 thousand tons)
- Broilers (6.4 thousand tons)

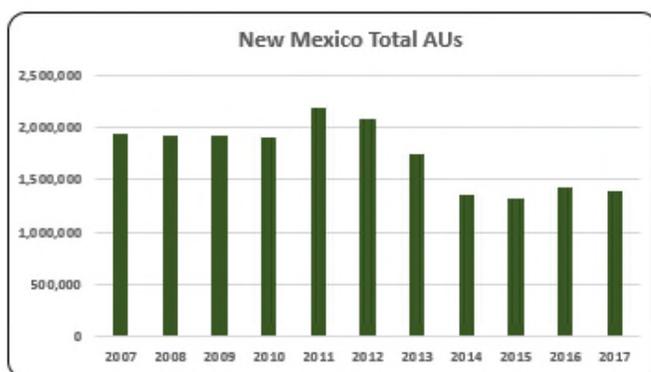
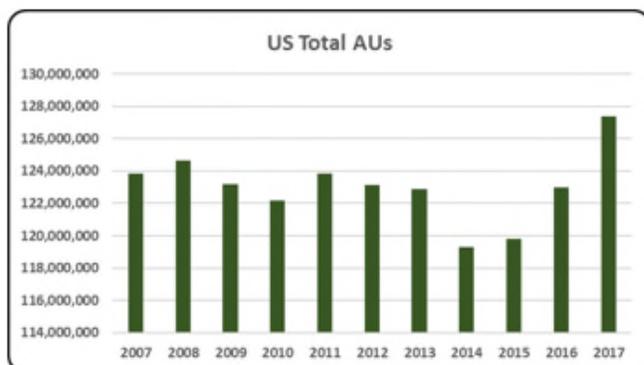


New Mexico Animal Unit (AU) Trends

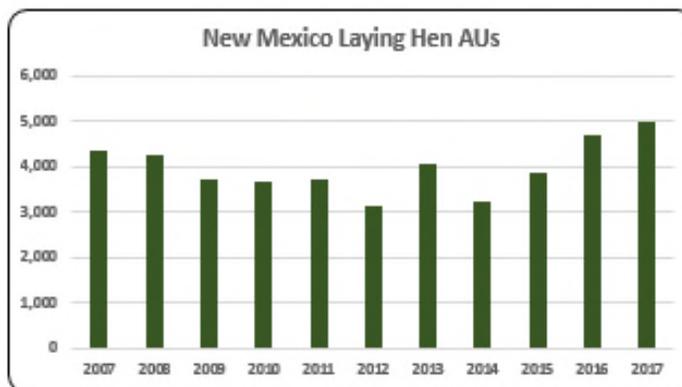
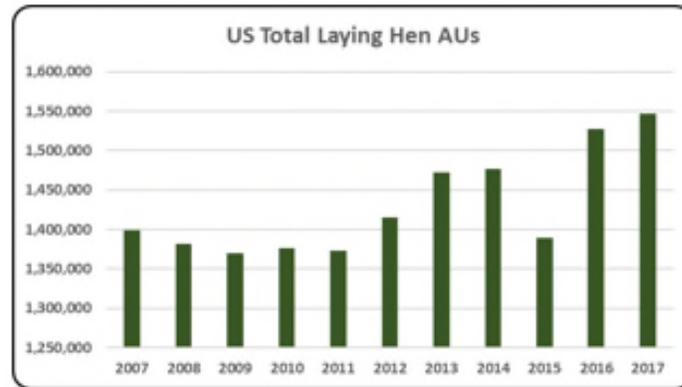
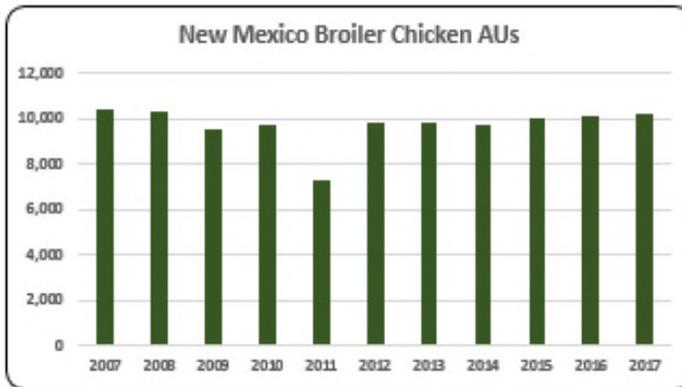
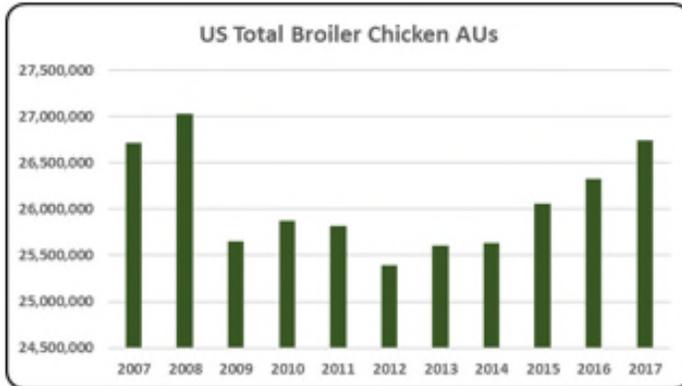
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New Mexico. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

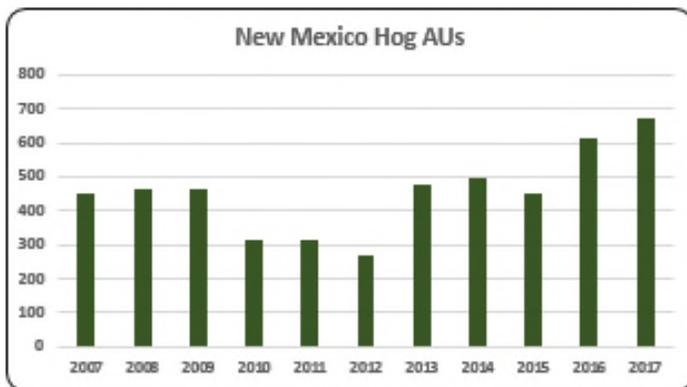
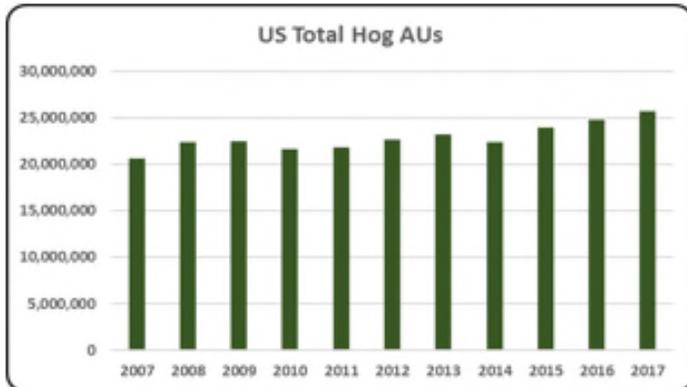
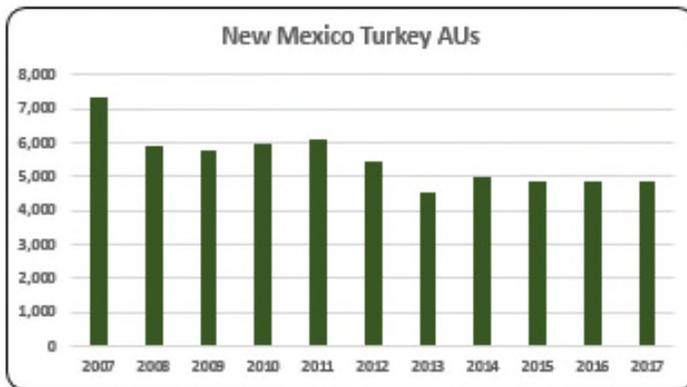
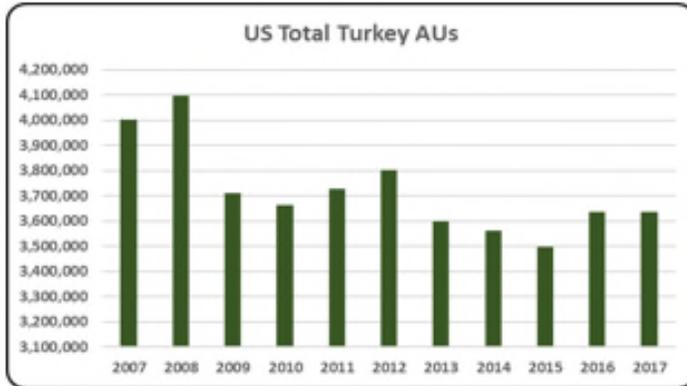
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New Mexico, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (907,575 AUs), Dairy Cows (455,000 AUs), and Broiler Chickens (10,232 AUs). Total animal units in New Mexico during 2017 were 1.4 million AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- 2011 was a record year for animal units in New Mexico with 2.2 million AUs, however AUs have since declined and 2017 animal units for the state were only 1.4 million AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broilers represented 0.74% (10,232 broiler AUs) of all AUs in the state in 2017. Broiler AUs have declined 2.12% from the beginning of the decade.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- 0.4% (4,979 layer AUs) of animal units were from laying hens in 2017. The increase in laying hens from 2007 to 2017 was 14%.

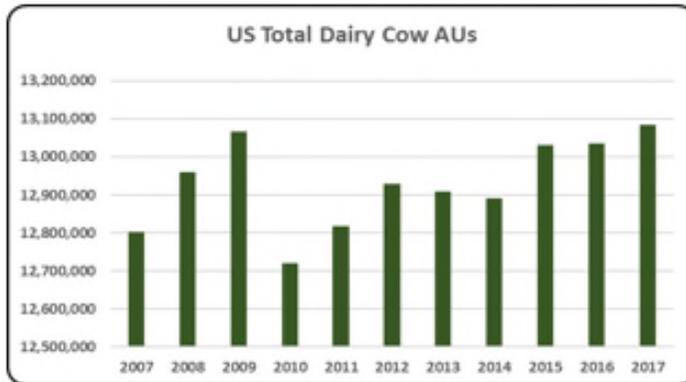


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

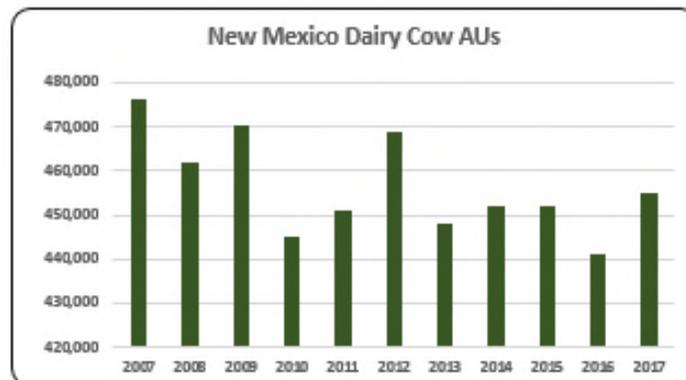
- Turkey numbers sunk 34.5% during the past decade to 4,835 turkey AUs in 2017.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

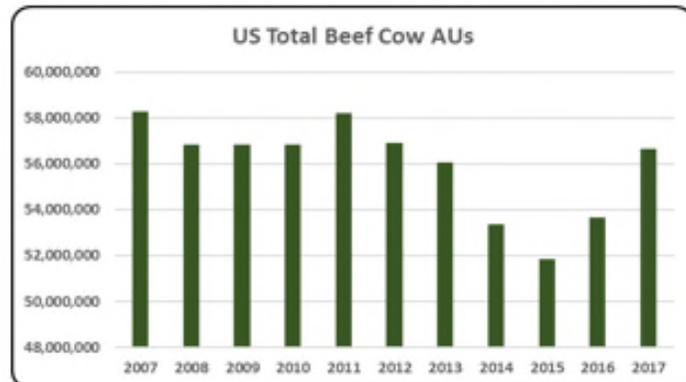
- The hog sector in New Mexico is small with only 675 hog AUs in 2017. It has an average of 454 AUs for the decade.



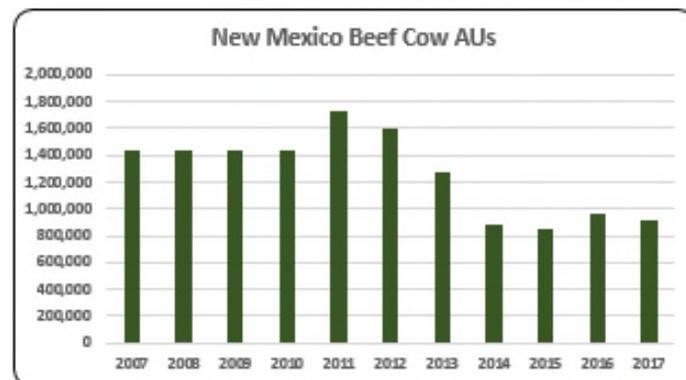
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cows are the second largest sector in terms of animal units in New Mexico with an average of 456,527 AUs throughout the decade.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow animal units have decreased 36% to 907,575 in the last decade. Still 65% of the state AUs are beef cows.

New Mexico Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,431,900	1,437,000	1,437,000	1,437,000	1,725,150	1,597,050	1,275,450	877,425	844,200	969,000	907,575
	Hog and Pig AUs	450	465	465	315	315	270	480	495	450	615	675
	Broiler AUs	10,453	10,290	9,568	9,696	7,306	9,851	9,817	9,761	10,013	10,088	10,232
	Turkey AUs	7,363	5,886	5,765	6,005	6,112	5,420	4,521	4,991	4,883	4,867	4,835
	Egg Layer AUs	4,374	4,249	3,717	3,692	3,714	3,133	4,056	3,232	3,889	4,724	4,979
	Dairy AUs	476,000	462,000	470,400	445,200	450,800	469,000	448,000	452,200	452,200	441,000	455,000
	Total Animal Units	1,930,541	1,919,890	1,926,914	1,901,908	2,193,397	2,084,724	1,742,324	1,348,104	1,315,635	1,430,294	1,383,296
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 513,195	\$ 587,945	\$ 539,497	\$ 659,946	\$ 893,864	\$ 993,045	\$ 723,204	\$ 857,620	\$ 786,306	\$ 695,565	\$ 694,496
	Hogs and Pigs (\$1,000)	\$ 272	\$ 300	\$ 267	\$ 264	\$ 252	\$ 181	\$ 472	\$ 579	\$ 428	\$ 426	\$ 518
	Broilers (\$1,000)	\$ 8,067	\$ 8,242	\$ 7,111	\$ 7,431	\$ 6,506	\$ 9,816	\$ 11,960	\$ 12,547	\$ 10,946	\$ 9,733	\$ 11,428
	Turkeys (\$1,000)	\$ 8,991	\$ 10,970	\$ 10,397	\$ 12,336	\$ 9,700	\$ 10,430	\$ 7,560	\$ 5,001	\$ 4,571	\$ 5,169	\$ 3,500
	Eggs (\$1,000)	\$ 16,087	\$ 19,387	\$ 13,798	\$ 15,147	\$ 16,608	\$ 18,625	\$ 21,042	\$ 33,682	\$ 56,151	\$ 22,081	\$ 29,857
	Milk (\$1,000)	\$ 1,370,520	\$ 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
	Other	\$ 5,688	\$ 4,918	\$ 5,650	\$ 5,925	\$ 5,227	\$ 5,481	\$ 5,033	\$ 5,017	\$ 6,697	\$ 6,646	\$ 9,527
	Sheep and Lambs (\$1,000)	\$ 5,267	\$ 4,432	\$ 5,099	\$ 5,309	\$ 4,546	\$ 4,735	\$ 4,222	\$ 4,141	\$ 5,756	\$ 5,639	\$ 6,092
	Aquaculture (\$1,000)	\$ 421	\$ 486	\$ 551	\$ 616	\$ 681	\$ 746	\$ 811	\$ 876	\$ 941	\$ 1,006	\$ 3,435
	Total (\$1,000)	\$ 1,922,820	\$ 2,008,137	\$ 1,533,104	\$ 1,946,247	\$ 2,518,495	\$ 2,455,504	\$ 2,283,987	\$ 2,721,862	\$ 2,125,890	\$ 1,942,536	\$ 2,087,883

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,061	5,395	7,219	8,989	
	Cattle feedlots (112112)	183	142	102	68	
	Dairy cattle and milk production (11212)	164	185	196	196	
	Hog and pig farming (1122)	87	96	125	76	
	Poultry and egg production (1123)	94	116	396	134	
	Sheep and goat farming (1124)	403	344	1,634	1,222	
	Animal aquaculture and other animal production (1125,1129)	1,168	2,692	3,091	3,852	
Value of Sales (\$1,000)	Cattle and Calves	656,701	533,952	576,025	630,837	
	Hogs and Pigs	1,250	381	375	392	
	Poultry and Eggs	16,609	17,468	withheld	3,346	
	Milk and Other Dairy Products	463,450	730,083	1,009,671	1,251,065	
	Aquaculture	withheld	1,604	3,228	6,909	
	Other (calculated)	29,883	19,285	32,641	16,440	
	Total	1,167,893	1,302,773	1,621,940	1,908,989	
Input Purchases	Livestock and poultry purchased	(Farms) 4,419	3,708	4,054	4,962	
		\$1,000	221,246	217,212	187,501	137,673
	Breeding livestock purchased	(Farms) <i>n/a</i>	2,344	2,569	3,043	
		\$1,000	<i>n/a</i>	71,093	66,729	33,048
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	2,060	2,066	2,530	
		\$1,000	<i>n/a</i>	146,119	120,772	104,625
Feed purchased	(Farms)	7,760	9,443	12,073	16,204	
	\$1,000	334,541	486,979	697,004	1,124,762	

2017 Animal Agriculture	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 1,482,193	\$ 291,272	6,699	\$ 66,992
Hogs, Pigs, and Other	\$ 15,103	\$ 3,433	83	\$ 789	
Poultry and Eggs	\$ 80,067	\$ 16,687	382	\$ 3,838	
Dairy	\$ 2,423,188	\$ 545,194	13,464	\$ 125,395	
Total	\$ 4,000,551	\$ 856,585	20,629	\$ 197,015	

Change from 2007 to 2017	Cattle and Calves	\$ 196,661	\$ 38,647	889	\$ 8,889
	Hogs, Pigs, and Other	\$ 4,586	\$ 1,042	25	\$ 240
	Poultry and Eggs	\$ 10,516	\$ 2,192	50	\$ 504
	Dairy	\$ (488,879)	\$ (109,993)	(2,716)	\$ (25,298)
	Total	\$ (277,116)	\$ (68,112)	(1,752)	\$ (15,666)

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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.3%
	Total	23.0%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$5.4 billion in economic output
- 32,569 jobs
- \$1.1 billion in earnings
- \$298.3 million in income taxes paid at local, state, and federal levels
- \$208.9 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in New York has increased economic output by over \$202.3 million, boosted household earnings by \$34.1 million, contributed 972 additional jobs and paid \$8.9 million in additional tax revenues.

New York's animal agriculture consumed almost 426.4 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (239.5 thousand tons)
- Broilers (83.6 thousand tons)
- Egg-Laying Hens (53.3 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 small part of New York's economy. In 2017, New York's animal agriculture contributed the following to the economy:

- About \$5.4 billion in economic output
- \$1.1 billion in household earnings
- 32,569 jobs
- \$298.3 million in income taxes

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

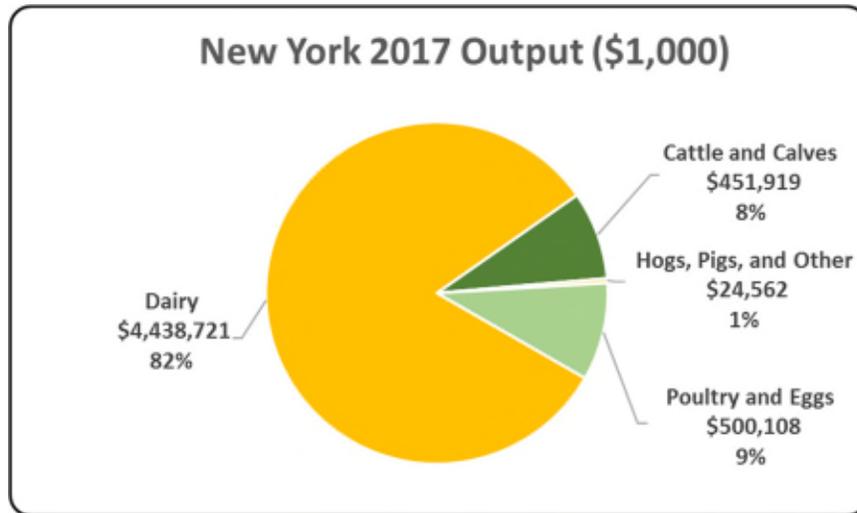
- Increased economic output by \$202.3 million
- Boosted household earnings by \$34.1 million
- Added 972 jobs
- Paid an additional \$8.9 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 5,415,310	\$ 202,256	3.88%
Earnings (\$1,000)	\$ 1,142,324	\$ 34,095	3.08%
Employment (Jobs)	32,569	972	3.08%
Income Taxes Paid (\$1,000)	\$ 298,261	\$ 8,902	3.08%
Property Taxes Paid in 2012 (\$1,000)	\$ 208,852		

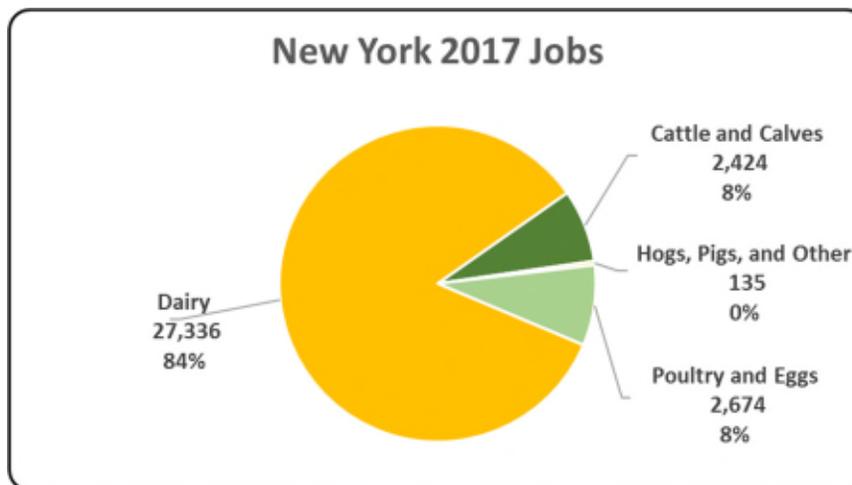
New York Output

“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 York economy. Animal agriculture’s impact on New York total economic output is about \$5.4 billion.



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 32,569 jobs within and outside of animal agriculture.



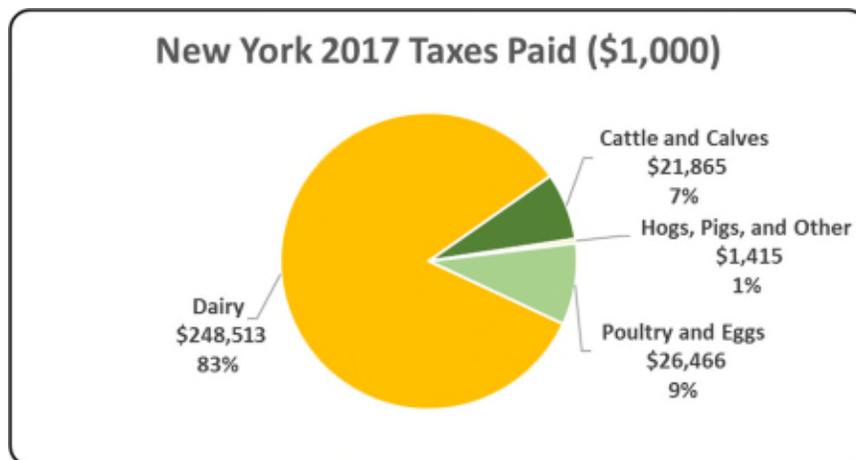
New York Earnings

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 \$1.1 billion to household earnings in 2017.



New York Taxes Paid by Animal Agriculture

New York’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$298.3 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$208.9 million in property taxes paid by all of New York agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



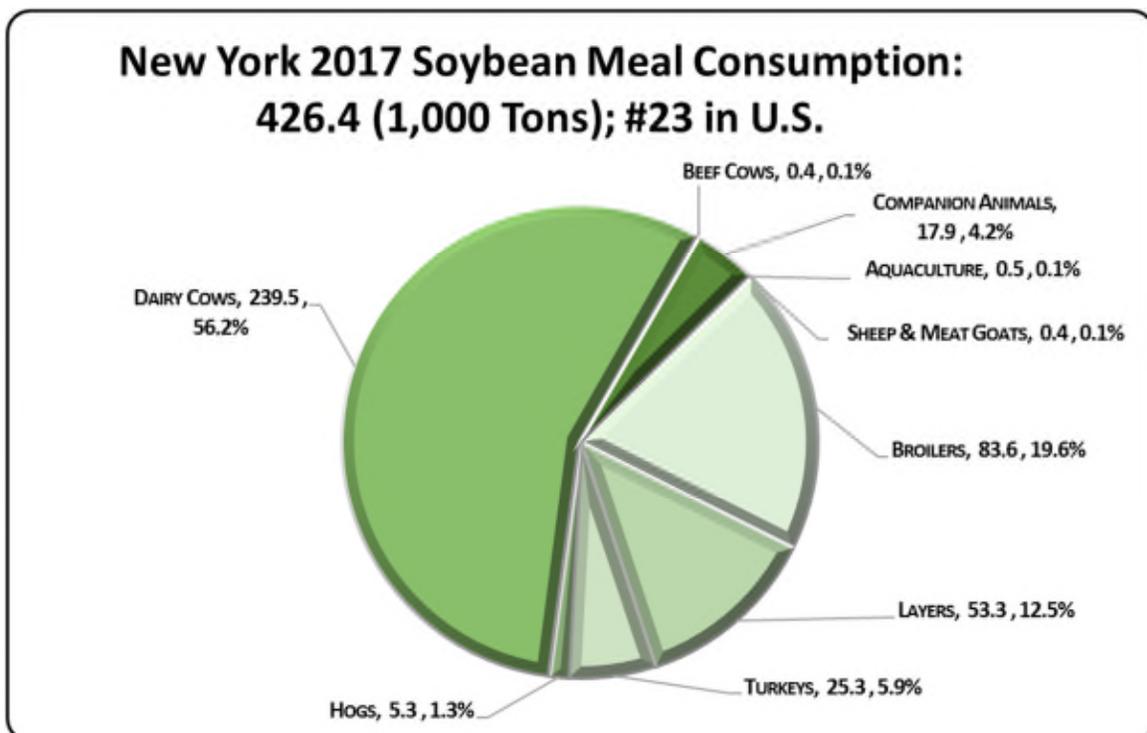
New York Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

New York's animal agriculture consumed almost 426.4 thousand tons of soybean meal in 2017, placing the state as #23 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in New York consumed 2,205 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (239.5 thousand tons)
- Broilers (83.6 thousand tons)
- Egg-Laying Hens (53.3 thousand tons)

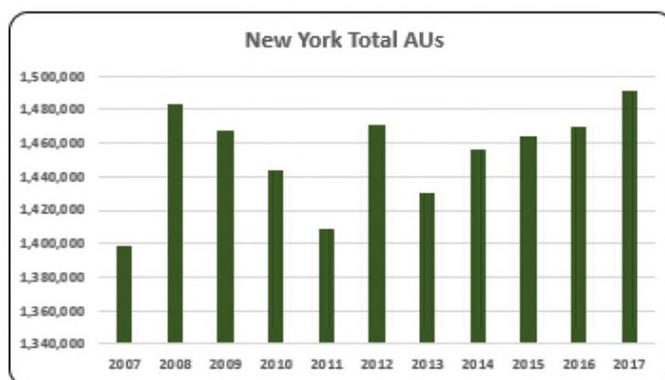
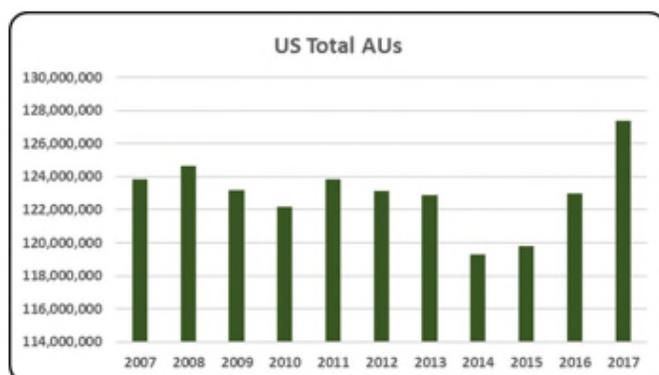


New York Animal Unit (AU) Trends

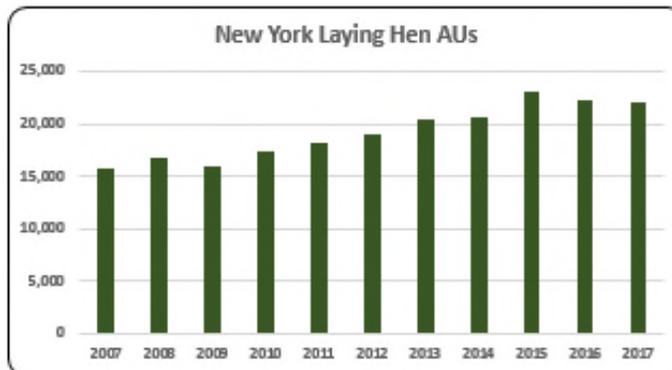
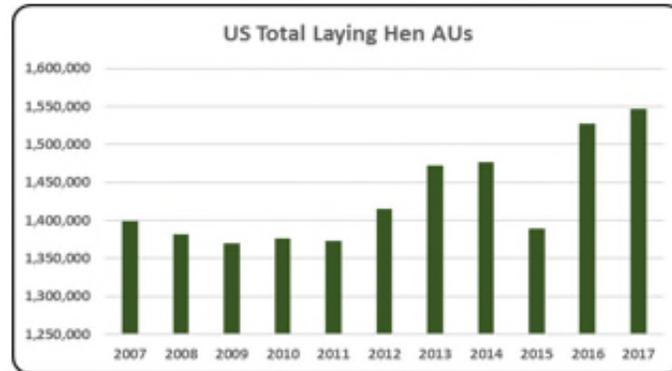
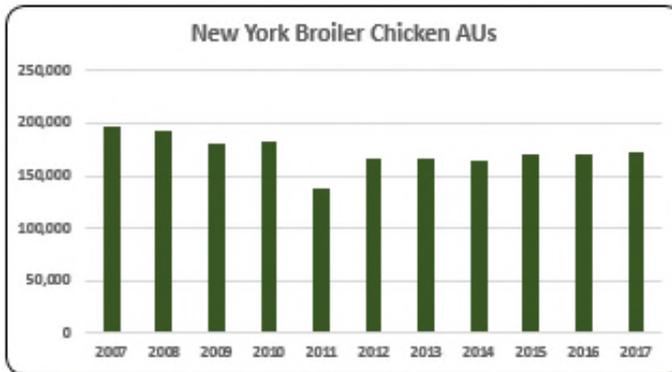
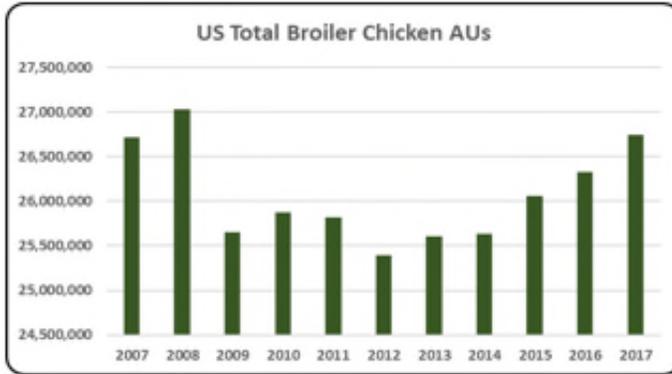
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of New York. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

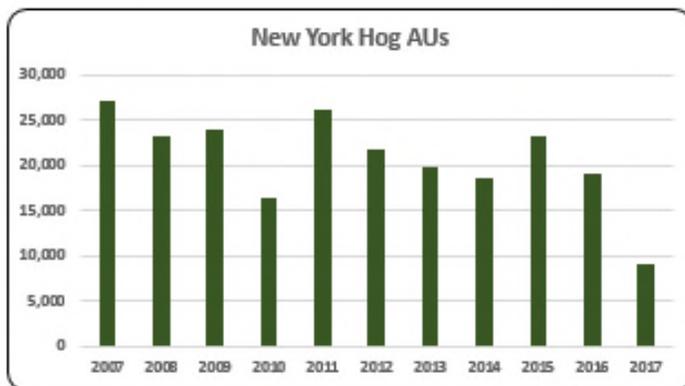
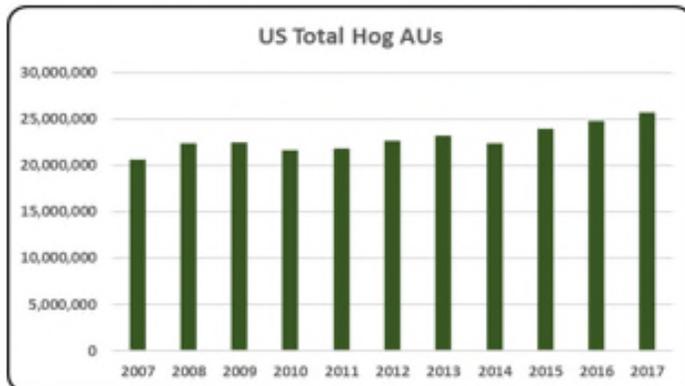
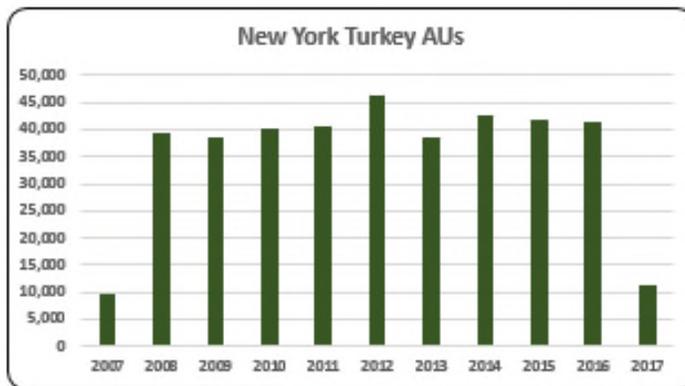
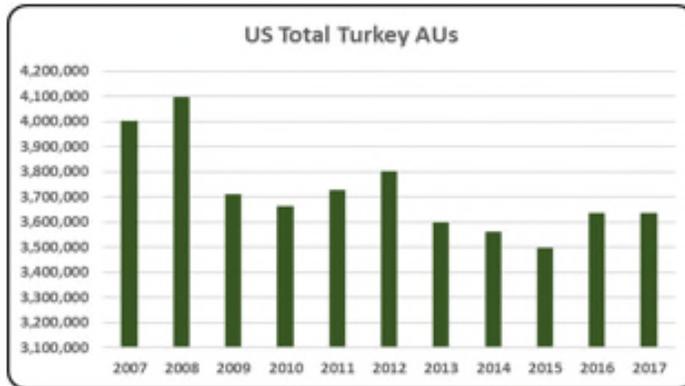
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In New York, the largest three segments of animal agriculture in terms of AUs during 2017 were: Dairy Cows (868,000 AUs), Beef Cows (407,025 AUs), and Broiler Chickens (173,188 AUs). Total animal units in New York during 2017 were 1.5 million AUs.



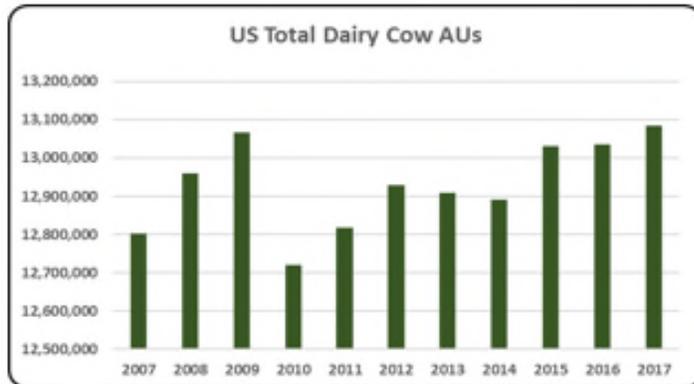
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Total animal units in New York widely fluctuated during 2007 to 2017, however 2017 holds the decade record for the highest number of animal units 1.5 million.



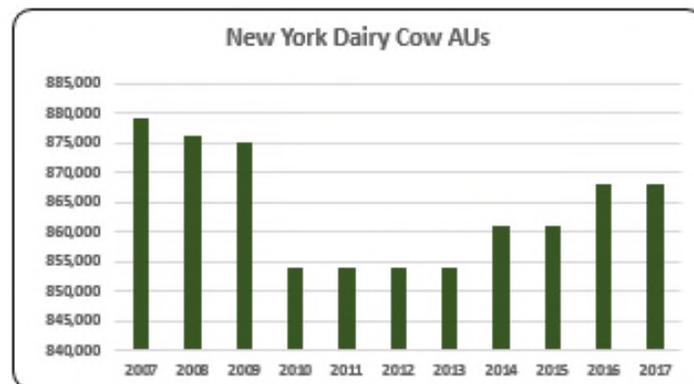
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broilers in 2017 (173,188 broiler AUs) represented 11.62% of all animal units. Broiler AUs decreased 12% during 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 2007 to 2017 was 19,198. Layer numbers in 2017 reached 22,030 AUs, a 40% increase from 2007.



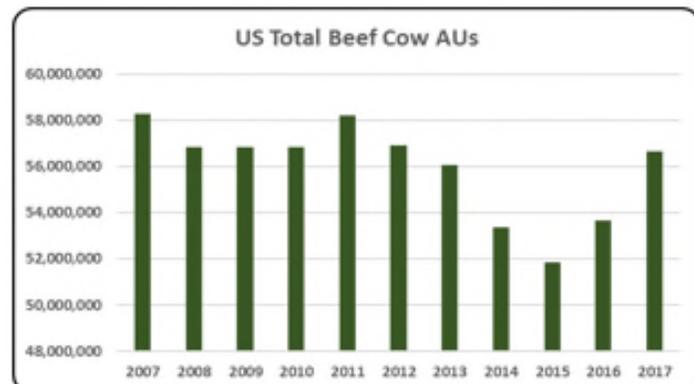
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkeys AUs dropped sharply by 72% from 2016 (41,564) to the 2017 AU number of 11,433.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- New York hog AUs decreased 66% since the start of the decade. The average number of hog AUs was 20,797 from 2007 to 2017.



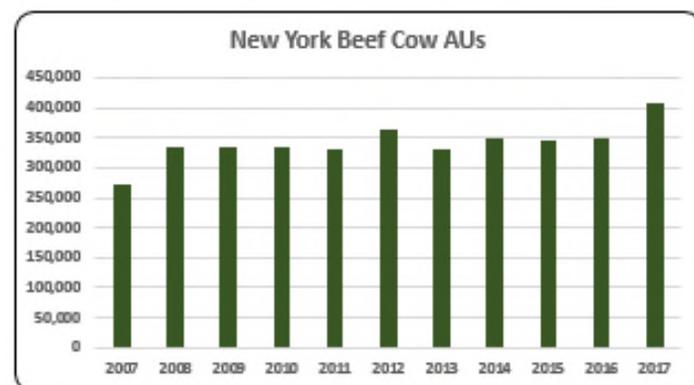
- From 2007 to 2017 dairy cow AUs averaged 12.9 million. In 2017 dairy cow AUs remained at 13 million increasing only 50,000 AUs from 2016. There have been steady but small increases in dairy cow numbers since the early 2010s.



- The leading animal sector in New York is dairy cows with 58.2% of all AUs in the state in 2017. The average dairy cow AUs for the 2007 to 2017 decade were 864,055.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cows represent 27% (407,025) of AUs in the state of New York. There has been a 50% increase in beef cow AUs since 2007.

New York Additional Information and Methodology

Animal agriculture is an important 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:

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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 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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	270,600	333,600	333,600	333,600	331,950	363,450	331,350	347,925	346,035	348,315	407,025
	Hog and Pig AUs	27,285	23,280	24,120	16,305	26,295	21,705	19,725	18,525	23,340	19,050	9,135
	Broiler AUs	196,873	193,803	180,192	182,615	137,602	166,736	166,154	165,210	169,475	170,752	173,188
	Turkey AUs	9,513	39,196	38,394	39,991	40,705	46,286	38,611	42,625	41,705	41,564	11,433
	Egg Layer AUs	15,684	16,660	15,904	17,340	18,116	19,046	20,472	20,632	23,032	22,257	22,030
	Dairy AUs	879,200	876,400	875,000	854,000	854,000	854,000	854,000	861,000	861,000	868,000	868,000
	Total Animal Units	1,399,155	1,482,939	1,467,209	1,443,852	1,408,668	1,471,224	1,430,312	1,455,917	1,464,587	1,469,938	1,490,812
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 95,331	\$ 104,390	\$ 127,438	\$ 166,544	\$ 259,842	\$ 305,678	\$ 334,031	\$ 405,250	\$ 410,986	\$ 293,527	\$ 315,300
	Hogs and Pigs (\$1,000)	\$ 10,784	\$ 9,508	\$ 8,708	\$ 11,264	\$ 18,669	\$ 16,818	\$ 16,325	\$ 20,924	\$ 20,665	\$ 13,755	\$ 5,671
	Broilers (\$1,000)	\$ 151,936	\$ 155,223	\$ 133,925	\$ 139,956	\$ 122,530	\$ 166,138	\$ 202,436	\$ 212,371	\$ 185,275	\$ 164,733	\$ 193,436
	Turkeys (\$1,000)	\$ 8,108	\$ 22,159	\$ 33,953	\$ 47,797	\$ 64,598	\$ 69,457	\$ 50,346	\$ 33,308	\$ 39,037	\$ 44,144	\$ 29,889
	Eggs (\$1,000)	\$ 73,945	\$ 96,871	\$ 66,428	\$ 66,177	\$ 82,740	\$ 93,883	\$ 107,145	\$ 133,207	\$ 193,585	\$ 63,470	\$ 89,145
	Milk (\$1,000)	\$ 2,384,291	\$ 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
	Other	\$ 11,065	\$ 11,143	\$ 11,161	\$ 11,988	\$ 11,549	\$ 11,140	\$ 11,246	\$ 11,365	\$ 12,357	\$ 12,087	\$ 11,738
	Sheep and Lambs (\$1,000)	\$ 2,507	\$ 2,763	\$ 2,959	\$ 3,964	\$ 3,702	\$ 3,472	\$ 3,755	\$ 4,052	\$ 5,222	\$ 5,130	\$ 5,096
	Aquaculture (\$1,000)	\$ 8,558	\$ 8,380	\$ 8,202	\$ 8,024	\$ 7,847	\$ 7,669	\$ 7,491	\$ 7,313	\$ 7,136	\$ 6,958	\$ 6,642
	Total (\$1,000)	\$ 2,735,459	\$ 2,786,239	\$ 2,071,277	\$ 2,655,788	\$ 3,307,260	\$ 3,221,975	\$ 3,575,686	\$ 4,303,845	\$ 3,427,013	\$ 3,103,807	\$ 3,359,163

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	4,821	3,974	4,302	4,453	
	Cattle feedlots (112112)	580	1,038	501	143	
	Dairy cattle and milk production (11212)	7,852	6,531	5,237	4,694	
	Hog and pig farming (1122)	314	363	385	422	
	Poultry and egg production (1123)	281	423	1,005	882	
	Sheep and goat farming (1124)	696	1,115	1,068	1,120	
	Animal aquaculture and other animal production (1125,1129)	2,602	4,976	5,111	5,171	
Value of Sales (\$1,000)	Cattle and Calves	216,075	251,121	318,080	449,497	
	Hogs and Pigs	15,108	14,005	28,302	38,999	
	Poultry and Eggs	87,265	106,620	123,727	144,663	
	Milk and Other Dairy Products	1,461,624	1,560,895	2,280,218	2,417,398	
	Aquaculture	1,833	15,185	20,417	18,036	
	Other (calculated)	82,317	34,880	85,962	39,094	
	Total	1,864,222	1,982,706	2,856,706	3,107,687	
Input Purchases	Livestock and poultry purchased	(Farms) 9,787	9,678	8,447	10,255	
		\$1,000	111,258	122,666	117,208	139,833
	Breeding livestock purchased	(Farms) <i>n/a</i>	5,796	4,657	5,449	
		\$1,000	<i>n/a</i>	50,639	49,526	72,677
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	5,053	5,103	6,538	
		\$1,000	<i>n/a</i>	72,026	67,683	67,156
Feed purchased	(Farms)	17,393	22,148	18,994	21,869	
	\$1,000	482,735	537,185	695,165	1,007,295	

2017 Animal Agriculture	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 451,919	\$ 83,744	2,424	\$ 21,865
Hogs, Pigs, and Other	\$ 24,562	\$ 5,421	135	\$ 1,415	
Poultry and Eggs	\$ 500,108	\$ 101,365	2,674	\$ 26,466	
Dairy	\$ 4,438,721	\$ 951,794	27,336	\$ 248,513	
Total	\$ 5,415,310	\$ 1,142,324	32,569	\$ 298,261	

Change from 2007 to 2017	Cattle and Calves	\$ 291,544	\$ 54,025	1,564	\$ 14,106
	Hogs, Pigs, and Other	\$ (11,619)	\$ (2,564)	(64)	\$ (670)
	Poultry and Eggs	\$ 60,550	\$ 12,273	324	\$ 3,204
	Dairy	\$ (138,220)	\$ (29,638)	(851)	\$ (7,739)
	Total	\$ 202,256	\$ 34,095	972	\$ 8,902

RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)
	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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	6.4%
	Total	26.1%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal ag contributed:

- \$18.2 billion in economic output
- 88,838 jobs
- \$4.1 billion in earnings
- \$1.0 billion in income taxes paid at local, state, and federal levels
- \$142.4 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in North Carolina has increased economic output by over \$2.2 billion, boosted household earnings by \$487.6 million, contributed 10,477 additional jobs and paid \$124.1 million in additional tax revenues.

North Carolina's animal agriculture consumed almost 2.7 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (1.4 million tons)
- Hogs (868.2 thousand tons)
- Turkeys (292.5 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 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 2017, North Carolina's animal agriculture contributed the following to the economy:

- About \$18.2 billion in economic output
- \$4.1 billion in household earnings
- 88,838 jobs
- \$1.0 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:

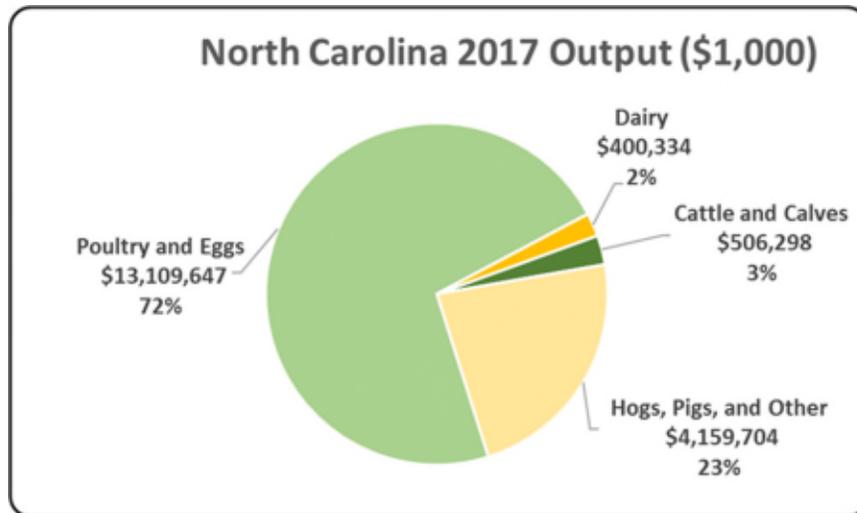
- Increased economic output by \$2.2 billion
- Boosted household earnings by \$487.6 million
- Added 10,477 jobs
- Paid an additional \$124.1 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 18,175,981	\$ 2,216,401	13.89%
Earnings (\$1,000)	\$ 4,062,124	\$ 487,617	13.64%
Employment (Jobs)	88,838	10,477	13.37%
Income Taxes Paid (\$1,000)	\$ 1,033,811	\$ 124,098	13.64%
Property Taxes Paid in 2012 (\$1,000)	\$ 142,392		

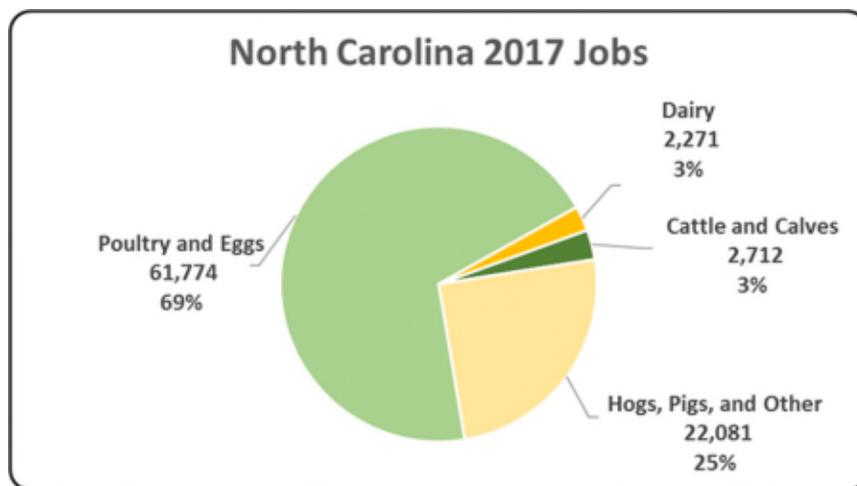
North Carolina Output

“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.



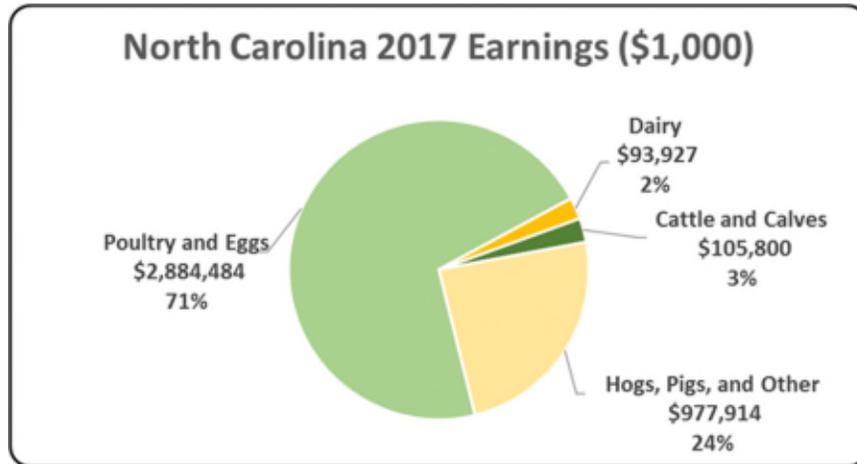
North Carolina Jobs

“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 88,838 jobs within and outside of animal agriculture.



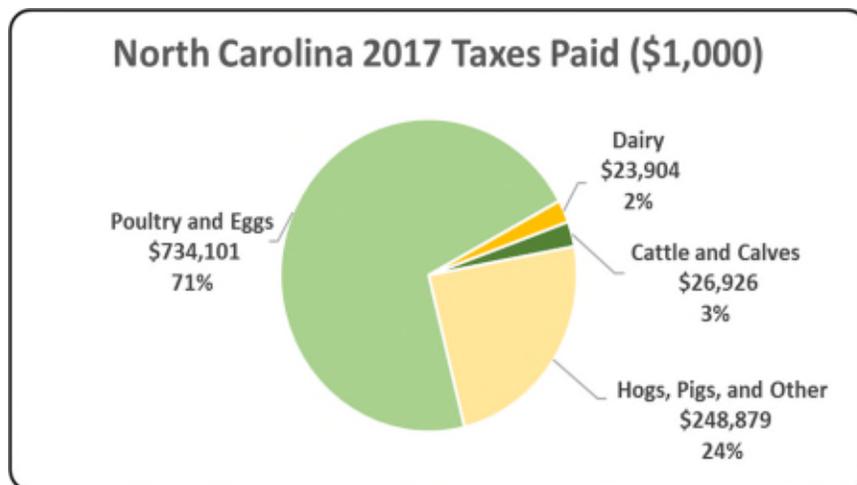
North Carolina Earnings

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 2017.



North Carolina Taxes Paid by Animal Agriculture

North Carolina’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$1.0 billion in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$142.4 million in property taxes paid by all of North Carolina agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



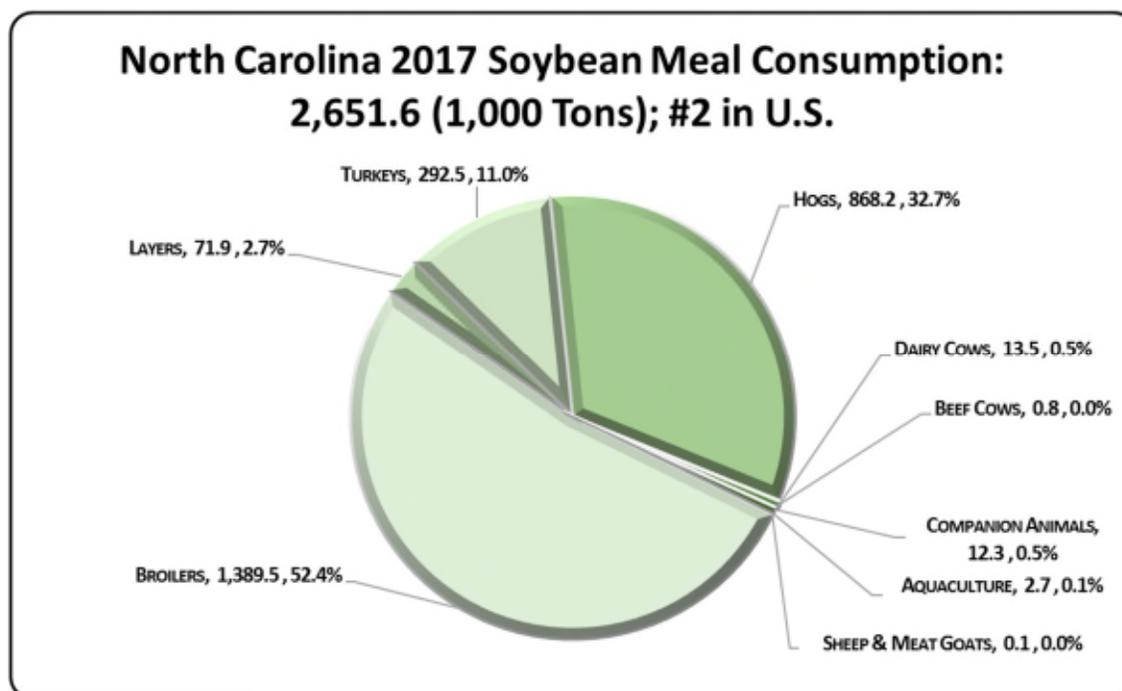
North Carolina Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

North Carolina's animal agriculture consumed almost 2.7 million tons of soybean meal in 2017, placing the state as #2 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in North Carolina consumed 15,169 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (1.4 million tons)
- Hogs (868.2 thousand tons)
- Turkeys (292.5 thousand tons)

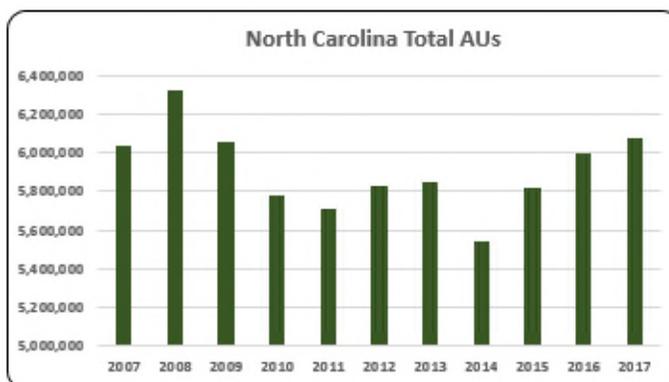
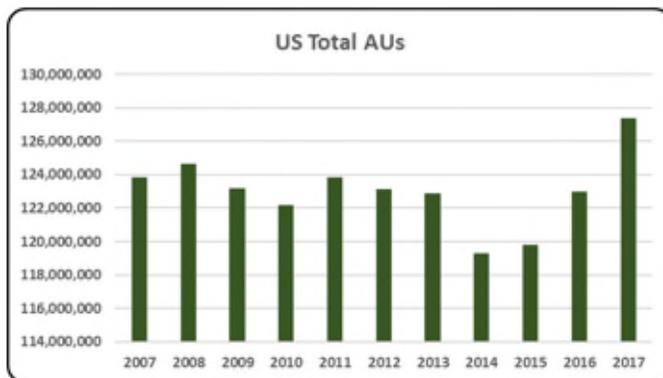


North Carolina Animal Unit (AU) Trends

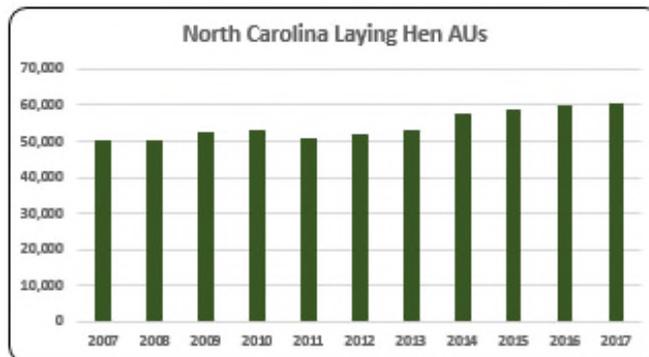
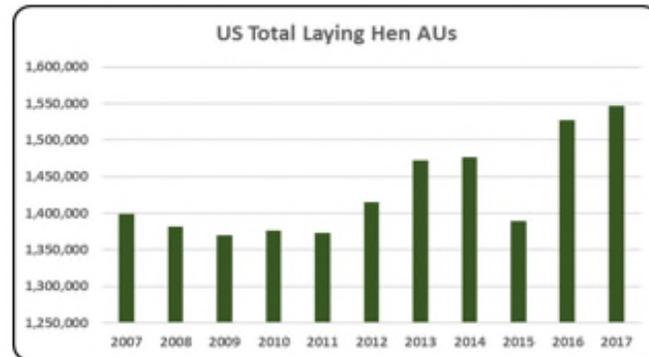
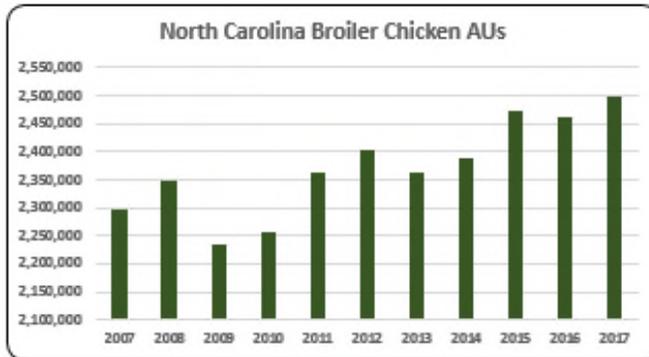
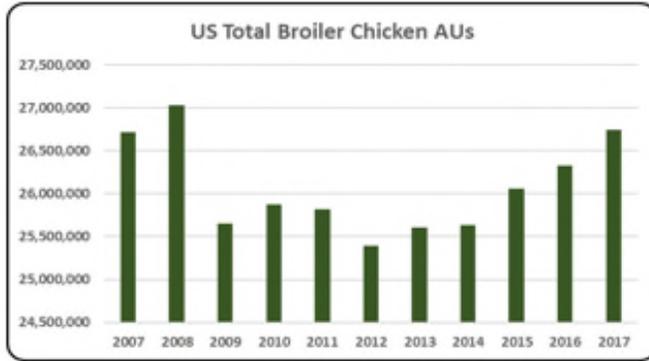
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of North Carolina. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

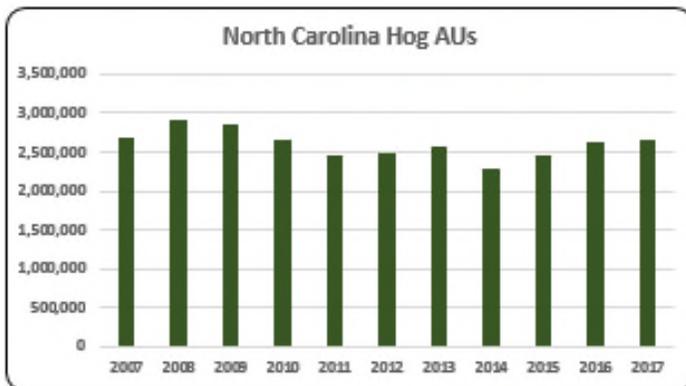
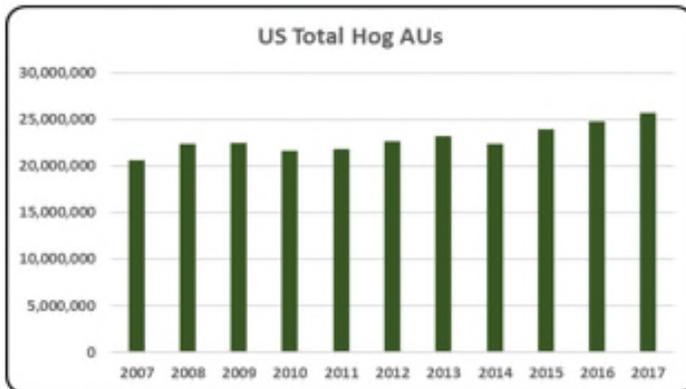
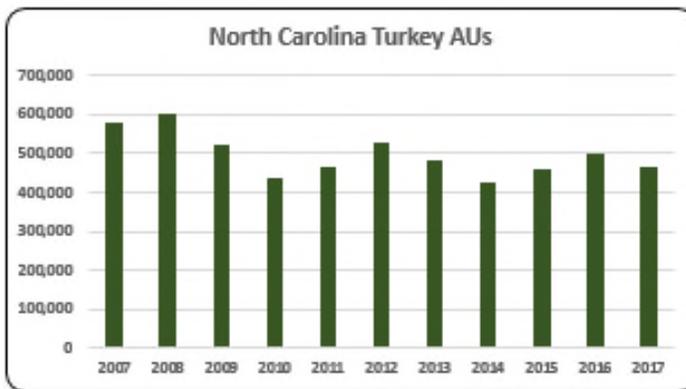
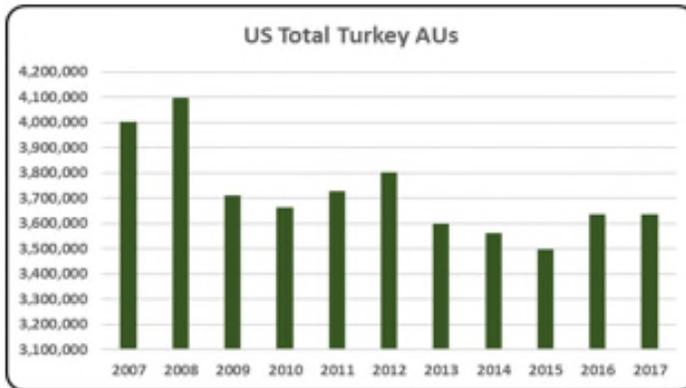
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In North Carolina, the largest three segments of animal agriculture in terms of AUs during 2017 were: Hogs (2.7 million AUs), Broiler Chickens (2.5 million AUs), and Turkeys (465,056 AUs). Total animal units in North Carolina during 2017 were 6.1 million AUs.



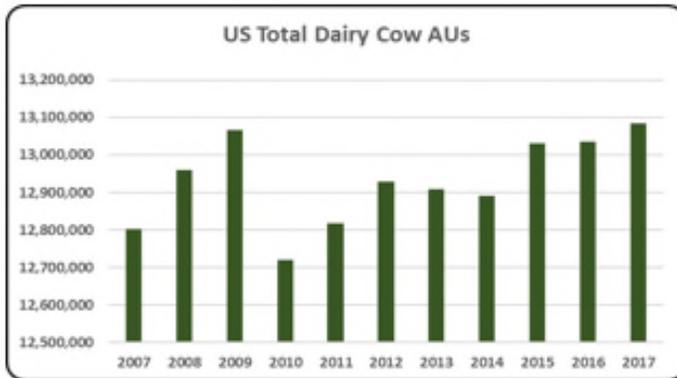
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- 4.77% of all AUs in the U.S. were in North Carolina in 2017. 2008 was a record year for animal units in North Carolina with 6.3 million AUs. 2017 was a strong year with 6.1 million AUs.



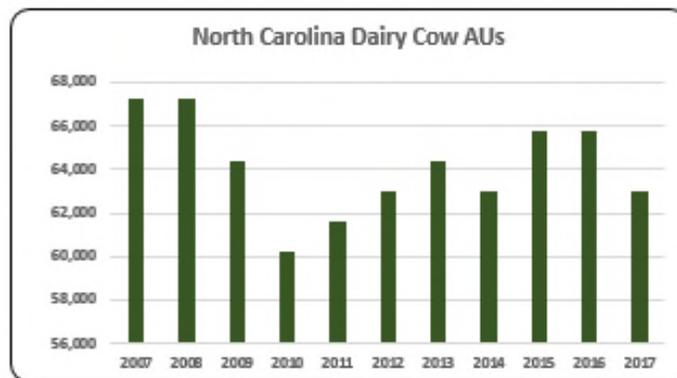
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Forty-one percent (2.5 million) of all AUs in 2017 were from broilers. There was an upward trend in the broiler industry during the last decade and broiler AUs increased 8.7% from 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Only 1% (60,461) of all AUs in North Carolina were from laying hens in 2017. The average number of layers during last decade was about 54,488 AUs.



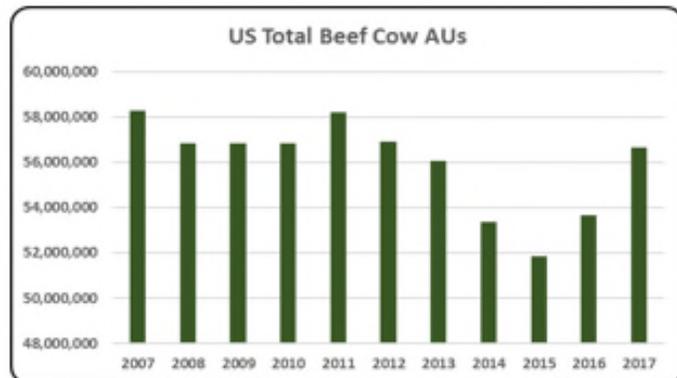
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- North Carolina represented 12.8% (465,056) of all turkey AUs in the U.S. Overall, turkey AUs decreased 20% during the 2007-2017 period.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hogs in North Carolina account for 43.8% (2.66 million hog AUs) of the state total AUs in 2017. Hog AUs in North Carolina experienced a slight downward trend during the last decade.



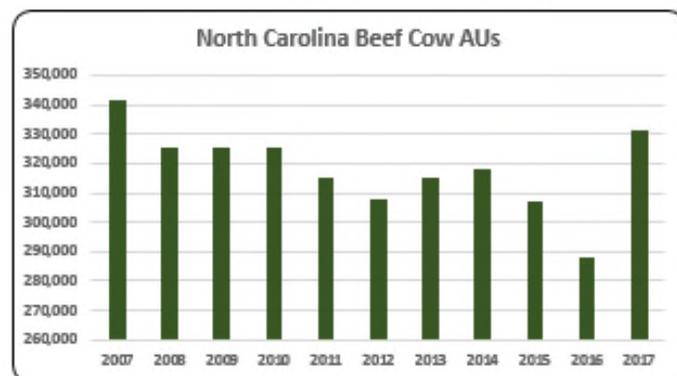
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- The average number of dairy cow AUs in North Carolina were 64,145 from 2007 to 2017. Dairy cow AUs decreased 6.3% throughout the decade.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- From 2007 to 2017 North Carolina's beef cow AUs averaged 318,082. In 2017 beef cow AUs increased to 331,125 from the lowest of the decade in 2016.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	341,280	325,275	325,275	325,275	315,420	307,575	314,850	317,775	307,125	287,925	331,125
	Hog and Pig AUs	2,696,400	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
	Broiler AUs	2,297,558	2,347,373	2,235,055	2,255,662	2,364,262	2,403,427	2,364,243	2,390,000	2,472,688	2,460,768	2,496,954
	Turkey AUs	581,320	603,884	520,188	438,859	467,418	525,879	485,177	424,604	460,947	497,526	465,056
	Egg Layer AUs	50,184	50,080	52,744	53,336	50,824	51,918	52,926	57,578	59,076	60,240	60,461
	Dairy AUs	67,200	67,200	64,400	60,200	61,600	63,000	64,400	63,000	65,800	65,800	63,000
	Total Animal Units	6,033,942	6,317,462	6,052,912	5,784,178	5,706,024	5,832,214	5,843,746	5,539,406	5,817,536	5,997,108	6,076,246
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 204,135	\$ 210,118	\$ 205,617	\$ 236,278	\$ 306,298	\$ 316,790	\$ 304,014	\$ 412,922	\$ 404,242	\$ 272,237	\$ 277,545
	Hogs and Pigs (\$1,000)	\$ 1,931,118	\$ 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
	Broilers (\$1,000)	\$ 2,479,538	\$ 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
	Turkeys (\$1,000)	\$ 596,596	\$ 628,000	\$ 468,319	\$ 534,710	\$ 670,078	\$ 827,406	\$ 727,935	\$ 737,831	\$ 888,781	\$ 990,577	\$ 729,334
	Eggs (\$1,000)	\$ 328,664	\$ 373,944	\$ 349,371	\$ 327,373	\$ 375,573	\$ 392,549	\$ 431,359	\$ 501,063	\$ 588,368	\$ 444,441	\$ 460,106
	Milk (\$1,000)	\$ 191,568	\$ 191,780	\$ 134,368	\$ 167,138	\$ 207,016	\$ 192,700	\$ 200,090	\$ 246,977	\$ 183,210	\$ 165,015	\$ 178,976
	Other	\$ 25,519	\$ 25,833	\$ 25,843	\$ 26,405	\$ 26,171	\$ 26,234	\$ 26,280	\$ 26,399	\$ 26,722	\$ 26,773	\$ 35,413
	Sheep and Lambs (\$1,000)	\$ 701	\$ 969	\$ 933	\$ 1,449	\$ 1,169	\$ 1,185	\$ 1,185	\$ 1,258	\$ 1,535	\$ 1,540	\$ 1,489
	Aquaculture (\$1,000)	\$ 24,818	\$ 24,864	\$ 24,910	\$ 24,956	\$ 25,003	\$ 25,049	\$ 25,095	\$ 25,141	\$ 25,188	\$ 25,234	\$ 33,924
	Total (\$1,000)	\$ 5,757,138	\$ 6,071,794	\$ 5,423,476	\$ 6,071,419	\$ 6,621,523	\$ 7,147,493	\$ 8,094,790	\$ 8,596,679	\$ 7,807,399	\$ 7,088,690	\$ 7,596,906

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	14,594	16,761	14,413	13,909	
	Cattle feedlots (112112)	443	13	3	10	
	Dairy cattle and milk production (11212)	612	740	381	263	
	Hog and pig farming (1122)	2,017	1,735	1,619	1,170	
	Poultry and egg production (1123)	3,564	3,827	4,096	3,404	
	Sheep and goat farming (1124)	464	1,004	2,437	1,922	
	Animal aquaculture and other animal production (1125,1129)	2,689	5,232	6,290	5,190	
Value of Sales (\$1,000)	Cattle and Calves	177,058	185,222	288,801	332,733	
	Hogs and Pigs	2,570,376	2,183,646	3,104,731	2,873,988	
	Poultry and Eggs	2,254,453	2,382,365	4,087,004	4,837,026	
	Milk and Other Dairy Products	180,130	150,406	161,373	179,265	
	Aquaculture	11,510	17,669	32,175	23,365	
	Other (calculated)	38,180	33,744	33,266	15,340	
	Total	5,231,707	4,953,052	7,707,350	8,261,717	
Input Purchases	Livestock and poultry purchased	(Farms) 11,609	11,972	12,342	12,827	
		\$1,000	916,191	1,049,514	1,666,076	1,397,510
	Breeding livestock purchased	(Farms) <i>n/a</i>	5,119	5,004	5,806	
		\$1,000	<i>n/a</i>	57,036	131,277	136,342
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	7,997	8,677	8,692	
		\$1,000	<i>n/a</i>	992,478	1,534,800	1,261,168
	Feed purchased	(Farms) 22,116	30,938	28,263	29,837	
	\$1,000	2,262,032	1,917,997	3,183,993	4,121,552	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 506,298	\$ 105,800	2,712	\$ 26,926
	Hogs, Pigs, and Other	\$ 4,159,704	\$ 977,914	22,081	\$ 248,879
	Poultry and Eggs	\$ 13,109,647	\$ 2,884,484	61,774	\$ 734,101
	Dairy	\$ 400,334	\$ 93,927	2,271	\$ 23,904
	Total	\$ 18,175,981	\$ 4,062,124	88,838	\$ 1,033,811
Change from 2007 to 2017	Cattle and Calves	\$ 69,223	\$ 14,465	371	\$ 3,681
	Hogs, Pigs, and Other	\$ 146,715	\$ 34,491	779	\$ 8,778
	Poultry and Eggs	\$ 2,103,069	\$ 462,733	9,910	\$ 117,766
	Dairy	\$ (102,606)	\$ (24,073)	(582)	\$ (6,127)
	Total	\$ 2,216,401	\$ 487,617	10,477	\$ 124,098
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	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				13.5%
	Federal Social Security tax rate				6.2%
	State Effective Rate				5.8%
	Total				25.5%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 factor of animal agriculture's 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 2017 animal agriculture contributed:

- \$2.8 billion in economic output
- 13,178 jobs
- \$544.3 million in earnings
- \$118.1 million in income taxes paid at local, state, and federal levels
- \$129.9 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in North Dakota has increased economic output by over \$661.4 million, boosted household earnings by \$127.5 million, contributed 3,071 additional jobs and paid \$27.7 million in additional tax revenues.

North Dakota's animal agriculture consumed almost 62.6 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (31.8 thousand tons)
- Broilers (10.1 thousand tons)
- Beef Cows (8.2 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 2017, North Dakota's animal agriculture contributed the following to the economy:

- About \$2.8 billion in economic output
- \$544.3 million in household earnings
- 13,178 jobs
- \$118.1 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:

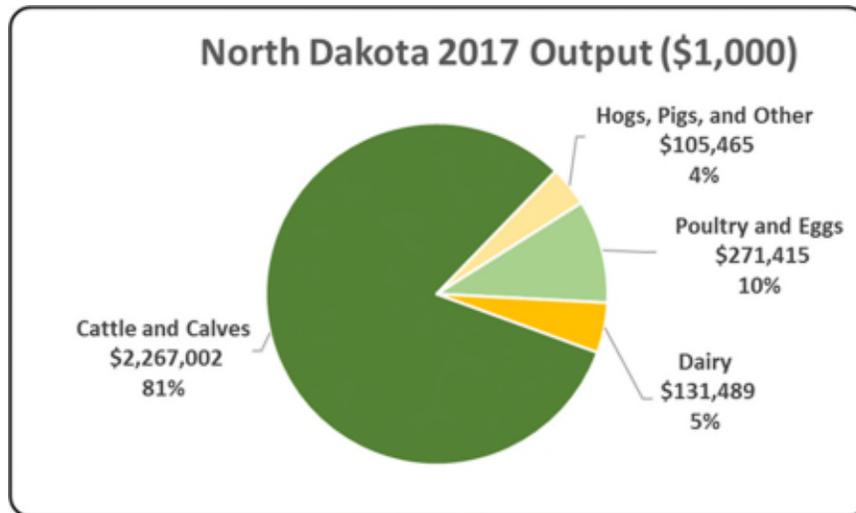
- Increased economic output by \$661.4 million
- Boosted household earnings by \$127.5 million
- Added 3,071 jobs
- Paid an additional \$27.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,775,372	\$ 661,415	31.29%
Earnings (\$1,000)	\$ 544,291	\$ 127,480	30.58%
Employment (Jobs)	13,178	3,071	30.39%
Income Taxes Paid (\$1,000)	\$ 118,111	\$ 27,663	30.58%
Property Taxes Paid in 2012 (\$1,000)	\$ 129,909		

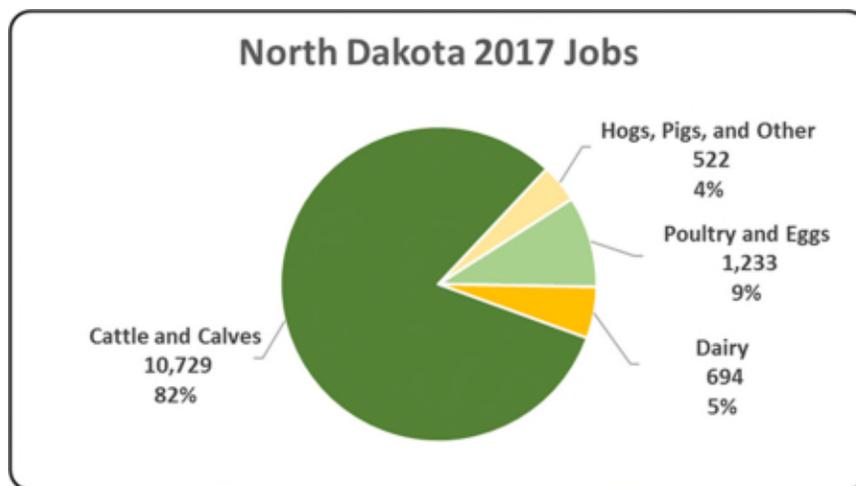
North Dakota Output

“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 \$2.8 billion.



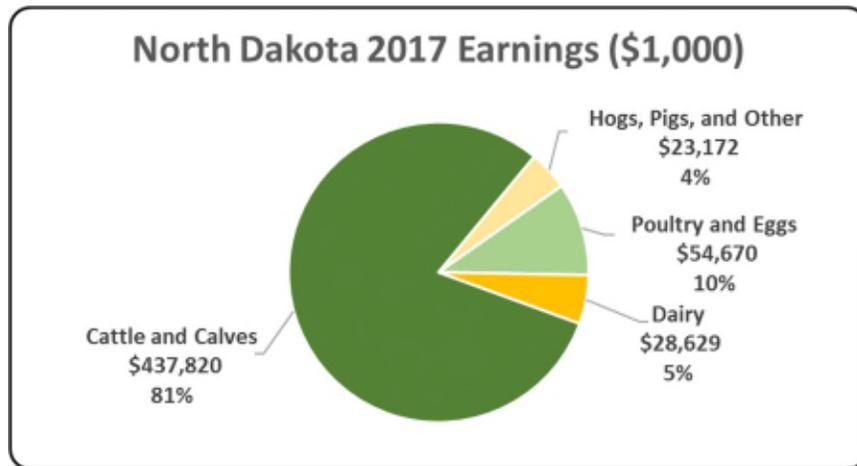
North Dakota Jobs

“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 13,178 jobs within and outside of animal agriculture.



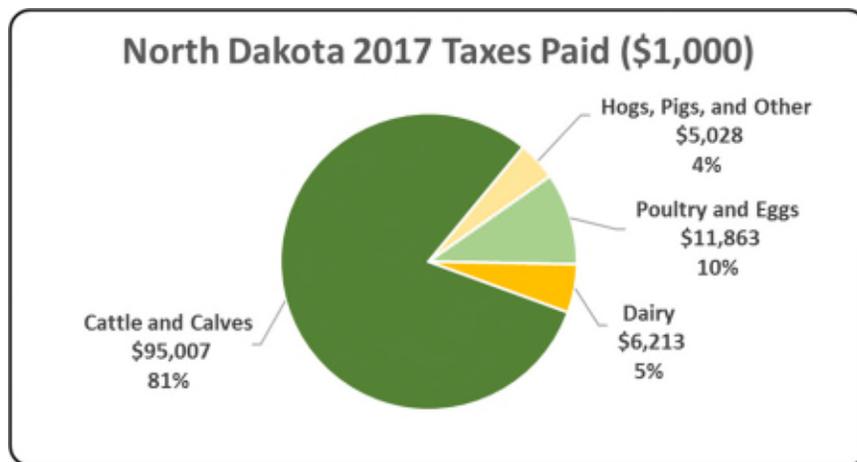
North Dakota Earnings

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 \$544.3 million to household earnings in 2017.



North Dakota Taxes Paid by Animal Agriculture

North Dakota’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$118.1 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$129.9 million in property taxes paid by all of North Dakota agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



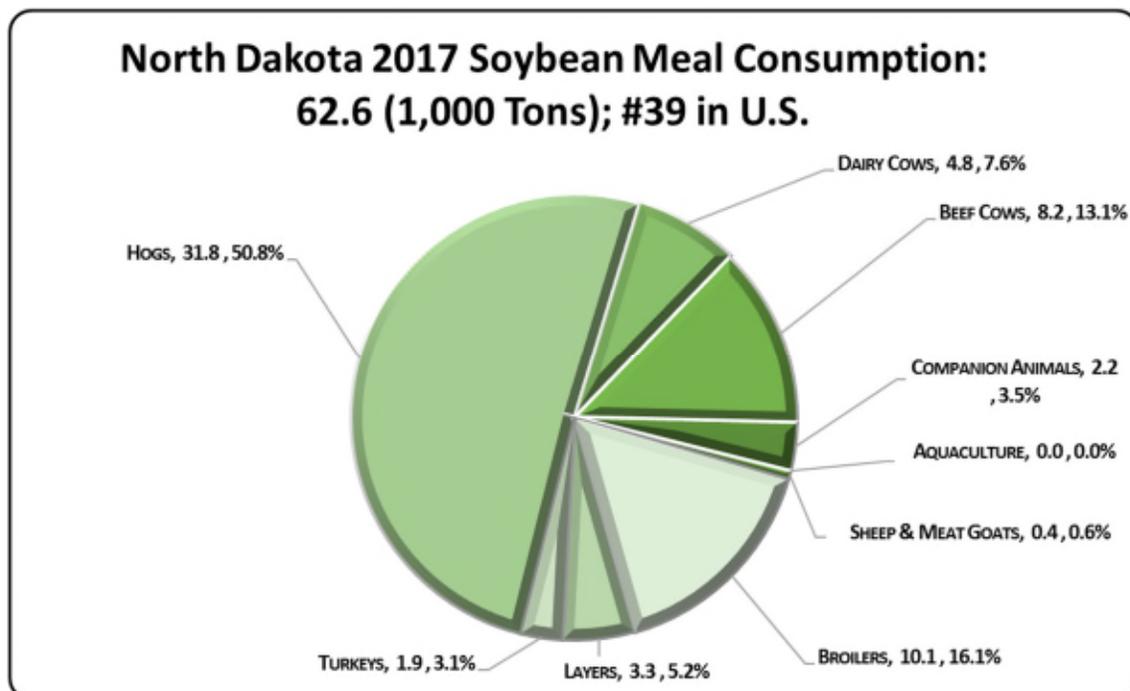
North Dakota Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

North Dakota's animal agriculture consumed almost 62.6 thousand tons of soybean meal in 2017, placing the state as #39 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in North Dakota consumed 41,673 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (31.8 thousand tons)
- Broilers (10.1 thousand tons)
- Beef Cows (8.2 thousand tons)

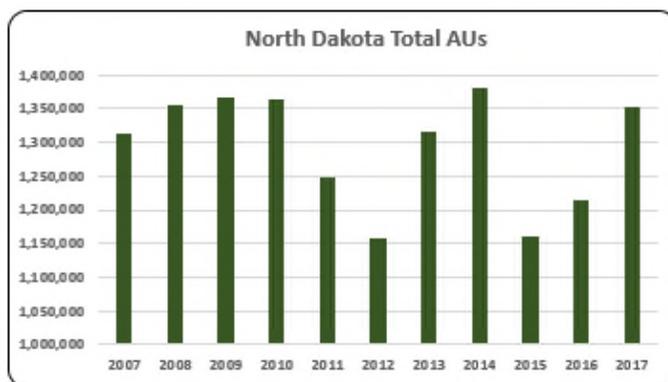
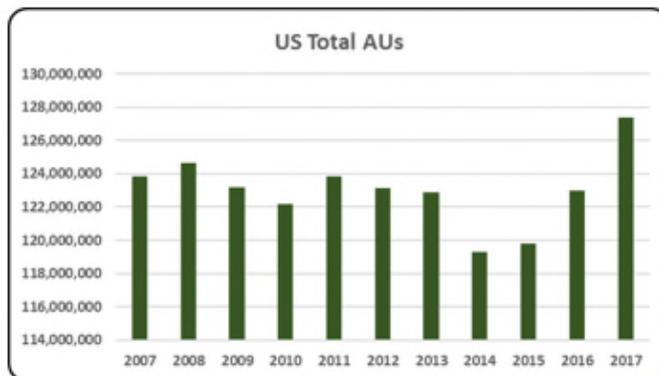


North Dakota Animal Unit (AU) Trends

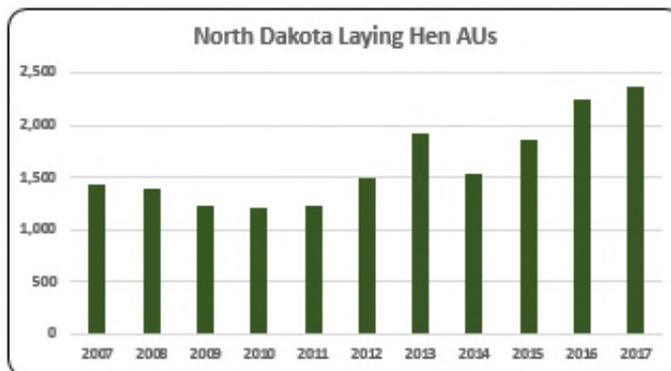
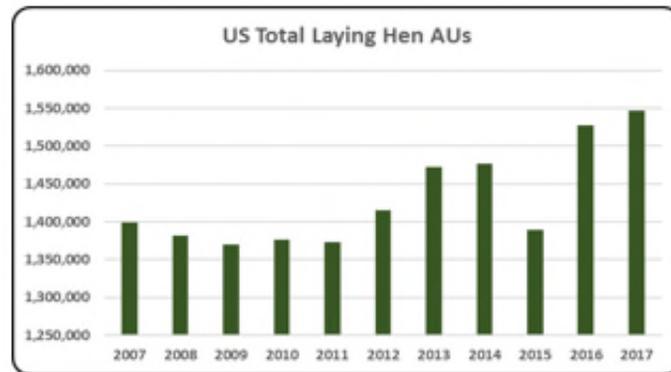
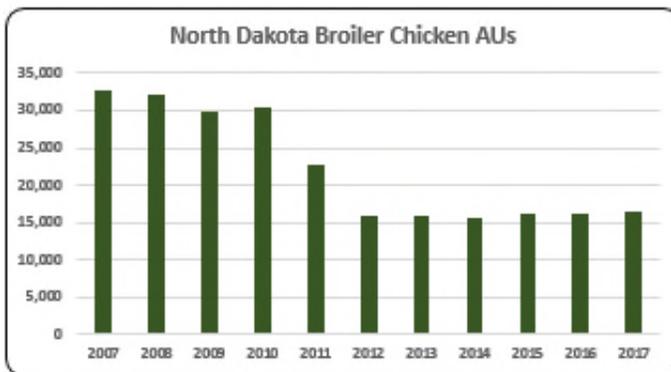
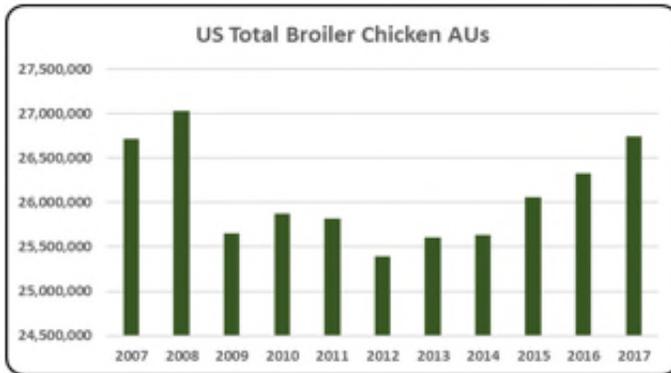
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of North Dakota. Due to this reality, using a single year as a measure of the presence and strength of a sector 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 North Dakota and to give perspective on North 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.

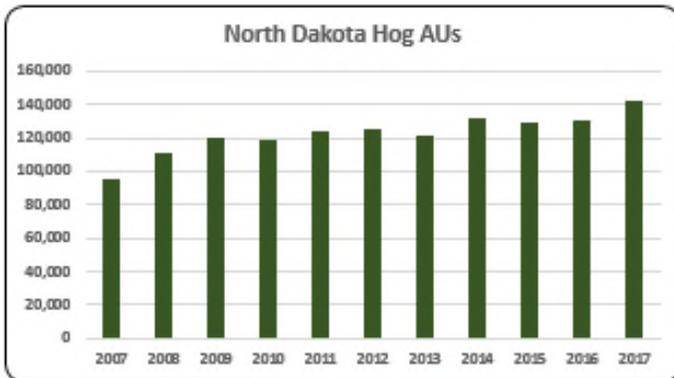
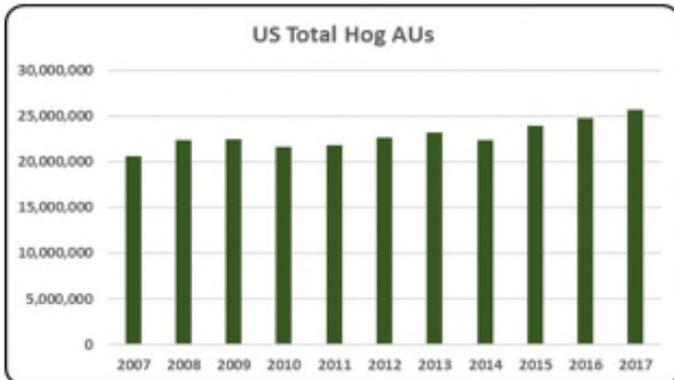
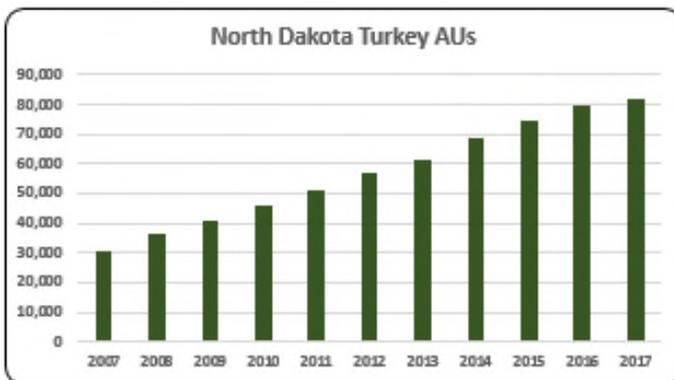
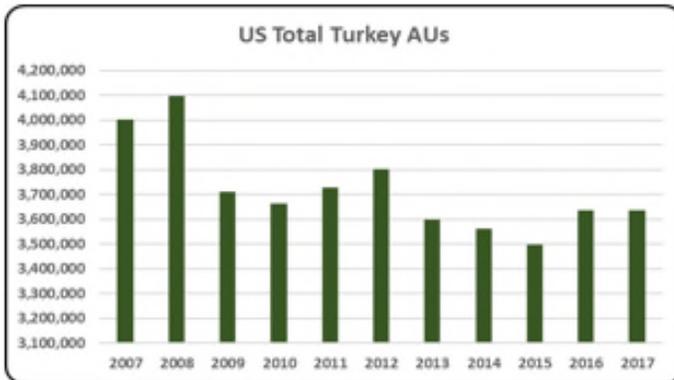
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In North Dakota, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (1.1 million AUs), Hogs (142,125 AUs), and Turkeys (81,993 AUs). Total animal units in North Dakota during 2017 were 1.4 million AUs.



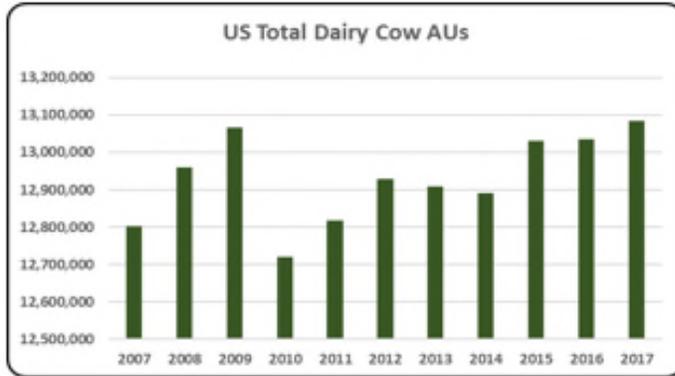
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- About 1% (1.4 million) of all AUs in the U.S. were in North Dakota in 2017. About 80.4 % of all AUs in North Dakota were from beef cows in 2017.



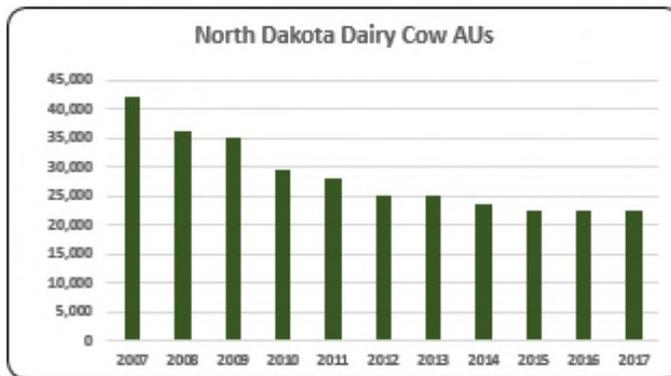
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- In 2017, there were 16,485 broiler AUs in North Dakota. There was a 50% reduction in broiler AUs from 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 2,365 layer AUs in 2017. Overall AUs increased 65% during the last decade.



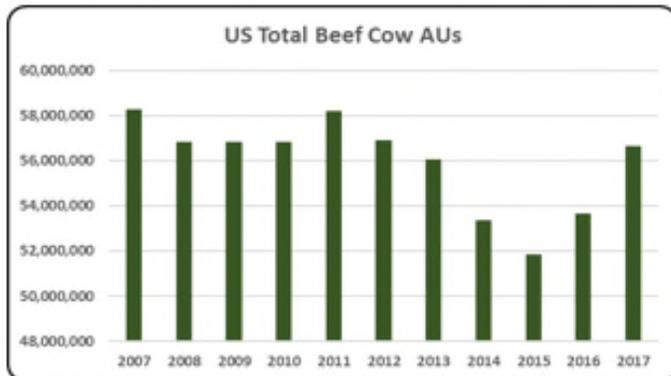
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkey AUs grew 171.5% in North Dakota from 2007 to 2017. Turkeys represented 6.06% (81,993 turkey AUs) of all animal units in the state in 2017.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- There were 142,125 hog AUs in North Dakota in 2017. Hog numbers rose 49.4% from 95,115 in 2007.



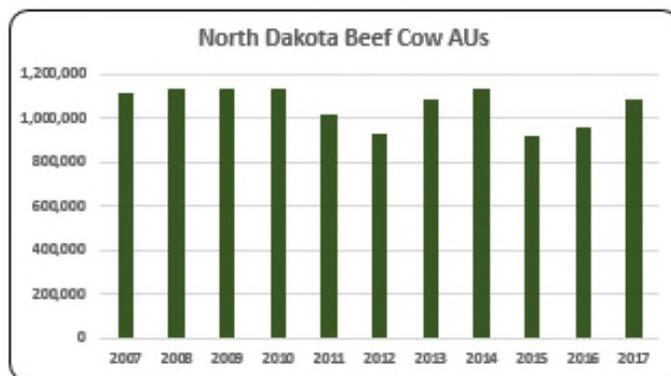
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cows were 1.7% (22,400 dairy cow AUs) of all North Dakota AUs in 2017. Dairy cow AUs followed a downward trend since 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow numbers in North Dakota, were 1,087,155 in 2017. The average beef cow AUs were 1.1 million from 2007 to 2017.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Animal Units (AUs)	Beef Cattle AUs	1,111,575	1,139,025	1,139,025	1,139,025	1,021,125	933,765	1,091,460	1,140,090	917,970	961,770	1,087,155
	Hog and Pig AUs	95,115	110,685	119,580	119,010	124,425	126,015	121,155	131,835	128,940	131,250	142,125
	Broiler AUs	32,667	32,158	29,899	30,301	22,832	15,871	15,816	15,726	16,132	16,253	16,485
	Turkey AUs	30,198	36,233	40,589	45,934	51,270	56,678	61,552	68,830	74,198	79,604	81,993
	Egg Layer AUs	1,437	1,396	1,221	1,213	1,220	1,489	1,927	1,536	1,848	2,244	2,365
	Dairy AUs	42,000	36,400	35,000	29,400	28,000	25,200	25,200	23,800	22,400	22,400	22,400
	Total Animal Units	1,312,992	1,355,896	1,365,314	1,364,883	1,248,872	1,159,018	1,317,110	1,381,817	1,161,487	1,213,522	1,352,524
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 599,566	\$ 629,990	\$ 490,746	\$ 655,715	\$ 780,087	\$ 837,759	\$ 857,342	\$ 1,058,418	\$ 1,046,219	\$ 903,207	\$ 954,688
	Hogs and Pigs (\$1,000)	\$ 35,825	\$ 35,474	\$ 39,733	\$ 51,177	\$ 56,408	\$ 46,692	\$ 52,400	\$ 67,274	\$ 64,387	\$ 50,149	\$ 56,979
	Broilers (\$1,000)	\$ 25,211	\$ 25,756	\$ 22,222	\$ 23,223	\$ 20,331	\$ 15,814	\$ 19,269	\$ 20,215	\$ 17,636	\$ 15,680	\$ 18,412
	Turkeys (\$1,000)	\$ 23,056	\$ 28,913	\$ 32,287	\$ 38,084	\$ 45,896	\$ 52,166	\$ 57,855	\$ 66,655	\$ 72,579	\$ 78,079	\$ 83,228
	Eggs (\$1,000)	\$ 7,643	\$ 9,211	\$ 6,556	\$ 7,197	\$ 7,890	\$ 8,849	\$ 9,998	\$ 16,003	\$ 26,678	\$ 10,491	\$ 14,185
	Milk (\$1,000)	\$ 82,140	\$ 77,330	\$ 50,310	\$ 61,056	\$ 69,000	\$ 65,583	\$ 67,859	\$ 76,464	\$ 56,772	\$ 55,728	\$ 60,720
	Other	\$ 5,482	\$ 5,962	\$ 5,795	\$ 7,052	\$ 6,732	\$ 8,065	\$ 5,767	\$ 6,080	\$ 6,704	\$ 7,105	\$ 6,662
	Sheep and Lambs (\$1,000)	\$ 5,409	\$ 5,901	\$ 5,747	\$ 7,016	\$ 6,708	\$ 8,053	\$ 5,767	\$ 6,080	\$ 6,704	\$ 7,105	\$ 6,410
	Aquaculture (\$1,000)	\$ 73	\$ 61	\$ 48	\$ 36	\$ 24	\$ 12	\$ -	\$ -	\$ -	\$ -	\$ 251
	Total (\$1,000)	\$ 778,922	\$ 812,636	\$ 647,650	\$ 843,504	\$ 986,345	\$ 1,034,928	\$ 1,070,490	\$ 1,311,109	\$ 1,290,975	\$ 1,120,439	\$ 1,194,875

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,600	7,154	5,961	4,949	
	Cattle feedlots (112112)	378	378	252	157	
	Dairy cattle and milk production (11212)	662	410	212	90	
	Hog and pig farming (1122)	207	90	74	66	
	Poultry and egg production (1123)	72	63	130	105	
	Sheep and goat farming (1124)	338	307	276	251	
	Animal aquaculture and other animal production (1125,1129)	871	1,147	1,415	2,085	
Value of Sales (\$1,000)	Cattle and Calves	499,719	625,070	856,489	1,063,287	
	Hogs and Pigs	34,861	25,888	34,910	50,366	
	Poultry and Eggs	27,371	22,365	28,496	withheld	
	Milk and Other Dairy Products	80,128	65,450	78,959	67,079	
	Aquaculture	withheld	withheld	withheld	738	
	Other (calculated)	36,135	34,221	46,843	61,862	
	Total	678,214	772,994	1,045,697	1,243,332	
Input Purchases	Livestock and poultry purchased	(Farms)	8,030	7,129	6,074	7,183
		\$1,000	106,412	124,054	204,142	291,801
	Breeding livestock purchased	(Farms)	n/a	5,406	4,901	5,772
		\$1,000	n/a	31,117	59,706	101,420
	Other livestock and poultry purchased	(Farms)	n/a	2,841	2,022	2,666
		\$1,000	n/a	92,937	144,436	190,381
Feed purchased	(Farms)	12,996	11,956	9,597	11,830	
	\$1,000	125,867	118,559	158,337	324,796	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 2,267,002	\$ 437,820	10,729	\$ 95,007
	Hogs, Pigs, and Other	\$ 105,465	\$ 23,172	522	\$ 5,028
	Poultry and Eggs	\$ 271,415	\$ 54,670	1,233	\$ 11,863
	Dairy	\$ 131,489	\$ 28,629	694	\$ 6,213
	Total	\$ 2,775,372	\$ 544,291	13,178	\$ 118,111
Change from 2007 to 2017	Cattle and Calves	\$ 595,939	\$ 115,092	2,821	\$ 24,975
	Hogs, Pigs, and Other	\$ 25,120	\$ 5,519	124	\$ 1,198
	Poultry and Eggs	\$ 117,642	\$ 23,696	534	\$ 5,142
	Dairy	\$ (77,286)	\$ (16,828)	(408)	\$ (3,652)
	Total	\$ 661,415	\$ 127,480	3,071	\$ 27,663
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				13.5%
	Federal Social Security tax rate				6.2%
	State Effective Rate				2.0%
	Total				21.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 key driver of animal agriculture success in the State of Ohio. The success of Ohio animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Ohio during 2017 animal agriculture contributed:

- \$7.6 billion in economic output
- 45,387 jobs
- \$1.7 billion in earnings
- \$376.9 million in income taxes paid at local, state, and federal levels
- \$235.7 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Ohio has increased economic output by over \$750.3 million, boosted household earnings by \$161.7 million, contributed 4,400 additional jobs and paid \$36.3 million in additional tax revenues.

Ohio's animal agriculture consumed almost 813.6 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Egg-Laying Hens (251.8 thousand tons)
- Hogs (215.4 thousand tons)
- Broilers (167.1 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 integral part of Ohio's economy. In 2017, Ohio's animal agriculture contributed the following to the economy:

- About \$7.6 billion in economic output
- \$1.7 billion in household earnings
- 45,387 jobs
- \$376.9 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:

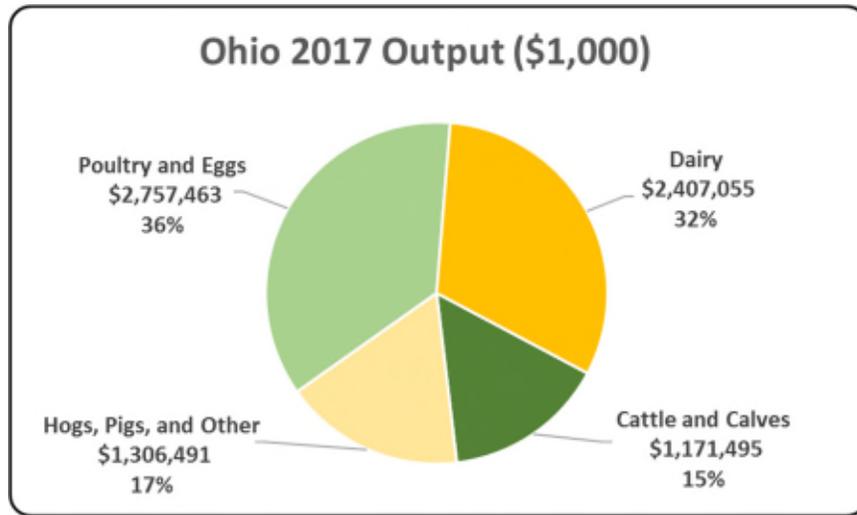
- Increased economic output by \$750.3 million
- Boosted household earnings by \$161.7 million
- Added 4,400 jobs
- Paid an additional \$36.3 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 7,642,504	\$ 750,339	10.89%
Earnings (\$1,000)	\$ 1,678,985	\$ 161,703	10.66%
Employment (Jobs)	45,387	4,400	10.73%
Income Taxes Paid (\$1,000)	\$ 376,932	\$ 36,302	10.66%
Property Taxes Paid in 2012 (\$1,000)	\$ 235,741		

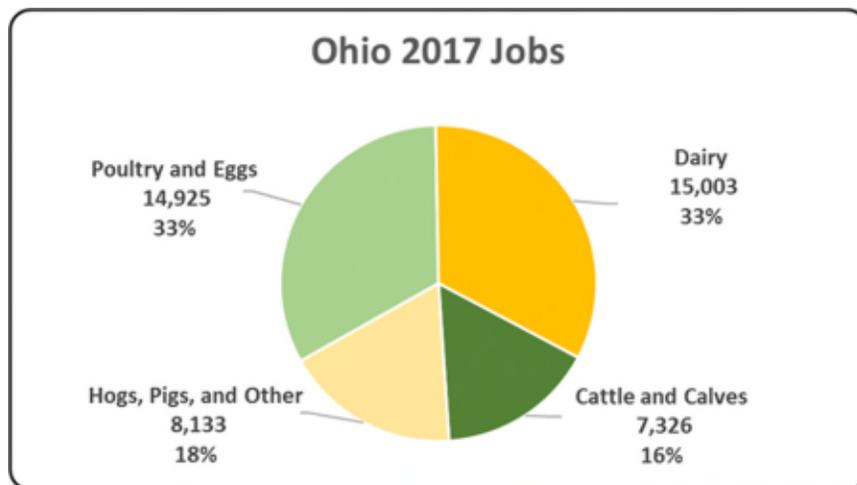
Ohio Output

“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 \$7.6 billion.



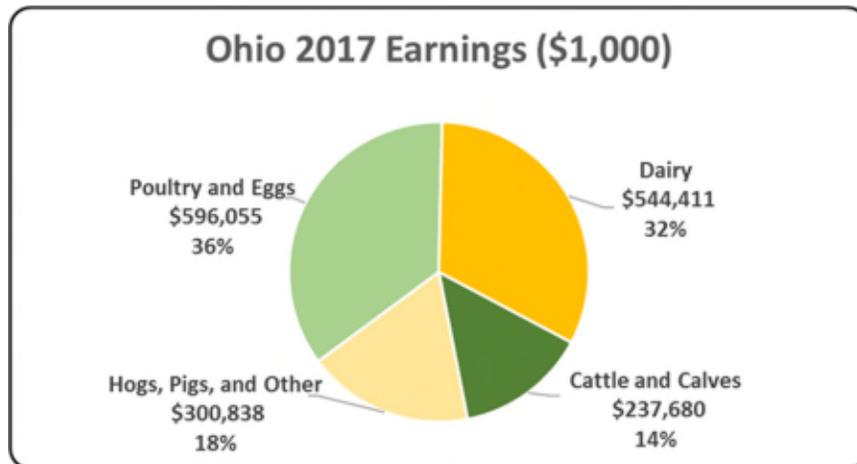
Ohio Jobs

“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 significantly to Ohio total jobs, contributing 45,387 jobs within and outside of animal agriculture.



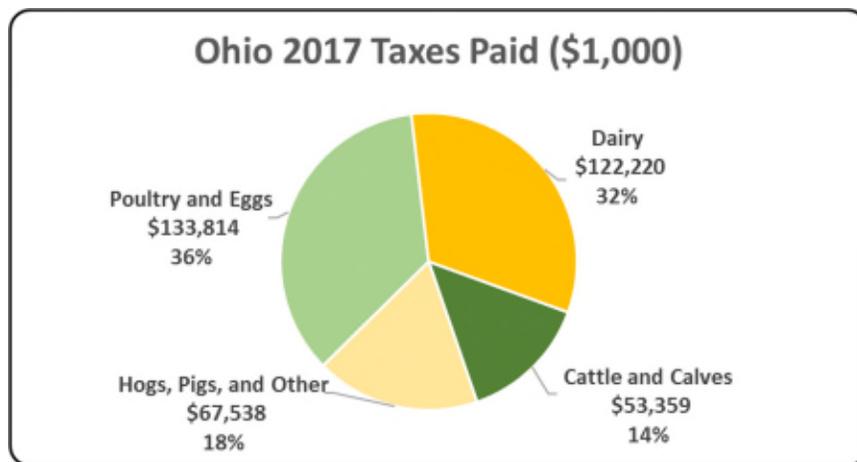
Ohio Earnings

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 2017.



Ohio Taxes Paid by Animal Agriculture

Ohio’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$376.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$235.7 million in property taxes paid by all of Ohio agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



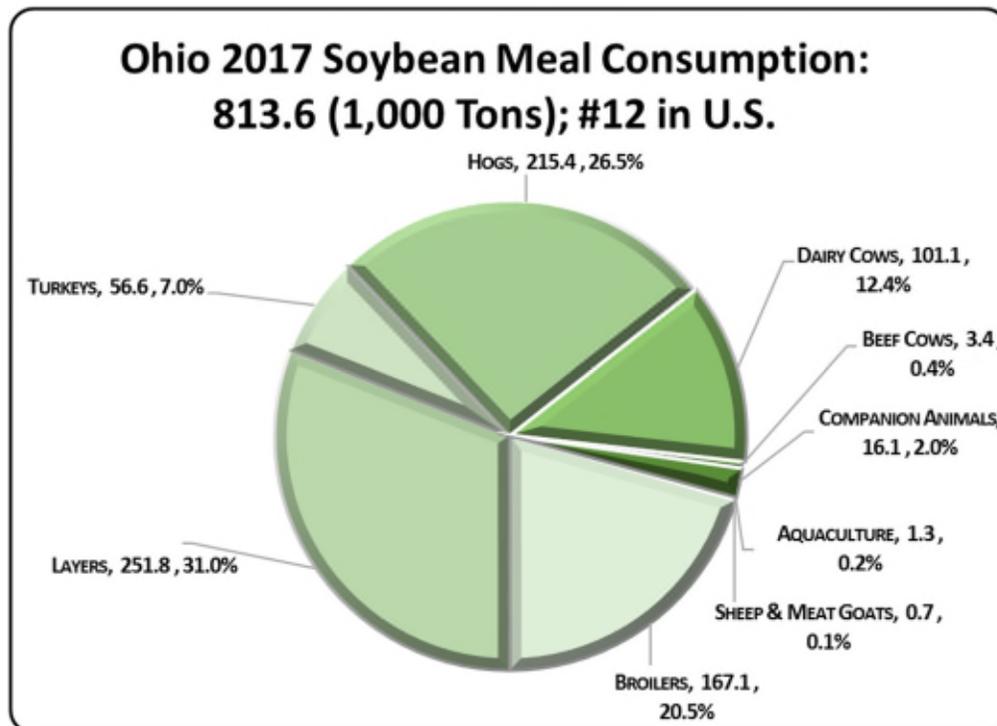
Ohio Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Ohio's animal agriculture consumed almost 813.6 thousand tons of soybean meal in 2017, placing the state as #12 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Ohio consumed 125,917 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Egg-Laying Hens (251.8 thousand tons)
- Hogs (215.4 thousand tons)
- Broilers (167.1 thousand tons)

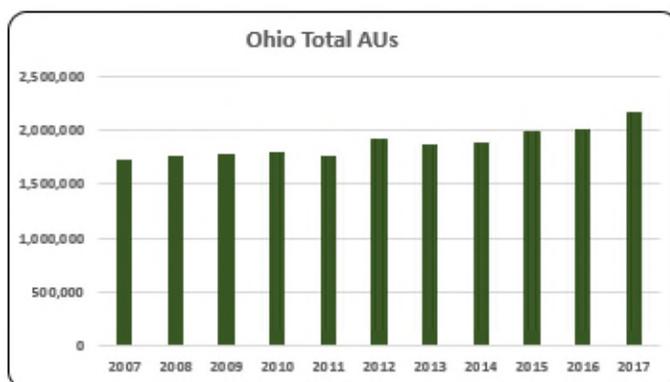
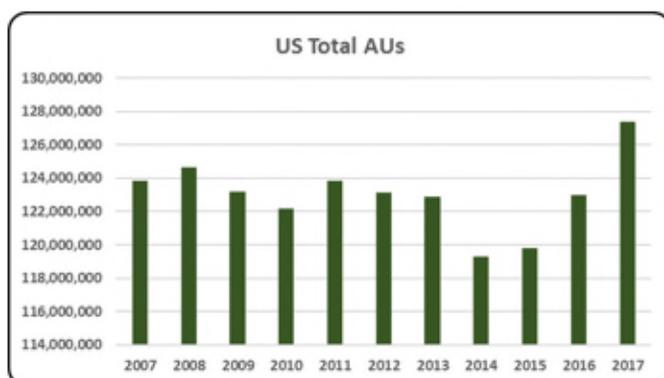


Ohio Animal Unit (AU) Trends

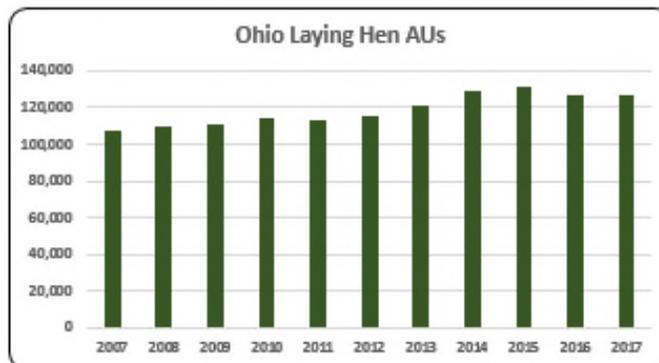
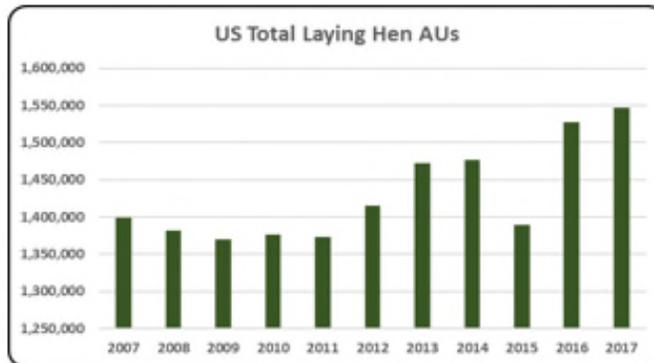
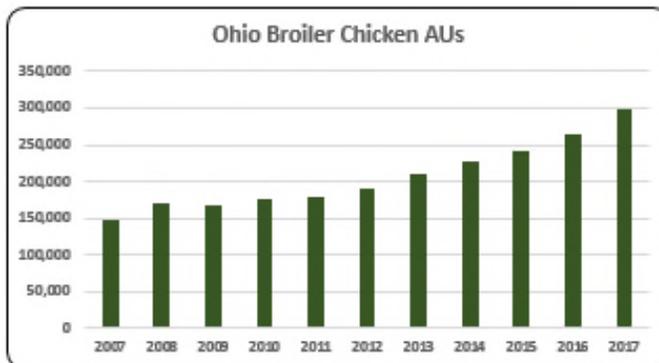
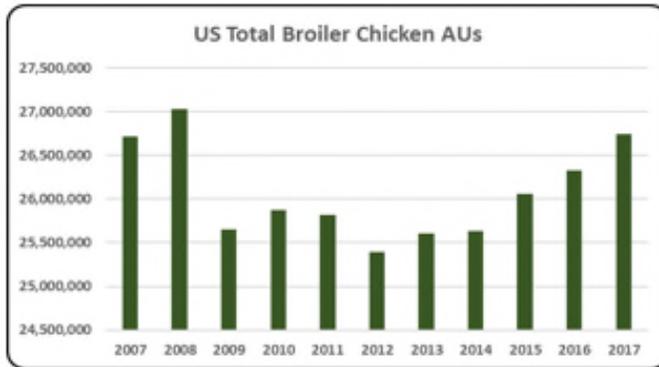
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Ohio. Due to this reality, using a single year as a measure of the presence and strength of a sector can be misleading. 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.

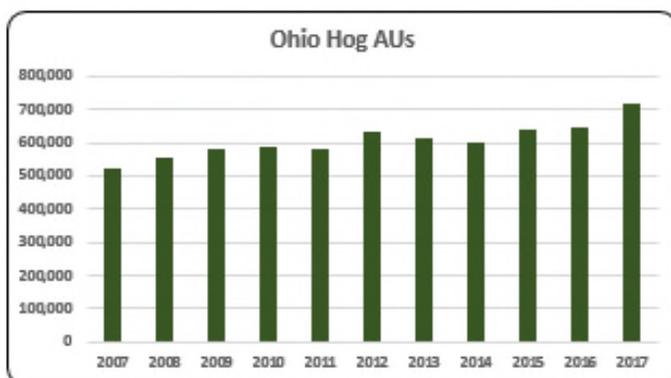
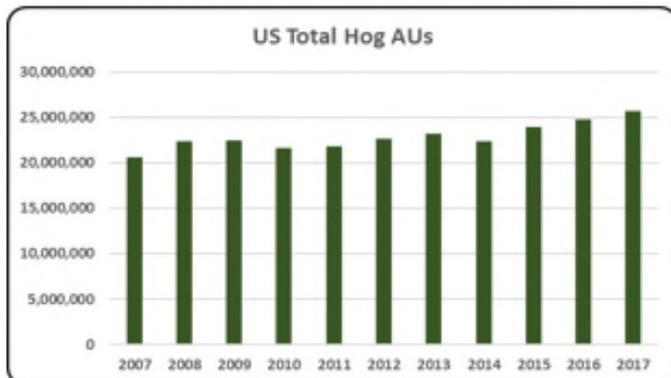
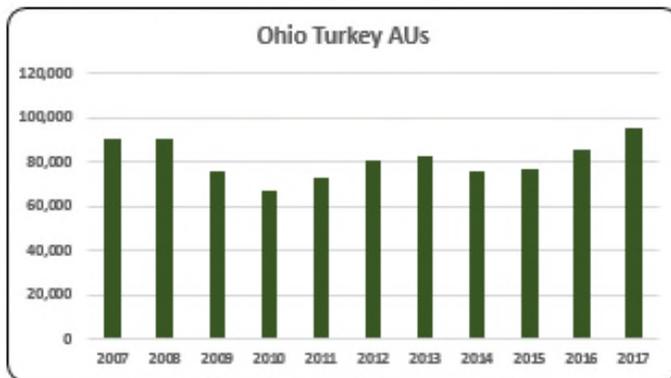
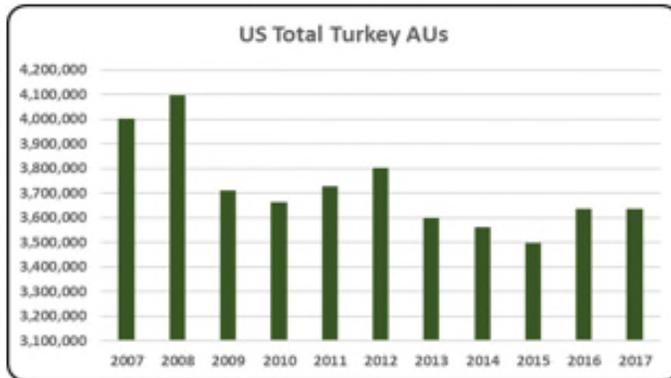
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Ohio, the largest three segments of animal agriculture in terms of AUs during 2017 were: Hogs (721,200 AUs), Beef Cows (550,050 AUs), and Dairy Cows (366,800 AUs). Total animal units in Ohio during 2017 were 2.2 million AUs.



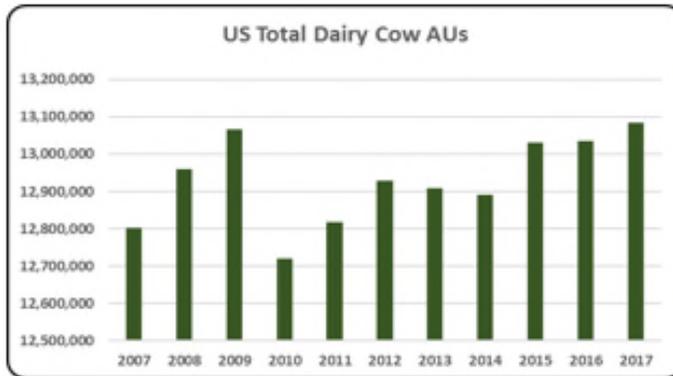
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- About 1.7% (2.2 million) of all AUs in the U.S. were in Ohio in 2017. There was 25% (425,536) growth in AUs over the last decade.



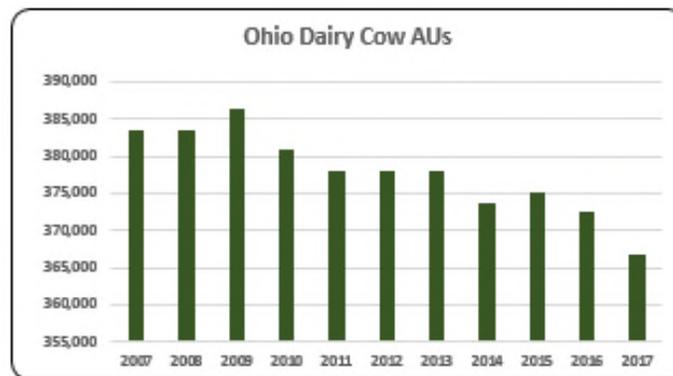
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There were 298,444 broiler AUs in Ohio in 2017. Broiler AUs climbed 104% from 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In 2017, Ohio was the second largest producer of eggs in the U.S. supplying 8.22% of the country’s total egg production. There were 127,179 layer AUs in 2017. Ohio layer AUs have grown 18.9% since 2007.



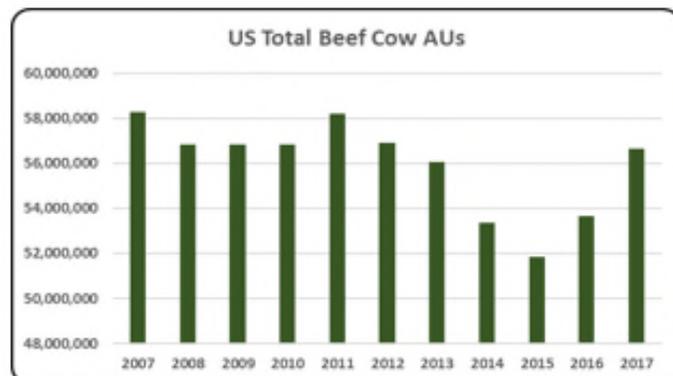
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- The average number of turkey AUs in Ohio during the last decade was 81,446. Turkey numbers grew 5.8% from 90,595 turkey AUs in 2007 to 95,873 turkey AUs in 2017.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- In 2017, hogs contributed 33% (721,200 hog AUs) to the total AUs for the state.



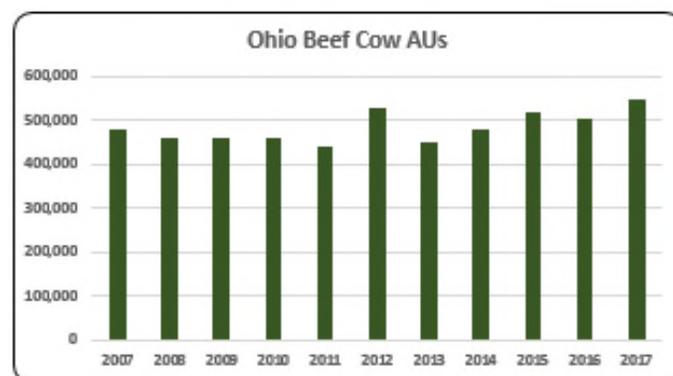
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Seventeen percent (366,800 dairy cow AUs) of AUs in Ohio in 2017 were dairy cows. 2009 was a record high (386,400 AUs) for dairy cow AUs in Ohio.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- The average number of beef cow AUs was 485,427 from 2007 to 2017. Beef cow AUs contributed 25% (550,050) 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	481,200	461,400	461,400	461,400	439,800	529,050	452,100	478,800	520,050	504,450	550,050
	Hog and Pig AUs	525,150	554,250	580,650	589,200	584,100	633,150	615,600	600,450	637,500	648,600	721,200
	Broiler AUs	146,465	169,544	165,952	176,568	179,070	189,966	209,794	227,218	241,648	264,502	298,444
	Turkey AUs	90,595	90,583	76,197	67,292	73,034	80,343	82,552	75,982	77,320	86,139	95,873
	Egg Layer AUs	107,000	109,624	111,108	114,200	113,436	115,082	121,312	129,183	131,249	126,578	127,179
	Dairy AUs	383,600	383,600	386,400	380,800	378,000	378,000	378,000	373,800	375,200	372,400	366,800
	Total Animal Units	1,734,010	1,769,001	1,781,706	1,789,460	1,767,440	1,925,591	1,859,359	1,885,433	1,982,967	2,002,669	2,159,546
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 380,827	\$ 371,612	\$ 303,704	\$ 380,804	\$ 411,199	\$ 522,424	\$ 495,967	\$ 611,530	\$ 691,543	\$ 576,523	\$ 584,987
	Hogs and Pigs (\$1,000)	\$ 390,400	\$ 420,245	\$ 392,245	\$ 553,136	\$ 695,683	\$ 671,567	\$ 720,787	\$ 768,076	\$ 631,779	\$ 585,057	\$ 696,334
	Broilers (\$1,000)	\$ 117,777	\$ 150,788	\$ 154,649	\$ 181,618	\$ 172,355	\$ 189,600	\$ 245,714	\$ 274,483	\$ 242,208	\$ 227,146	\$ 286,307
	Turkeys (\$1,000)	\$ 104,604	\$ 128,650	\$ 94,649	\$ 108,101	\$ 130,712	\$ 150,851	\$ 148,993	\$ 154,668	\$ 170,262	\$ 194,912	\$ 178,974
	Eggs (\$1,000)	\$ 483,441	\$ 585,477	\$ 403,793	\$ 427,361	\$ 486,185	\$ 523,315	\$ 587,562	\$ 772,430	\$ 1,262,374	\$ 411,781	\$ 479,638
	Milk (\$1,000)	\$ 991,020	\$ 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
	Other	\$ 12,807	\$ 13,844	\$ 13,898	\$ 15,932	\$ 16,322	\$ 18,624	\$ 18,023	\$ 17,033	\$ 17,880	\$ 17,692	\$ 24,409
	Sheep and Lambs (\$1,000)	\$ 9,229	\$ 10,069	\$ 9,926	\$ 11,764	\$ 11,957	\$ 14,063	\$ 13,265	\$ 12,078	\$ 12,729	\$ 12,344	\$ 11,867
	Aquaculture (\$1,000)	\$ 3,578	\$ 3,775	\$ 3,972	\$ 4,168	\$ 4,365	\$ 4,561	\$ 4,758	\$ 4,955	\$ 5,151	\$ 5,348	\$ 12,542
Total (\$1,000)	\$ 2,480,876	\$ 2,682,211	\$ 2,095,009	\$ 2,605,012	\$ 3,028,704	\$ 3,115,251	\$ 3,372,022	\$ 3,932,769	\$ 3,999,293	\$ 2,945,174	\$ 3,279,393	

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,951	10,526	12,297	11,445	
	Cattle feedlots (112112)	2,793	4,191	1,890	548	
	Dairy cattle and milk production (11212)	3,826	3,771	2,955	2,850	
	Hog and pig farming (1122)	2,456	1,781	1,594	1,170	
	Poultry and egg production (1123)	828	1,000	1,650	1,472	
	Sheep and goat farming (1124)	1,292	1,932	2,227	2,188	
	Animal aquaculture and other animal production (1125,1129)	4,137	9,357	7,195	8,071	
Value of Sales (\$1,000)	Cattle and Calves	360,769	408,242	565,746	689,655	
	Hogs and Pigs	363,586	322,687	571,685	788,761	
	Poultry and Eggs	575,438	604,808	883,301	946,592	
	Milk and Other Dairy Products	505,128	551,877	861,632	938,266	
	Aquaculture	1,788	3,338	6,582	3,875	
	Other (calculated)	66,720	67,702	71,544	51,921	
	Total	1,873,429	1,958,654	2,960,490	3,419,070	
Input Purchases	Livestock and poultry purchased	(Farms) 18,692	19,791	16,523	19,332	
		\$1,000	267,858	269,910	538,127	473,494
	Breeding livestock purchased	(Farms) <i>n/a</i>	9,275	7,668	9,355	
		\$1,000	<i>n/a</i>	37,335	78,925	102,128
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	13,139	11,055	12,880	
		\$1,000	<i>n/a</i>	232,575	459,202	371,366
	Feed purchased	(Farms) 31,975	40,506	34,423	38,782	
	\$1,000	713,397	648,768	959,439	1,521,609	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,171,495	\$ 237,680	7,326	\$ 53,359
	Hogs, Pigs, and Other	\$ 1,306,491	\$ 300,838	8,133	\$ 67,538
	Poultry and Eggs	\$ 2,757,463	\$ 596,055	14,925	\$ 133,814
	Dairy	\$ 2,407,055	\$ 544,411	15,003	\$ 122,220
	Total	\$ 7,642,504	\$ 1,678,985	45,387	\$ 376,932
Change from 2007 to 2017	Cattle and Calves	\$ 276,362	\$ 56,070	1,728	\$ 12,588
	Hogs, Pigs, and Other	\$ 448,624	\$ 103,302	2,793	\$ 23,191
	Poultry and Eggs	\$ 339,911	\$ 73,475	1,840	\$ 16,495
	Dairy	\$ (314,559)	\$ (71,145)	(1,961)	\$ (15,972)
	Total	\$ 750,339	\$ 161,703	4,400	\$ 36,302
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
RIMS II Multipliers	Cattle and Calves	\$ 2.003	\$ 0.406	12.5	
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	Poultry and Eggs	\$ 2.918	\$ 0.631	15.8	
	Dairy	\$ 2.340	\$ 0.529	14.6	
Tax Rates	Federal effective income tax rate			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			2.8%	
	Total			22.5%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 key driver of animal agriculture 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 2017 animal agriculture contributed:

- \$11.2 billion in economic output
- 73,128 jobs
- \$2.3 billion in earnings
- \$523.1 million in income taxes paid at local, state, and federal levels
- \$114.3 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Oklahoma has increased economic output by over \$1.6 billion, boosted household earnings by \$340.3 million, contributed 10,758 additional jobs and paid \$76.4 million in additional tax revenues.

Oklahoma's animal agriculture consumed almost 803.5 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (383.2 thousand tons)
- Broilers (355.1 thousand tons)
- Egg-Laying Hens (28.1 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 integral part of Oklahoma's economy. In 2017, Oklahoma's animal agriculture contributed the following to the economy:

- About \$11.2 billion in economic output
- \$2.3 billion in household earnings
- 73,128 jobs
- \$523.1 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:

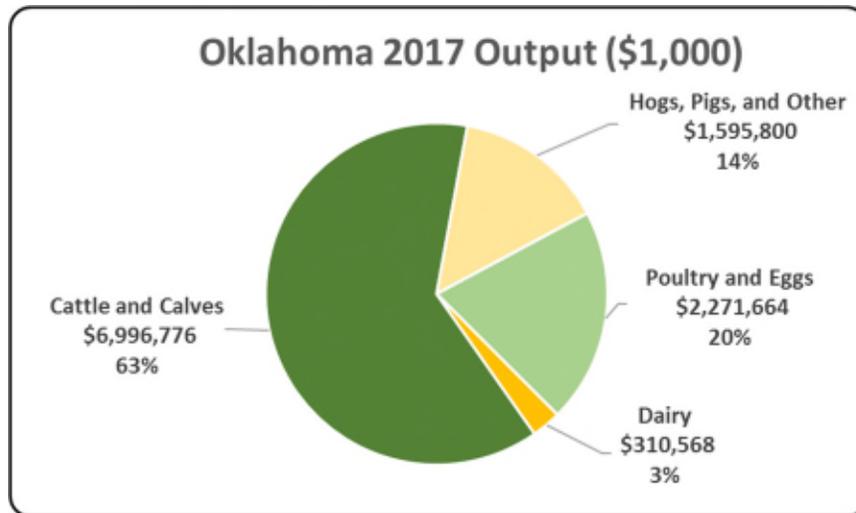
- Increased economic output by \$1.6 billion
- Boosted household earnings by \$340.3 million
- Added 10,758 jobs
- Paid an additional \$76.4 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 11,174,808	\$ 1,648,117	17.30%
Earnings (\$1,000)	\$ 2,329,906	\$ 340,313	17.10%
Employment (Jobs)	73,128	10,758	17.25%
Income Taxes Paid (\$1,000)	\$ 523,064	\$ 76,400	17.10%
Property Taxes Paid in 2012 (\$1,000)	\$ 114,320		

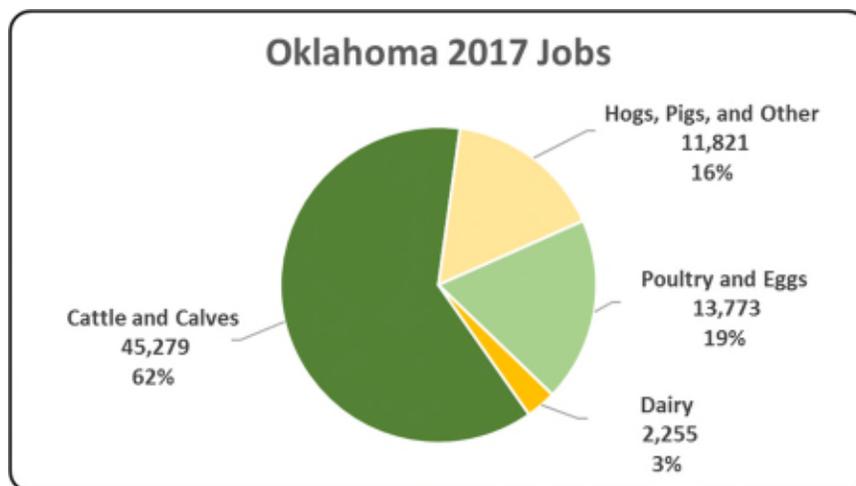
Oklahoma Output

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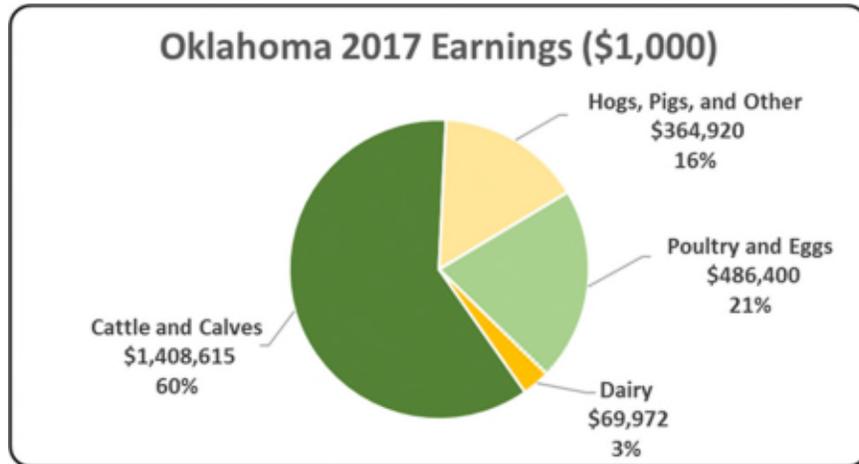
Oklahoma Jobs

“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 73,128 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 2017.



Oklahoma Taxes Paid by Animal Agriculture

Oklahoma’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$523.1 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$114.3 million in property taxes paid by all of Oklahoma agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



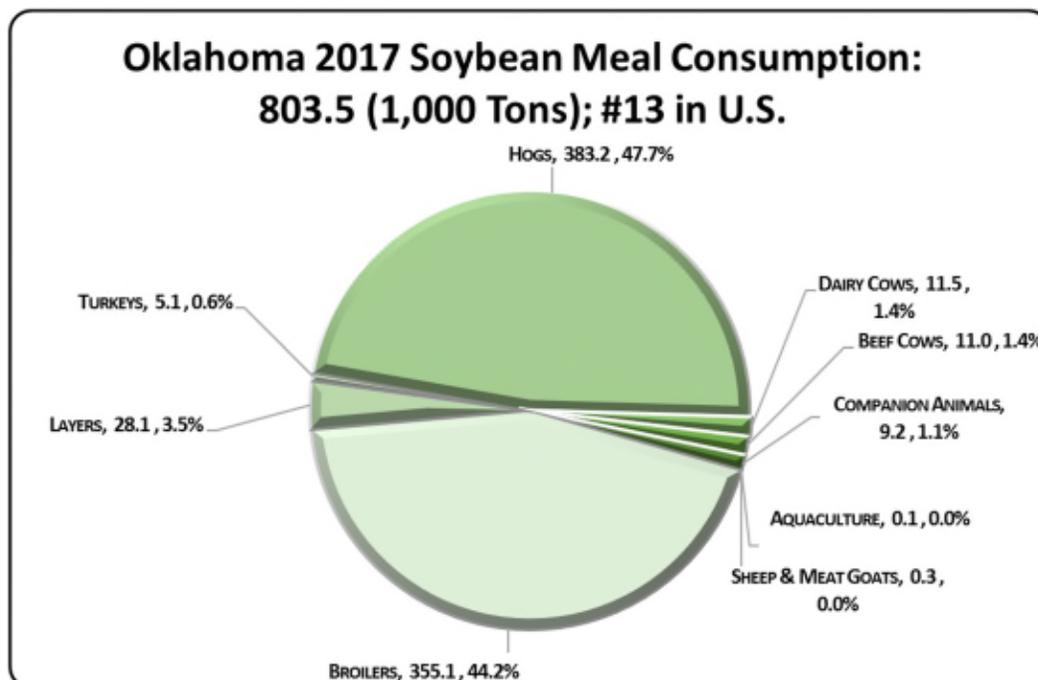
Oklahoma Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Oklahoma's animal agriculture consumed almost 803.5 thousand tons of soybean meal in 2017, placing the state as #13 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Oklahoma consumed 53,921 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (383.2 thousand tons)
- Broilers (355.1 thousand tons)
- Egg-Laying Hens (28.1 thousand tons)

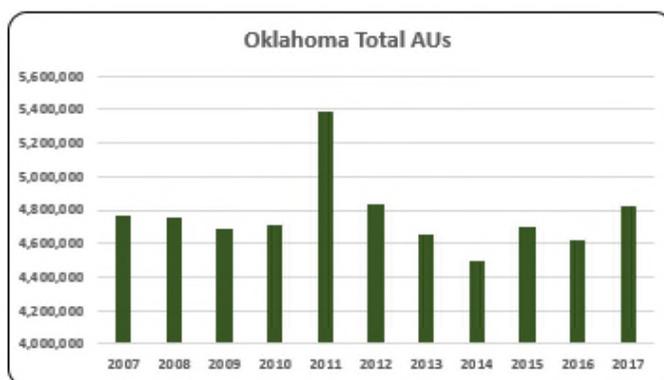
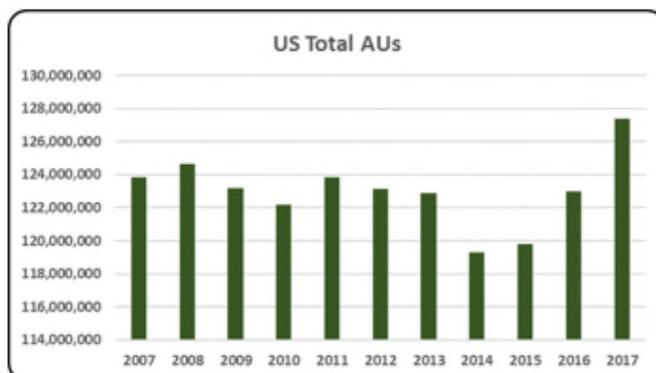


Oklahoma Animal Unit (AU) Trends

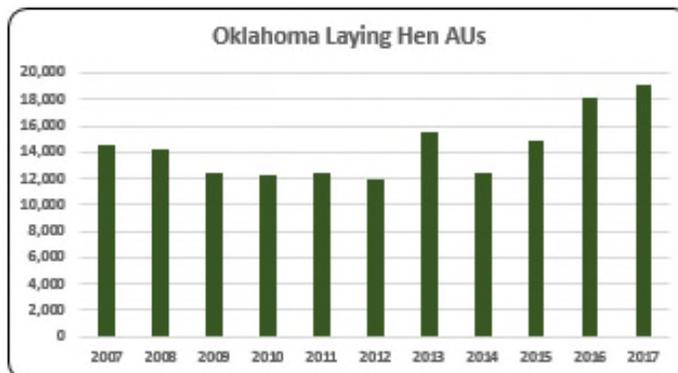
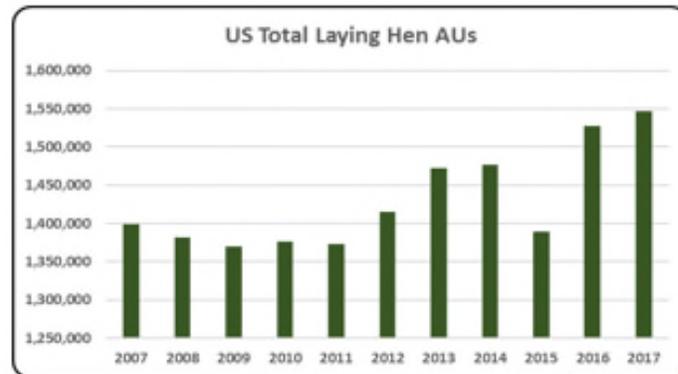
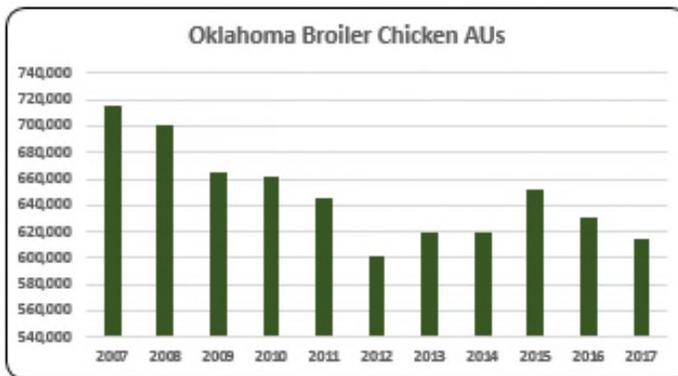
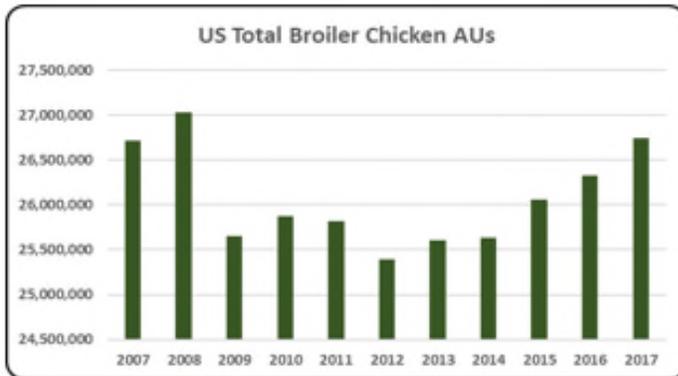
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Oklahoma. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

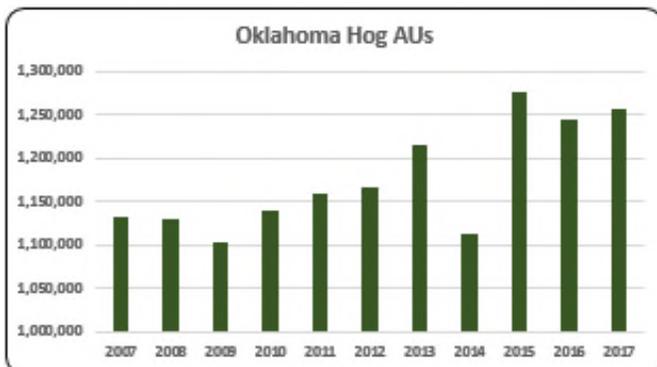
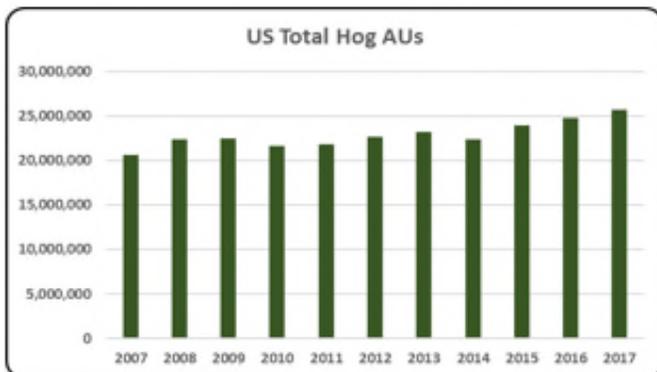
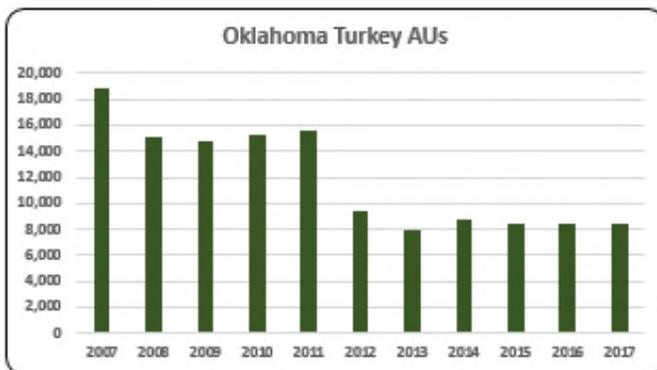
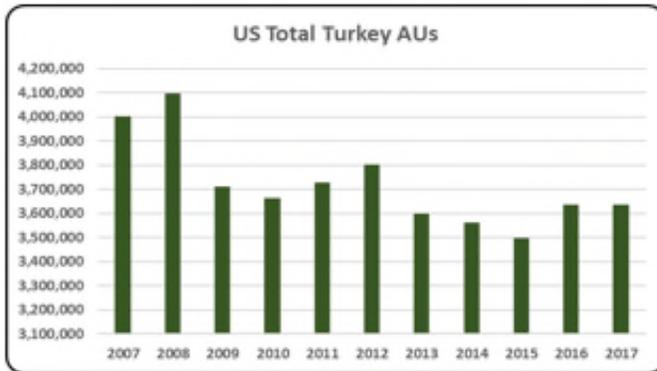
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Oklahoma, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (2.9 million AUs), Hogs (1.3 million AUs), and Broiler Chickens (614,621 AUs). Total animal units in Oklahoma during 2017 were 4.8 million AUs.



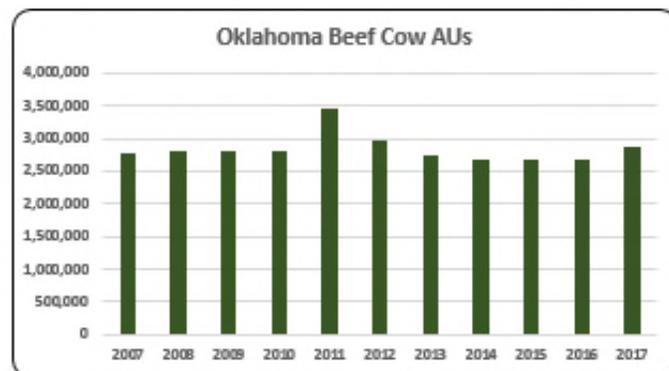
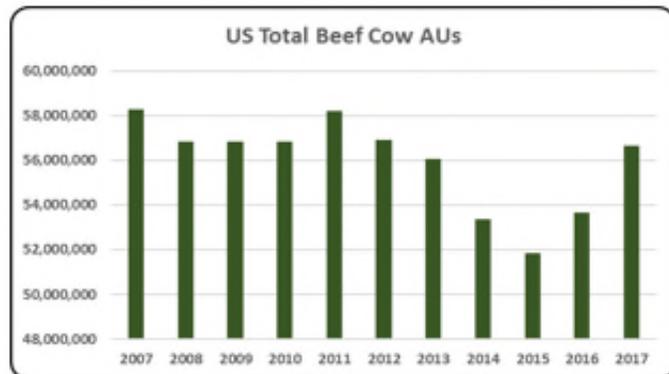
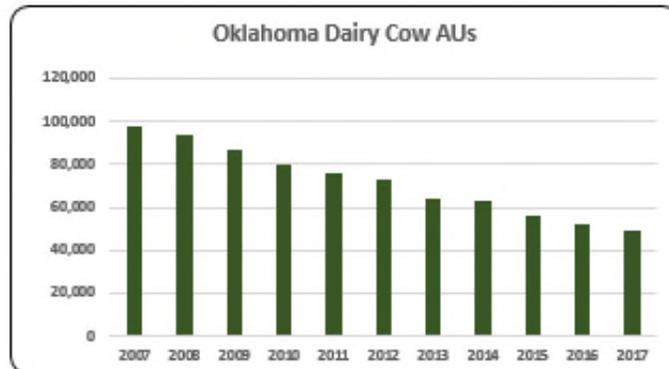
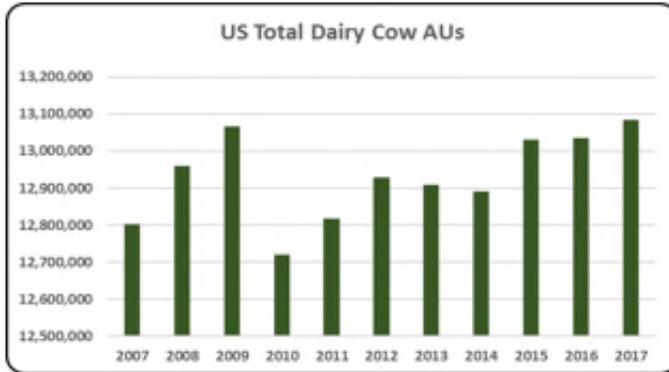
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 4.8 million AUs in Oklahoma in 2017 representing 3.79% 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 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler AUs decreased 14% since the beginning of the decade. There were 614,296 broiler AUs in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- On average, there were 14,329 laying hen AUs in Oklahoma from 2007 to 2017. The laying hen industry saw a positive trend of 30.6% throughout the last decade.



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Numbers decreased from 18,800 turkey AUs in 2007 to 8,413 turkey AUs in 2017. The average of turkey AUs for this decade is 11,895 AUs.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog numbers in 2017 were at nearly 1.3 million AUs. This represented 26% of AUs in the state for 2017.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- The Oklahoma dairy cow inventory showed a consistent decline throughout the decade from 98,000 dairy cow AUs in 2007 to 49,000 dairy cow AUs in 2017.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- Beef cows in Oklahoma during 2007 to 2017 represents 60% (2.9 million) 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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.

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 2007-2017 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 Oklahoma which have occurred. As shown in this state report, Oklahoma 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 Oklahoma. 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 2016-17 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 515.257.6077.

Oklahoma 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 Oklahoma’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 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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Animal Units (AUs)	Beef Cattle AUs	2,791,500	2,802,750	2,802,750	2,802,750	3,476,250	2,976,000	2,733,750	2,680,500	2,689,800	2,666,400	2,874,150
	Hog and Pig AUs	1,132,650	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
	Broiler AUs	714,678	701,175	664,985	662,132	645,072	601,458	619,464	618,539	652,210	630,296	614,621
	Turkey AUs	18,800	15,027	14,720	15,332	15,606	9,431	7,867	8,685	8,497	8,468	8,413
	Egg Layer AUs	14,576	14,160	12,385	12,303	12,375	11,979	15,510	12,359	14,870	18,062	19,037
	Dairy AUs	98,000	93,800	86,800	79,800	75,600	72,800	64,400	63,000	56,000	51,800	49,000
	Total Animal Units	4,770,204	4,755,962	4,684,739	4,710,966	5,384,252	4,838,818	4,656,891	4,496,232	4,698,628	4,619,276	4,822,221
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 2,001,874	\$ 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
	Hogs and Pigs (\$1,000)	\$ 549,716	\$ 514,635	\$ 470,649	\$ 656,887	\$ 902,933	\$ 855,855	\$ 947,769	\$ 1,004,253	\$ 878,267	\$ 828,114	\$ 918,094
	Broilers (\$1,000)	\$ 540,918	\$ 579,738	\$ 557,723	\$ 724,446	\$ 729,259	\$ 670,350	\$ 825,702	\$ 852,115	\$ 770,524	\$ 651,562	\$ 745,389
	Turkeys (\$1,000)	\$ 18,463	\$ 22,528	\$ 21,351	\$ 31,496	\$ 24,766	\$ 26,629	\$ 19,302	\$ 12,770	\$ 7,954	\$ 8,994	\$ 6,090
	Eggs (\$1,000)	\$ 71,107	\$ 80,888	\$ 70,175	\$ 84,499	\$ 88,168	\$ 91,776	\$ 97,227	\$ 102,284	\$ 114,807	\$ 79,048	\$ 78,838
	Milk (\$1,000)	\$ 239,096	\$ 214,322	\$ 146,292	\$ 172,620	\$ 203,060	\$ 172,659	\$ 167,485	\$ 188,034	\$ 135,222	\$ 122,484	\$ 139,776
	Other	\$ 4,641	\$ 4,486	\$ 4,186	\$ 5,091	\$ 4,358	\$ 4,996	\$ 4,425	\$ 4,091	\$ 3,644	\$ 2,897	\$ 4,121
	Sheep and Lambs (\$1,000)	\$ 3,056	\$ 3,088	\$ 2,975	\$ 4,067	\$ 3,521	\$ 4,346	\$ 3,961	\$ 3,814	\$ 3,553	\$ 2,993	\$ 3,193
	Aquaculture (\$1,000)	\$ 1,585	\$ 1,398	\$ 1,211	\$ 1,024	\$ 838	\$ 651	\$ 464	\$ 277	\$ 91	\$ (96)	\$ 928
	Total (\$1,000)	\$ 3,425,814	\$ 3,355,422	\$ 3,163,333	\$ 3,830,335	\$ 4,638,762	\$ 4,393,442	\$ 4,642,523	\$ 5,471,089	\$ 5,083,310	\$ 4,246,645	\$ 4,750,117

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	48,670	49,043	45,871	40,939	
	Cattle feedlots (112112)	1,158	1,799	956	372	
	Dairy cattle and milk production (11212)	838	1,037	721	309	
	Hog and pig farming (1122)	1,000	940	986	623	
	Poultry and egg production (1123)	1,164	1,504	2,358	1,472	
	Sheep and goat farming (1124)	633	1,426	2,446	2,269	
	Animal aquaculture and other animal production (1125,1129)	3,555	7,792	8,513	8,660	
Value of Sales (\$1,000)	Cattle and Calves	2,325,567	2,448,916	3,062,020	3,402,919	
	Hogs and Pigs	343,147	462,849	555,521	656,407	
	Poultry and Eggs	447,185	508,373	748,776	961,302	
	Milk and Other Dairy Products	150,138	163,006	191,775	164,341	
	Aquaculture	3,639	3,467	3,253	1,271	
	Other (calculated)	32,372	50,715	57,091	25,609	
	Total	3,302,048	3,637,326	4,618,436	5,211,849	
Input Purchases	Livestock and poultry purchased	(Farms) 26,102	27,203	24,499	24,658	
		\$1,000	1,100,066	1,244,354	1,463,556	1,696,662
	Breeding livestock purchased	(Farms) <i>n/a</i>	16,355	15,462	15,940	
		\$1,000	<i>n/a</i>	80,813	187,690	173,024
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	14,409	12,523	12,687	
		\$1,000	<i>n/a</i>	1,163,542	1,275,865	1,523,638
Feed purchased	(Farms)	53,275	64,090	57,396	61,650	
	\$1,000	900,546	917,560	1,307,568	2,017,049	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 6,996,776	\$ 1,408,615	45,279	\$ 316,234
	Hogs, Pigs, and Other	\$ 1,595,800	\$ 364,920	11,821	\$ 81,925
	Poultry and Eggs	\$ 2,271,664	\$ 486,400	13,773	\$ 109,197
	Dairy	\$ 310,568	\$ 69,972	2,255	\$ 15,709
	Total	\$ 11,174,808	\$ 2,329,906	73,128	\$ 523,064
Change from 2007 to 2017	Cattle and Calves	\$ 1,244,141	\$ 250,475	8,051	\$ 56,232
	Hogs, Pigs, and Other	\$ 469,897	\$ 107,454	3,481	\$ 24,123
	Poultry and Eggs	\$ 247,048	\$ 52,897	1,498	\$ 11,875
	Dairy	\$ (312,969)	\$ (70,513)	(2,272)	\$ (15,830)
	Total	\$ 1,648,117	\$ 340,313	10,758	\$ 76,400
	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	
Tax Rates	Federal effective income tax rate				13.5%
	Federal Social Security tax rate				6.2%
	State Effective Rate				2.8%
	Total				22.5%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 Animal Agriculture: OREGON

Oregon Executive Summary

The use of soybean meal as a key feed ingredient is a small part of Oregon 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 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 2017:

- \$2.9 billion in economic output
- 21,160 jobs
- \$630.3 million in earnings
- \$171.1 million in income taxes paid at local, state, and federal levels
- \$112.8 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Oregon has increased economic output by over \$318.2 million, boosted household earnings by \$64.9 million, contributed 2,305 additional jobs and paid \$17.6 million in additional tax revenues.

Oregon's animal agriculture consumed almost 139.6 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (57.3 thousand tons)
- Dairy Cows (31.9 thousand tons)
- Egg-Laying Hens (23.7 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 an important part of Oregon's economy. In 2017, Oregon's animal agriculture contributed the following to the economy:

- About \$2.9 billion in economic output
- \$630.3 million in household earnings
- 21,160 jobs
- \$171.1 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:

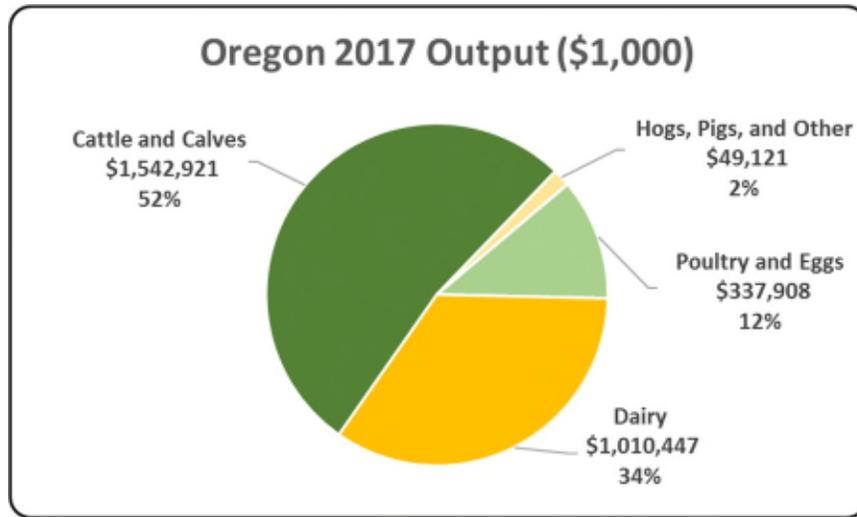
- Increased economic output by \$318.2 million
- Boosted household earnings by \$64.9 million
- Added 2,305 jobs
- Paid an additional \$17.6 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,940,397	\$ 318,214	12.14%
Earnings (\$1,000)	\$ 630,349	\$ 64,948	11.49%
Employment (Jobs)	21,160	2,305	12.22%
Income Taxes Paid (\$1,000)	\$ 171,140	\$ 17,633	11.49%
Property Taxes Paid in 2012 (\$1,000)	\$ 112,834		

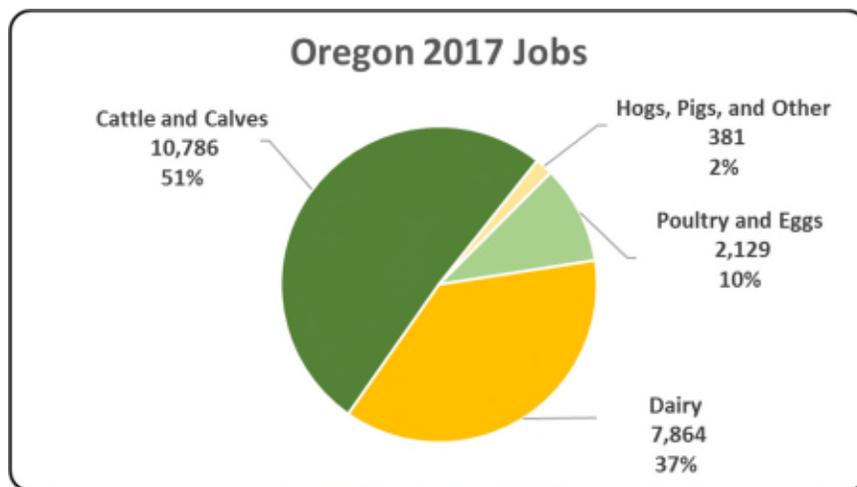
Oregon Output

“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 \$2.9 billion.



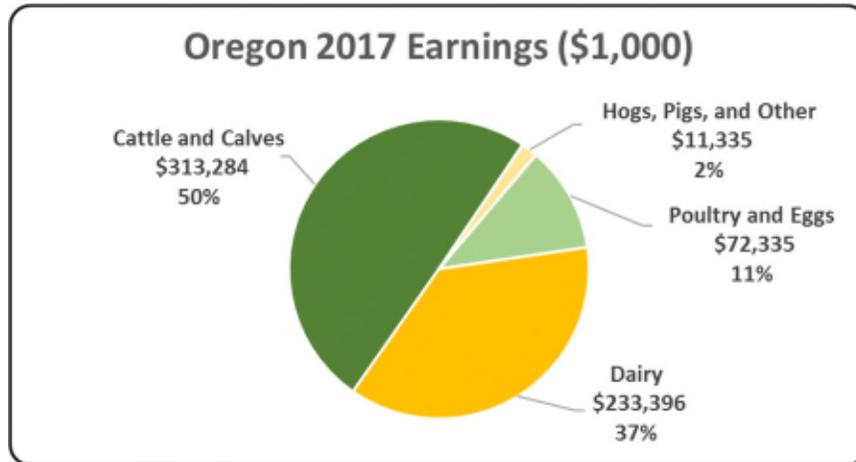
Oregon Jobs

“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 21,160 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 \$630.3 million to household earnings in 2017.



Oregon Taxes Paid by Animal Agriculture

Oregon’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$171.1 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$112.8 million in property taxes paid by all of Oregon agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



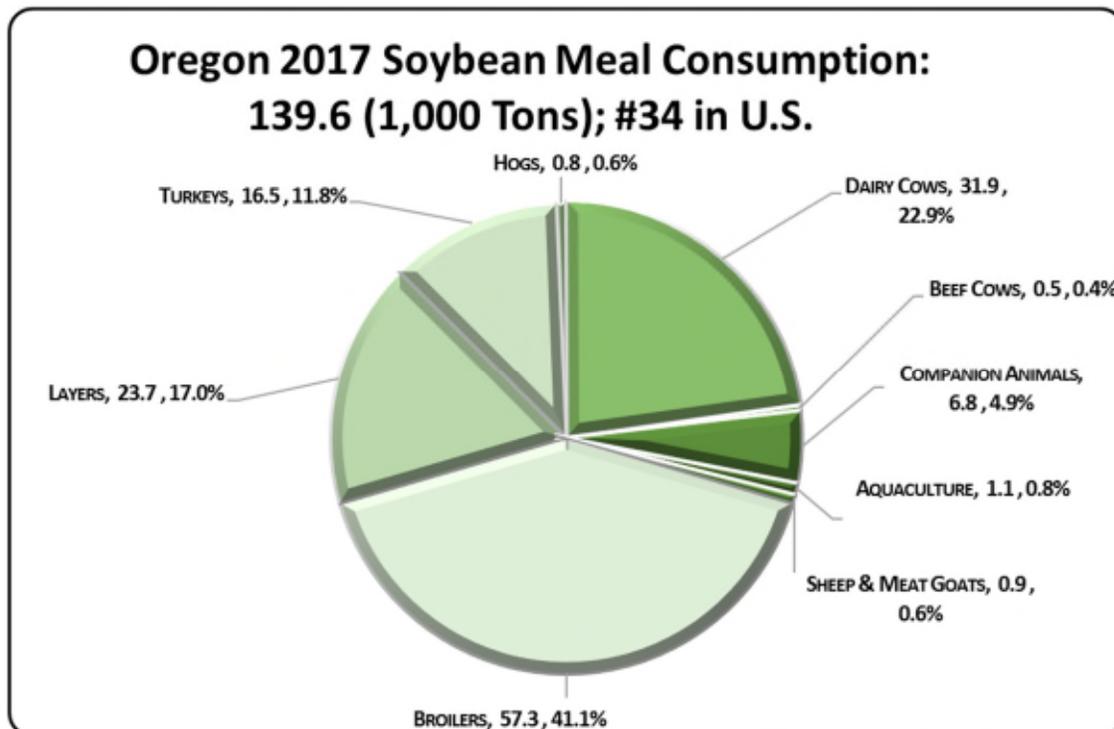
Oregon Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Oregon's animal agriculture consumed almost 139.6 thousand tons of soybean meal in 2017, placing the state as #34 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Oregon consumed 8,364 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (57.3 thousand tons)
- Dairy Cows (31.9 thousand tons)
- Egg-Laying Hens (23.7 thousand tons)

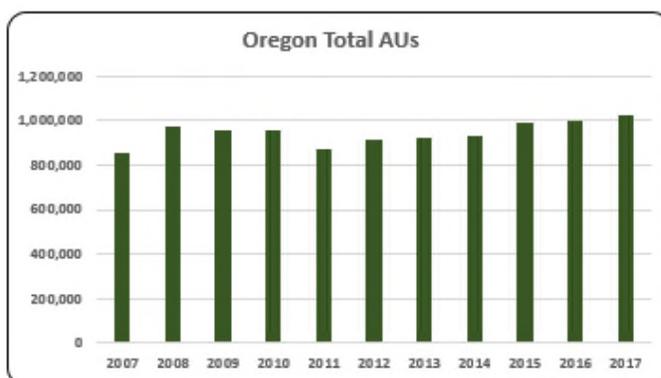
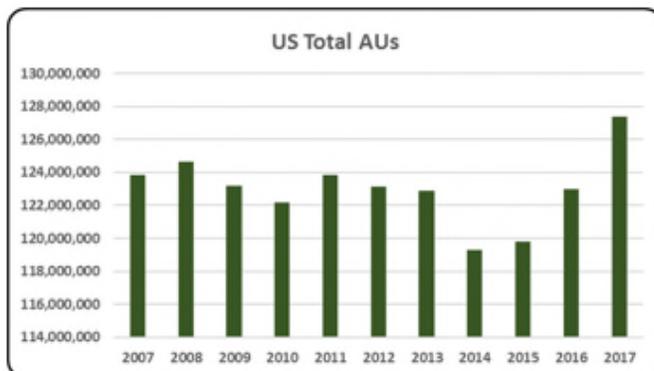


Oregon Animal Unit (AU) Trends

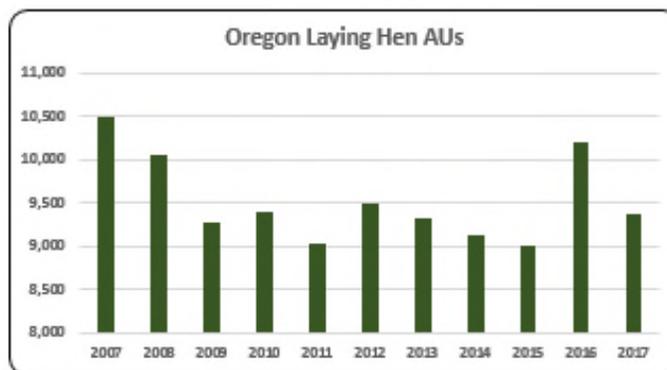
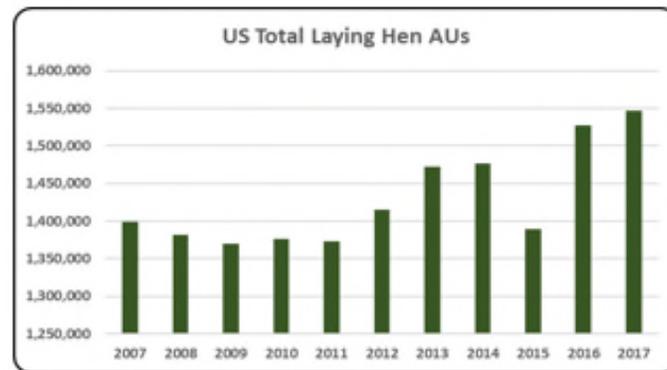
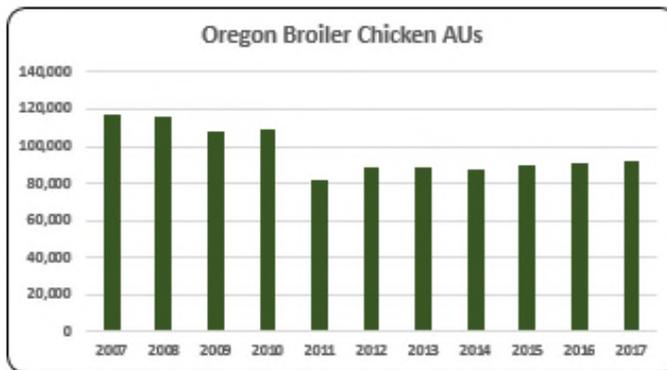
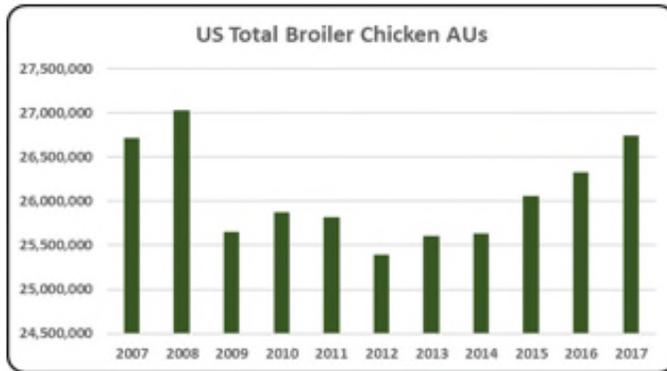
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Oregon. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

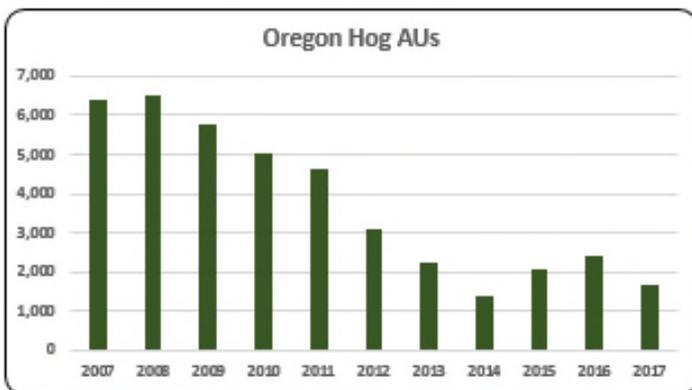
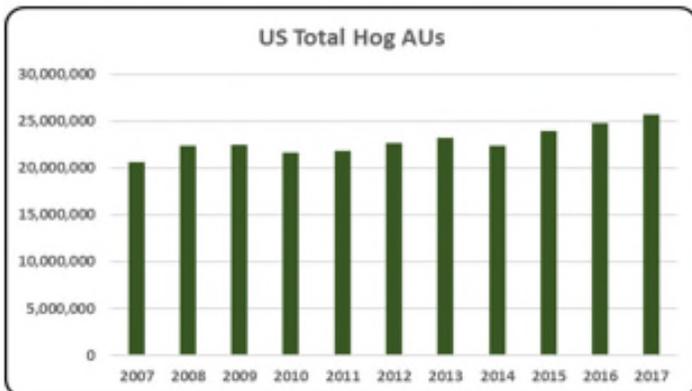
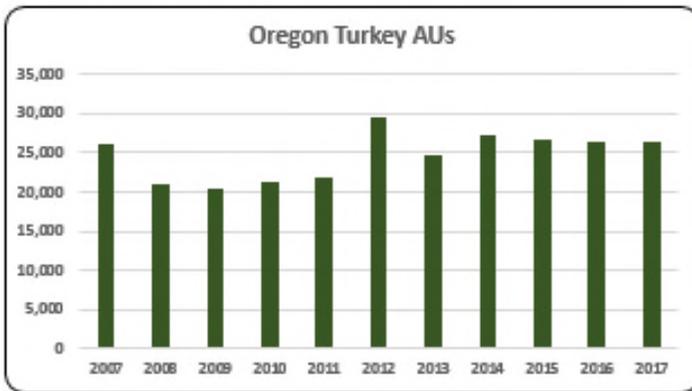
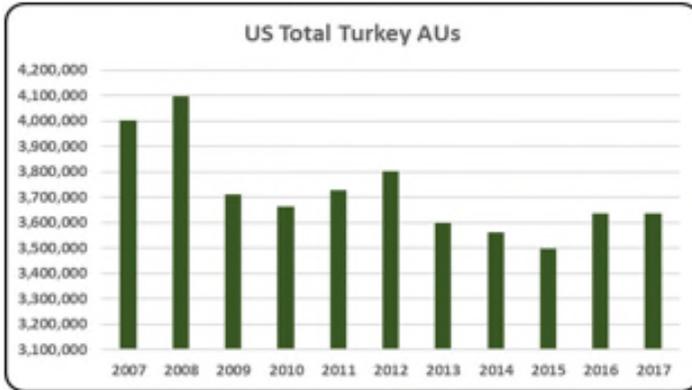
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Oregon, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (723,750 AUs), Dairy Cows (173,600 AUs), and Broiler Chickens (92,279 AUs). Total animal units in Oregon during 2017 were 1.0 million AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 1.0 million AUs in Oregon in 2017. Overall animal units increased 20% during 2007-2017.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler animal units represented 9% (92,279 broiler AUs) of all animal units in Oregon in 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 9,385 layer AUs in Oregon in 2017. Less than 0.91% of total AUs came from laying hens in 2017. Layer AUs fell 11% from 2007 to 2017.

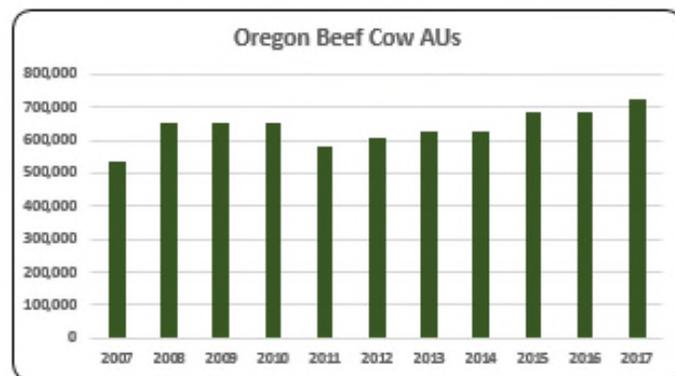
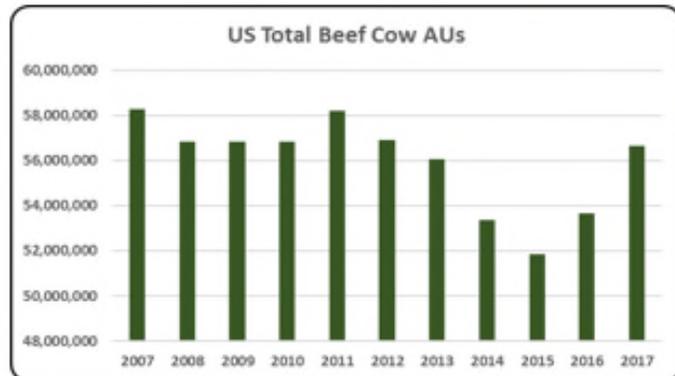
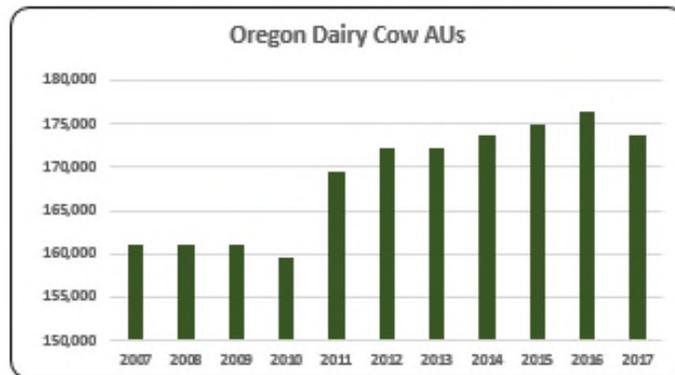
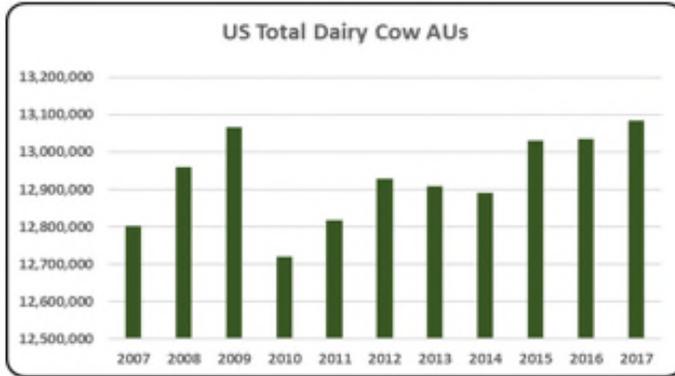


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

- Turkey numbers declined 0.53% throughout the decade. There were 26,303 turkey AUs on average from 2007 to 2017.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

- Hog animal unit numbers declined in Oregon during last decade, with a 73.9% decline. The total number of hog AUs in 2017 was 1,665.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- Numbers increased from 161,000 dairy cow AUs in 2007 to 173,600 dairy cow AUs in 2017.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- Beef cow production was the largest AU sector in the state of Oregon from 2007 to 2017. The average number of beef cow AUs during the decade was 639,955.

Oregon Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	534,150	654,300	654,300	654,300	583,350	609,900	624,300	629,850	682,650	688,650	723,750
	Hog and Pig AUs	6,375	6,525	5,775	5,025	4,605	3,075	2,220	1,365	2,070	2,430	1,665
	Broiler AUs	117,601	115,767	107,637	109,084	82,196	88,841	88,531	88,028	90,300	90,981	92,279
	Turkey AUs	26,163	20,913	20,485	21,337	21,718	29,484	24,595	27,152	26,566	26,476	26,303
	Egg Layer AUs	10,508	10,052	9,264	9,400	9,028	9,499	9,337	9,127	9,012	10,199	9,385
	Dairy AUs	161,000	161,000	161,000	159,600	169,400	172,200	172,200	173,600	175,000	176,400	173,600
	Total Animal Units	855,798	968,557	958,460	958,747	870,297	912,999	921,183	929,122	985,598	995,135	1,026,982
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 458,389	\$ 432,677	\$ 427,549	\$ 490,900	\$ 634,386	\$ 675,073	\$ 712,765	\$ 914,324	\$ 880,723	\$ 701,147	\$ 695,260
	Hogs and Pigs (\$1,000)	\$ 5,154	\$ 5,809	\$ 4,239	\$ 4,968	\$ 5,169	\$ 3,322	\$ 2,122	\$ 2,017	\$ 2,190	\$ 2,315	\$ 1,796
	Broilers (\$1,000)	\$ 90,758	\$ 92,722	\$ 79,999	\$ 83,602	\$ 73,193	\$ 88,522	\$ 107,863	\$ 113,156	\$ 98,719	\$ 87,774	\$ 103,067
	Turkeys (\$1,000)	\$ 39,495	\$ 48,191	\$ 45,672	\$ 43,833	\$ 34,466	\$ 37,059	\$ 26,862	\$ 17,771	\$ 24,867	\$ 28,120	\$ 19,039
	Eggs (\$1,000)	\$ 47,379	\$ 64,775	\$ 47,765	\$ 51,756	\$ 52,462	\$ 54,128	\$ 56,228	\$ 65,778	\$ 115,960	\$ 42,447	\$ 50,366
	Milk (\$1,000)	\$ 408,639	\$ 412,482	\$ 307,976	\$ 415,027	\$ 530,506	\$ 497,574	\$ 532,968	\$ 655,350	\$ 474,486	\$ 469,333	\$ 500,742
	Other	\$ 23,103	\$ 23,715	\$ 25,095	\$ 28,971	\$ 28,421	\$ 32,540	\$ 27,442	\$ 27,058	\$ 29,149	\$ 27,534	\$ 29,602
	Sheep and Lambs (\$1,000)	\$ 10,713	\$ 11,369	\$ 12,792	\$ 16,712	\$ 16,207	\$ 20,369	\$ 15,315	\$ 14,975	\$ 17,110	\$ 15,539	\$ 15,069
	Aquaculture (\$1,000)	\$ 12,390	\$ 12,346	\$ 12,303	\$ 12,259	\$ 12,215	\$ 12,171	\$ 12,127	\$ 12,083	\$ 12,039	\$ 11,995	\$ 14,533
	Total (\$1,000)	\$ 1,072,917	\$ 1,080,372	\$ 938,295	\$ 1,119,056	\$ 1,358,603	\$ 1,388,218	\$ 1,466,249	\$ 1,795,454	\$ 1,626,093	\$ 1,358,670	\$ 1,399,872

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	12,037	11,231	12,071	11,420	
	Cattle feedlots (112112)	1,111	1,593	778	140	
	Dairy cattle and milk production (11212)	469	521	432	344	
	Hog and pig farming (1122)	415	534	425	447	
	Poultry and egg production (1123)	304	622	891	965	
	Sheep and goat farming (1124)	1,488	1,816	2,103	1,871	
	Animal aquaculture and other animal production (1125,1129)	3,358	6,781	5,403	3,892	
Value of Sales (\$1,000)	Cattle and Calves	474,804	543,231	800,336	894,485	
	Hogs and Pigs	6,161	3,540	5,662	3,195	
	Poultry and Eggs	99,551	86,506	119,812	127,481	
	Milk and Other Dairy Products	207,240	293,927	401,786	519,790	
	Aquaculture	-	17,054	16,270	22,490	
	Other (calculated)	68,599	56,328	66,189	55,405	
	Total	856,355	1,000,586	1,410,055	1,622,846	
Input Purchases	Livestock and poultry purchased	(Farms)	9,806	11,223	9,557	10,191
		\$1,000	144,065	201,604	281,444	293,739
	Breeding livestock purchased	(Farms)	<i>n/a</i>	5,484	4,840	4,937
		\$1,000	<i>n/a</i>	22,334	33,064	42,659
	Other livestock and poultry purchased	(Farms)	<i>n/a</i>	7,244	6,048	6,774
		\$1,000	<i>n/a</i>	179,270	248,380	251,080
	Feed purchased	(Farms)	18,390	24,322	21,691	21,341
		\$1,000	229,748	259,418	454,733	628,524

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,542,921	\$ 313,284	10,786	\$ 85,057
	Hogs, Pigs, and Other	\$ 49,121	\$ 11,335	381	\$ 3,077
	Poultry and Eggs	\$ 337,908	\$ 72,335	2,129	\$ 19,639
	Dairy	\$ 1,010,447	\$ 233,396	7,864	\$ 63,367
	Total	\$ 2,940,397	\$ 630,349	21,160	\$ 171,140

Change from 2007 to 2017	Cattle and Calves	\$ 348,944	\$ 70,852	2,439	\$ 19,236
	Hogs, Pigs, and Other	\$ (2,767)	\$ (638)	(21)	\$ (173)
	Poultry and Eggs	\$ (70,567)	\$ (15,106)	(445)	\$ (4,101)
	Dairy	\$ 42,604	\$ 9,841	332	\$ 2,672
	Total	\$ 318,214	\$ 64,948	2,305	\$ 17,633

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	7.5%
	Total	27.2%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$8.7 billion in economic output
- 56,671 jobs
- \$1.9 billion in earnings
- \$433.7 million in income taxes paid at local, state, and federal levels
- \$229.9 million in the form of property taxes

Pennsylvania's animal agriculture consumed almost 894.0 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (288.2 thousand tons)
- Egg-Laying Hens (243.6 thousand tons)
- Dairy Cows (157.6 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 2017, Pennsylvania's animal agriculture contributed the following to the economy:

- About \$8.7 billion in economic output
- \$1.9 billion in household earnings
- 56,671 jobs
- \$433.7 million in income taxes

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

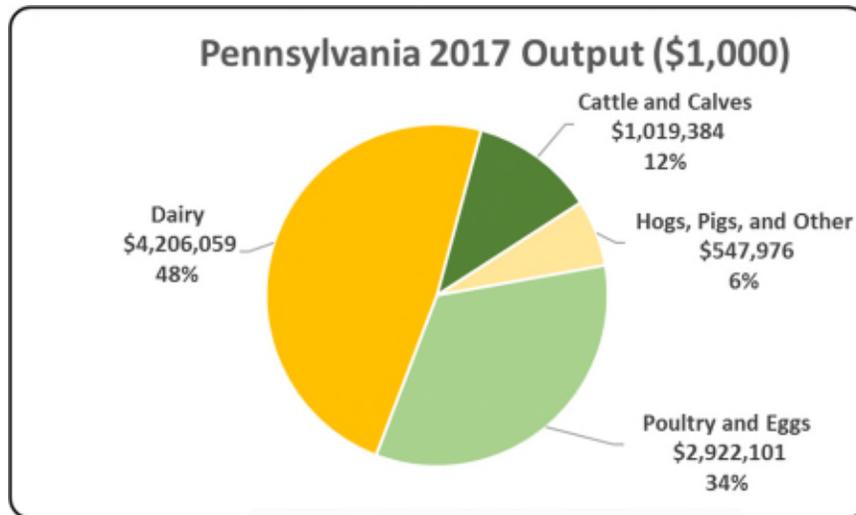
- Decreased economic output by \$493.3 million
- Reduced household earnings by \$120.5 million
- Shrunk by 4,091 jobs
- Paid \$27.4 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 8,695,520	\$ (493,315)	-5.37%
Earnings (\$1,000)	\$ 1,904,647	\$ (120,526)	-5.95%
Employment (Jobs)	56,671	(4,091)	-6.73%
Income Taxes Paid (\$1,000)	\$ 433,688	\$ (27,444)	-5.95%
Property Taxes Paid in 2012 (\$1,000)	#N/A		

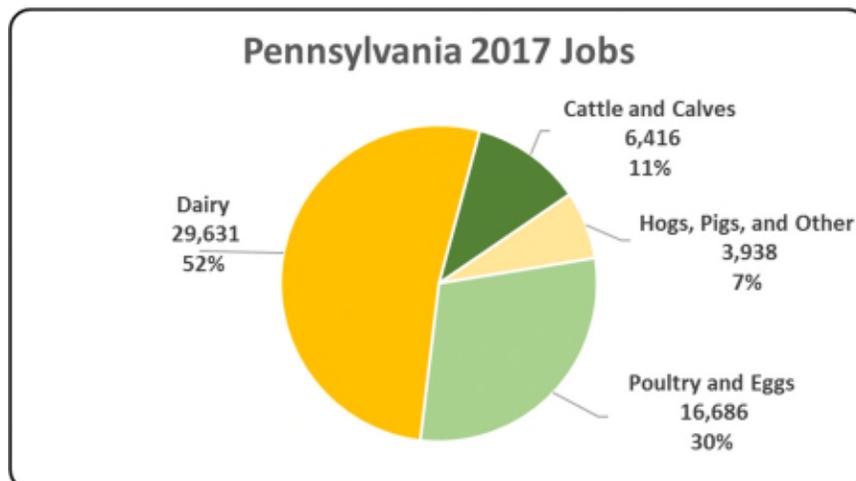
Pennsylvania Output

“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.



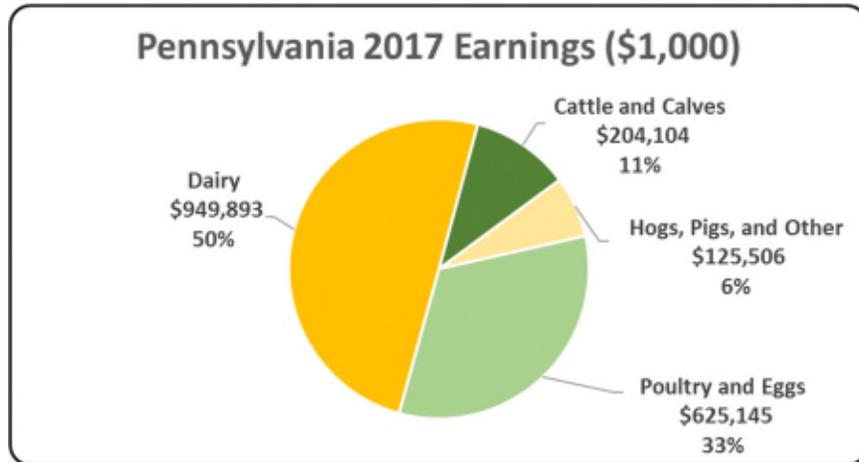
Pennsylvania Jobs

“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 significantly to Pennsylvania total jobs, contributing 56,671 jobs within and outside of animal agriculture.



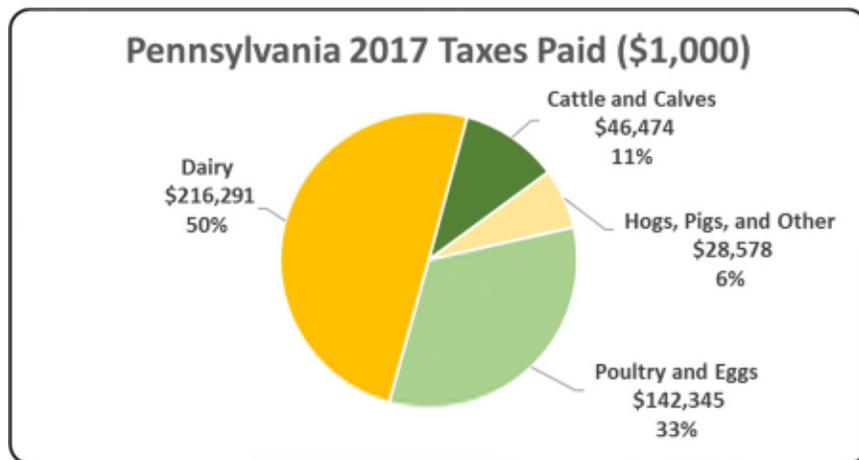
Pennsylvania Earnings

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 2017.



Pennsylvania Taxes Paid by Animal Agriculture

Pennsylvania’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$433.7 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$229.9 million in property taxes paid by all of Pennsylvania agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



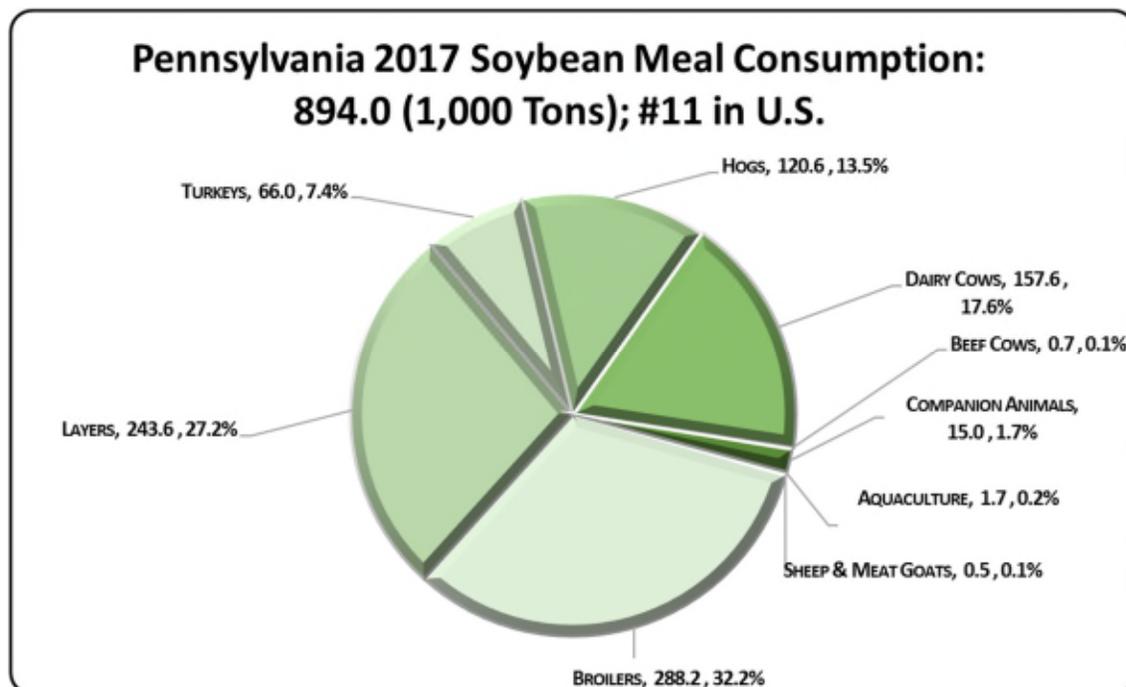
Pennsylvania Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Pennsylvania's animal agriculture consumed almost 894.0 thousand tons of soybean meal in 2017, placing the state as #11 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Pennsylvania consumed 141,377 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (288.2 thousand tons)
- Egg-Laying Hens (243.6 thousand tons)
- Dairy Cows (157.6 thousand tons)

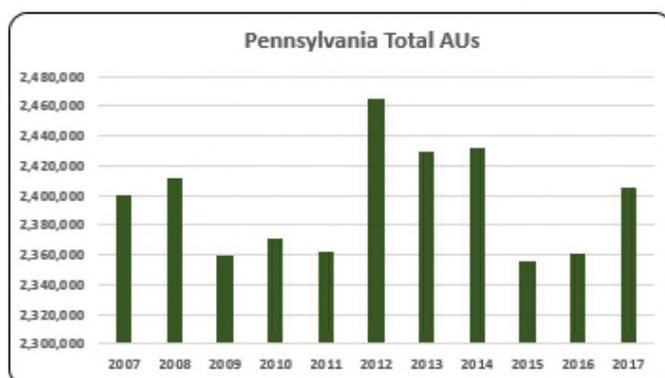
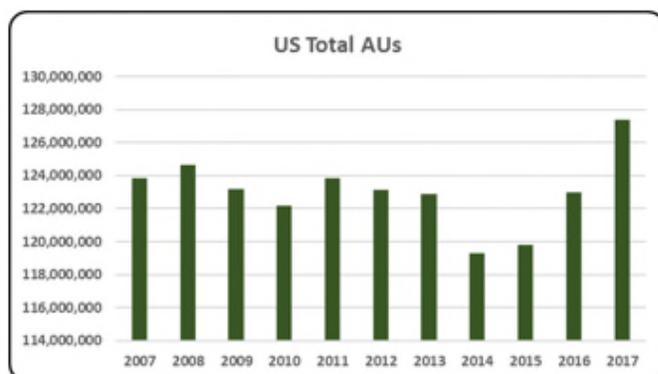


Pennsylvania Animal Unit (AU) Trends

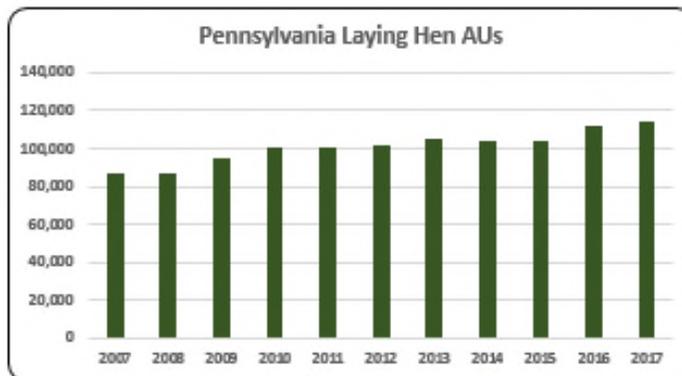
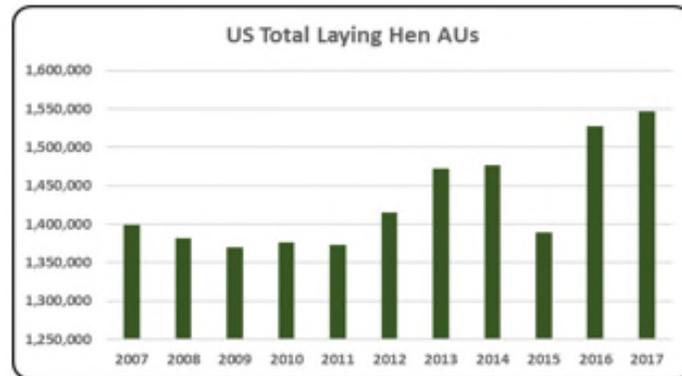
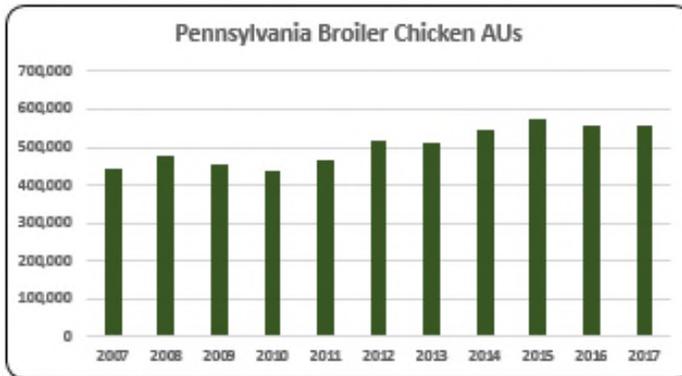
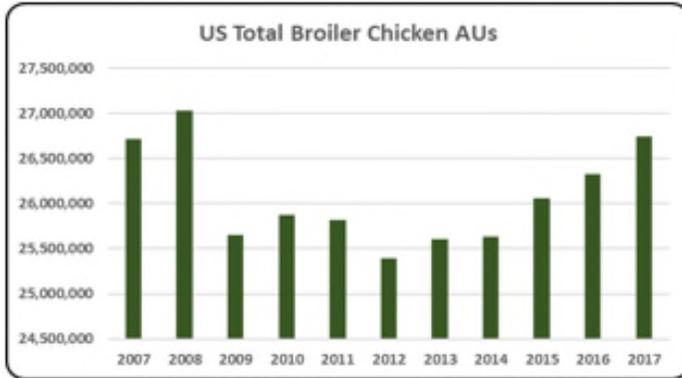
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Pennsylvania. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

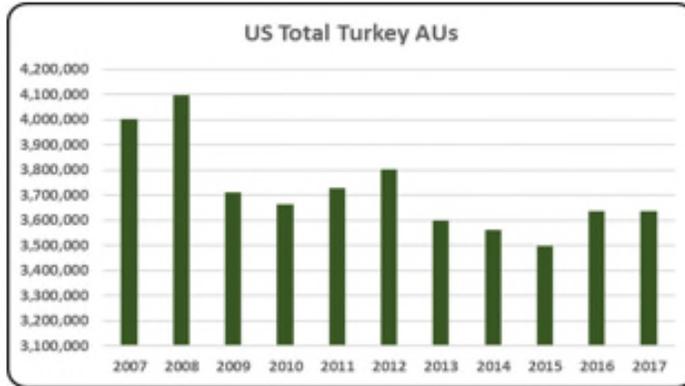
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Pennsylvania, the largest three segments of animal agriculture in terms of AUs during 2017 were: Dairy Cows (735,000 AUs), Beef Cows (563,400 AUs), and Broiler Chickens (556,615 AUs). Total animal units in Pennsylvania during 2017 were 2.4 million AUs.



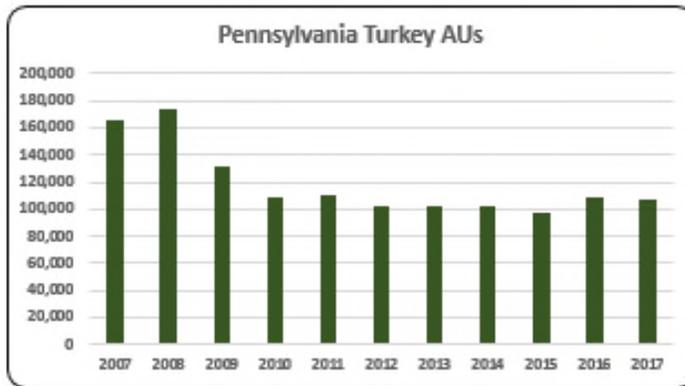
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 2.4 million AUs in Pennsylvania in 2017 representing 1.9% of all AUs in the U.S. Overall animal units increased 0.2% during the last decade.



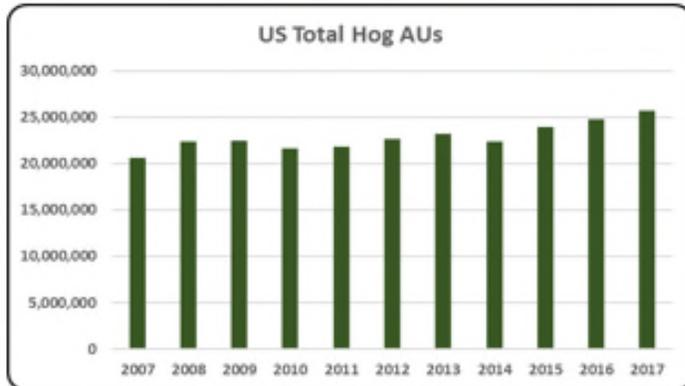
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- On average, there were 503,549 broiler AUs during the last decade. Broiler AUs showed a 25% increase from 2007 to 2017 (556,615).
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- In general, laying hen AUs showed an upward trend, increasing 31.8% throughout the decade. There were 114,322 layer AUs in 2017. Pennsylvania accounted for 4.75% of all layer AUs in the U.S. in 2017.



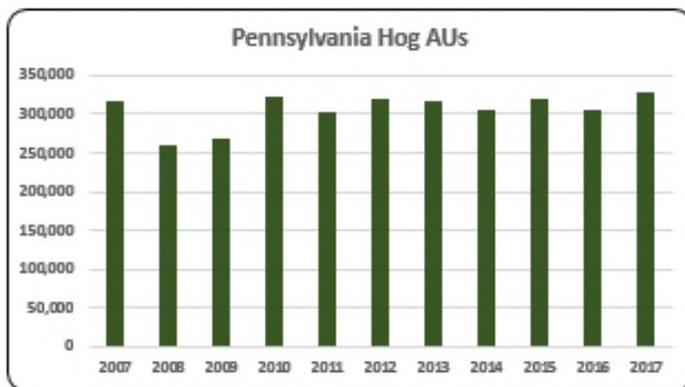
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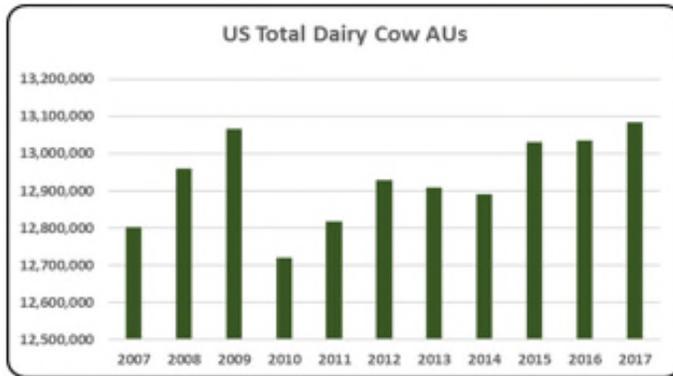
- Turkey AUs declined 35% during the last decade. From 2009 to 2017, on average, there were 107,611 turkey AUs.



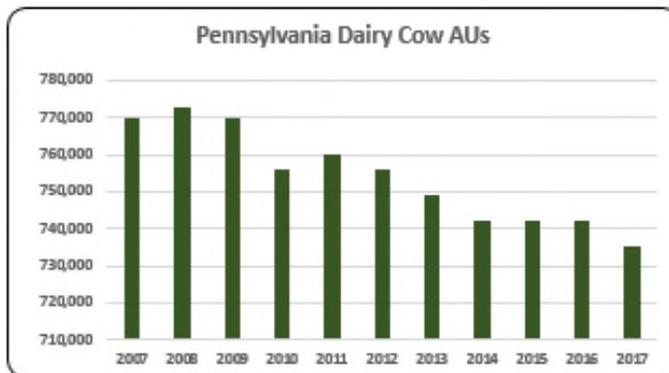
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.



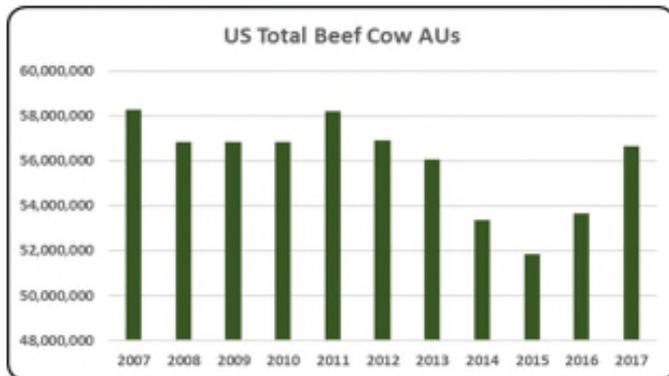
- There were 328,425 hog AUs in 2017. Hog AUs increased 3.4% from 2007 to 2017, but contributed 13.66% to the total Pennsylvania AU numbers in 2017.



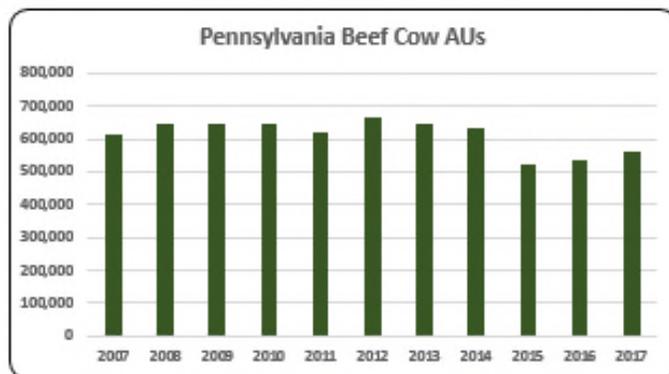
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cows AUs were 735,000 in Pennsylvania in 2017. This is a 5% decrease from a decade earlier in 2007. This is also 30% of all AUs in the state.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- The average number of beef cow AUs was 611,817 during the last decade. Beef cow AUs declined 8% during this time frame.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	615,300	643,800	643,800	643,800	621,150	668,670	643,875	630,525	521,835	533,835	563,400
	Hog and Pig AUs	317,445	259,620	268,170	322,350	303,000	319,800	317,400	306,600	318,825	306,375	328,425
	Broiler AUs	444,689	474,428	451,660	439,361	467,504	516,394	513,064	544,903	572,262	558,159	556,615
	Turkey AUs	166,091	173,617	131,879	108,252	109,551	102,254	101,380	102,799	96,650	108,416	107,321
	Egg Layer AUs	86,752	87,264	94,668	100,632	100,620	101,493	105,249	104,518	103,873	112,336	114,322
	Dairy AUs	770,000	772,800	770,000	756,000	760,200	756,000	749,000	742,000	742,000	742,000	735,000
	Total Animal Units	2,400,277	2,411,529	2,360,177	2,370,395	2,362,025	2,464,611	2,429,968	2,431,345	2,355,445	2,361,121	2,405,083
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 385,260	\$ 387,801	\$ 352,719	\$ 407,598	\$ 515,506	\$ 616,659	\$ 596,590	\$ 702,225	\$ 697,740	\$ 560,868	\$ 567,112
	Hogs and Pigs (\$1,000)	\$ 191,906	\$ 160,086	\$ 159,524	\$ 251,409	\$ 308,968	\$ 315,230	\$ 327,724	\$ 378,883	\$ 306,567	\$ 262,927	\$ 306,551
	Broilers (\$1,000)	\$ 381,015	\$ 429,272	\$ 399,875	\$ 404,446	\$ 399,973	\$ 481,050	\$ 580,231	\$ 635,216	\$ 573,616	\$ 497,072	\$ 564,182
	Turkeys (\$1,000)	\$ 103,532	\$ 133,209	\$ 89,514	\$ 95,191	\$ 114,129	\$ 117,625	\$ 109,158	\$ 128,105	\$ 132,886	\$ 156,331	\$ 130,535
	Eggs (\$1,000)	\$ 389,119	\$ 488,056	\$ 367,224	\$ 408,227	\$ 490,511	\$ 524,878	\$ 599,377	\$ 717,181	\$ 1,008,202	\$ 364,362	\$ 475,528
	Milk (\$1,000)	\$ 2,232,538	\$ 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
	Other	\$ 13,619	\$ 14,093	\$ 13,290	\$ 14,078	\$ 15,182	\$ 15,042	\$ 13,925	\$ 14,359	\$ 13,460	\$ 13,603	\$ 25,475
	Sheep and Lambs (\$1,000)	\$ 5,174	\$ 5,901	\$ 5,351	\$ 6,392	\$ 7,749	\$ 7,862	\$ 6,998	\$ 7,685	\$ 7,039	\$ 7,435	\$ 7,384
	Aquaculture (\$1,000)	\$ 8,445	\$ 8,192	\$ 7,939	\$ 7,686	\$ 7,433	\$ 7,180	\$ 6,927	\$ 6,674	\$ 6,421	\$ 6,168	\$ 18,091
	Total (\$1,000)	\$ 3,696,989	\$ 3,727,517	\$ 2,901,490	\$ 3,545,820	\$ 4,175,156	\$ 4,166,084	\$ 4,506,237	\$ 5,316,618	\$ 4,730,470	\$ 3,716,203	\$ 4,103,851

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,083	7,677	8,350	7,665	
	Cattle feedlots (112112)	2,463	3,197	1,611	726	
	Dairy cattle and milk production (11212)	9,591	8,678	7,434	6,598	
	Hog and pig farming (1122)	1,130	1,366	1,072	765	
	Poultry and egg production (1123)	1,320	1,655	2,691	2,141	
	Sheep and goat farming (1124)	993	1,524	2,010	2,073	
	Animal aquaculture and other animal production (1125,1129)	2,947	6,736	8,062	6,868	
Value of Sales (\$1,000)	Cattle and Calves	372,761	441,671	556,192	717,085	
	Hogs and Pigs	236,740	269,318	336,437	457,916	
	Poultry and Eggs	756,800	745,624	1,015,843	1,362,039	
	Milk and Other Dairy Products	1,330,978	1,393,992	1,890,190	1,966,892	
	Aquaculture	7,632	15,325	44,519	26,123	
	Other (calculated)	89,814	70,115	95,916	49,123	
	Total	2,794,725	2,936,045	3,939,097	4,579,178	
Input Purchases	Livestock and poultry purchased	(Farms) 16,075	17,996	15,367	18,409	
		\$1,000	290,987	333,396	482,913	502,633
	Breeding livestock purchased	(Farms) <i>n/a</i>	8,990	6,716	8,489	
		\$1,000	<i>n/a</i>	66,562	76,826	114,511
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	11,417	10,712	12,736	
		\$1,000	<i>n/a</i>	266,834	406,087	388,122
Feed purchased	(Farms)	26,901	36,011	32,576	37,228	
	\$1,000	973,221	937,355	1,267,184	1,832,951	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,019,384	\$ 204,104	6,416	\$ 46,474
	Hogs, Pigs, and Other	\$ 547,976	\$ 125,506	3,938	\$ 28,578
	Poultry and Eggs	\$ 2,922,101	\$ 625,145	16,686	\$ 142,345
	Dairy	\$ 4,206,059	\$ 949,893	29,631	\$ 216,291
	Total	\$ 8,695,520	\$ 1,904,647	56,671	\$ 433,688
Change from 2007 to 2017	Cattle and Calves	\$ 206,575	\$ 41,361	1,300	\$ 9,418
	Hogs, Pigs, and Other	\$ 149,851	\$ 34,321	1,077	\$ 7,815
	Poultry and Eggs	\$ 361,573	\$ 77,354	2,065	\$ 17,613
	Dairy	\$ (1,211,315)	\$ (273,562)	(8,533)	\$ (62,290)
	Total	\$ (493,315)	\$ (120,526)	(4,091)	\$ (27,444)
	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	
Tax Rates	Federal effective income tax rate			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			3.1%	
	Total			22.8%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 in 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 2017 animal agriculture contributed:

- \$37.3 million in economic output
- 164 jobs
- \$7.7 million in earnings
- \$1.9 million in income taxes paid at local, state, and federal levels
- \$7.4 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Rhode Island has increased economic output by over \$7.4 million, boosted household earnings by \$1.4 million, contributed 29 additional jobs and paid \$0.4 million in additional tax revenues.

Rhode Island's animal agriculture consumed 10,800 tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (5,200 tons)
- Turkeys (2,600 tons)
- Egg-Laying Hens (1,500 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 2017, Rhode Island's animal agriculture contributed the following to the economy:

- About \$37.3 million in economic output
- \$7.7 million in household earnings
- 164 jobs
- \$1.9 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:

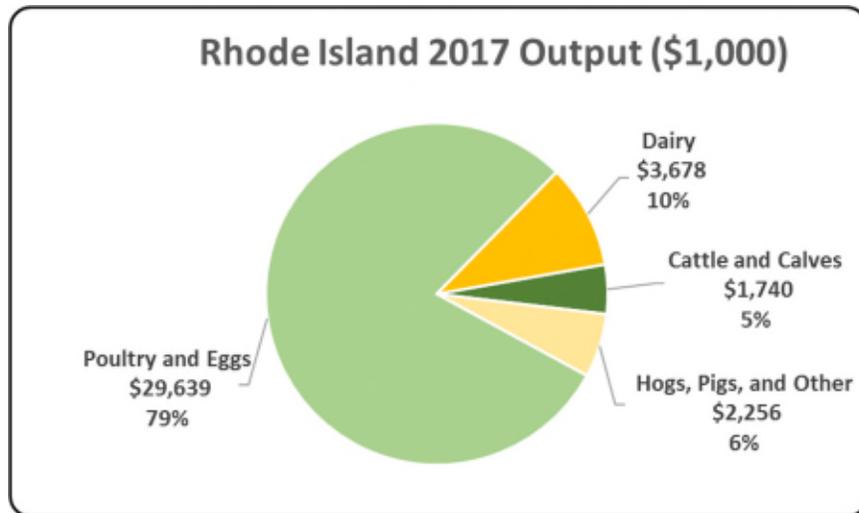
- Increased economic output by \$7.4 million
- Boosted household earnings by \$1.4 million
- Added 29 jobs
- Paid an additional \$356,000 in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 37,314	\$ 7,393	24.71%
Earnings (\$1,000)	\$ 7,659	\$ 1,449	23.34%
Employment (Jobs)	164	29	21.29%
Income Taxes Paid (\$1,000)	\$ 1,882	\$ 356	23.34%
Property Taxes Paid in 2012 (\$1,000)	\$ 7,365		

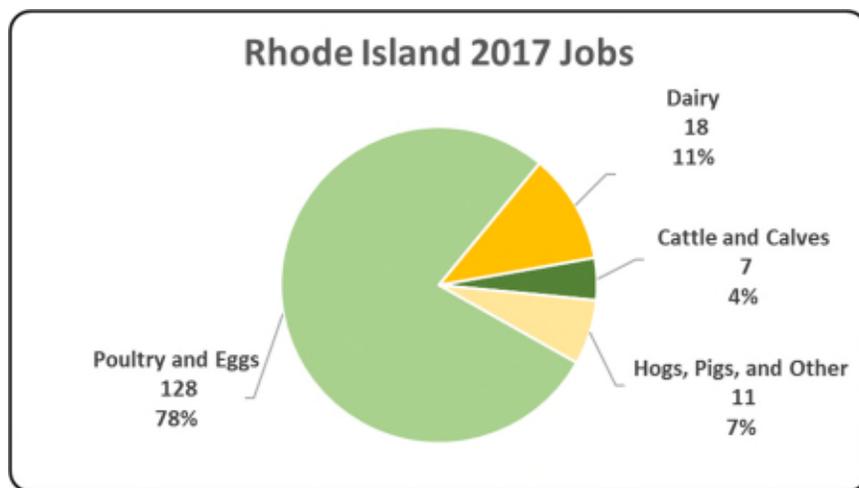
Rhode Island Output

“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 \$37.3 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 164 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 \$7.7 million to household earnings in 2017.



Rhode Island Taxes Paid by Animal Agriculture

Rhode Island’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$1.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$7.4 million in property taxes paid by all of Rhode Island agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



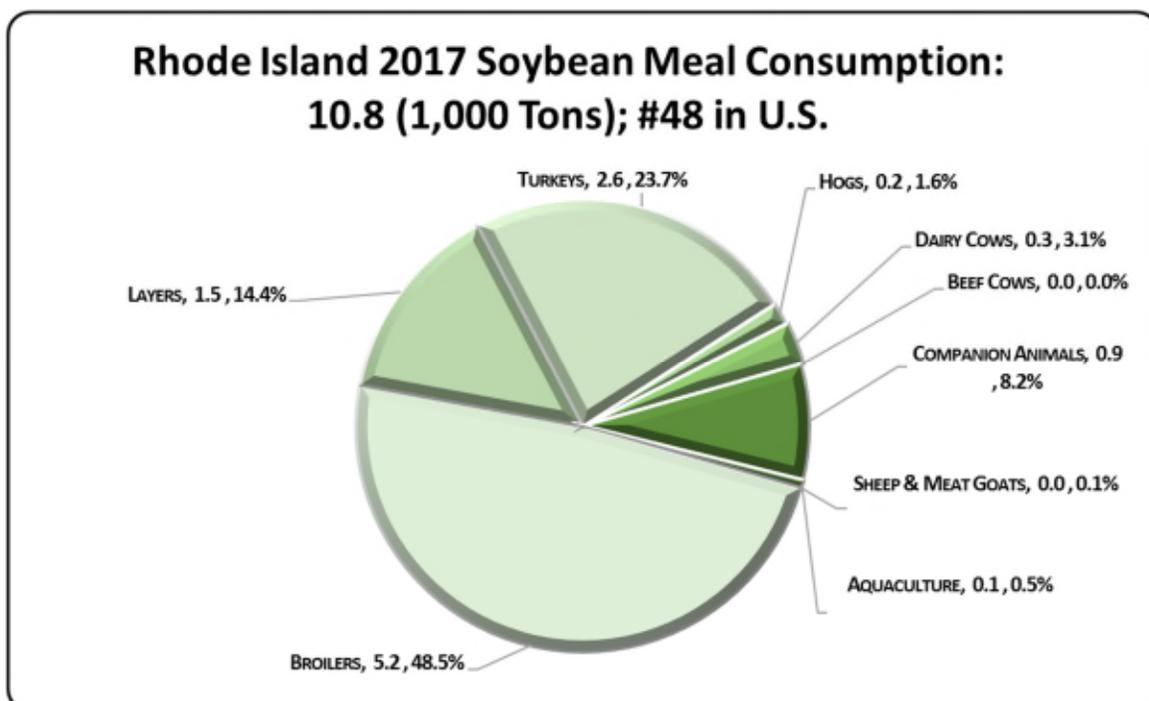
Rhode Island Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Rhode Island's animal agriculture consumed almost 10,800 tons of soybean meal in 2017, placing the state as #48 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:

- Broilers (5,200 tons)
- Turkeys (2,600 tons)
- Egg-Laying Hens (1,500 tons)

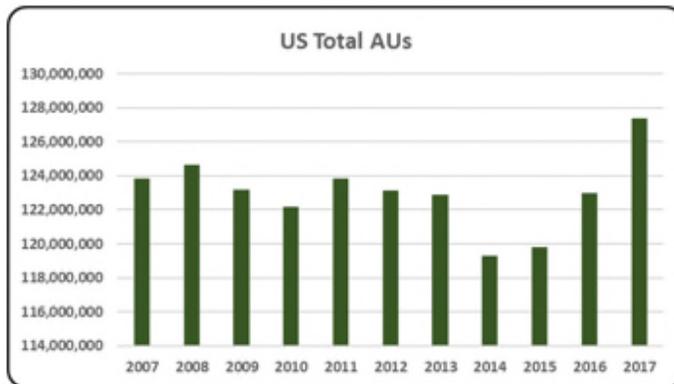


Rhode Island Animal Unit (AU) Trends

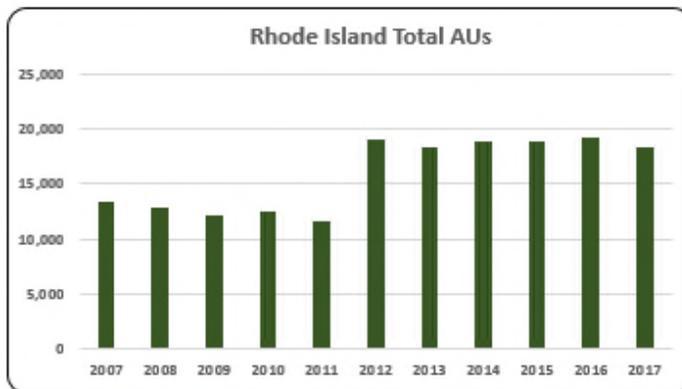
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Rhode Island. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

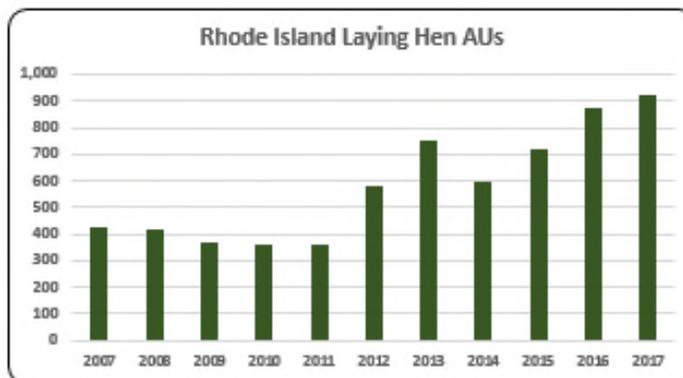
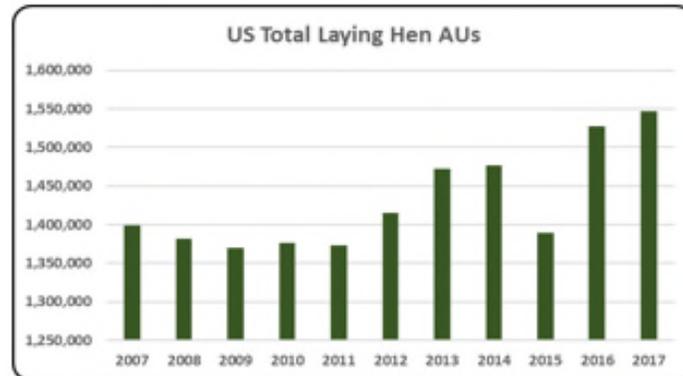
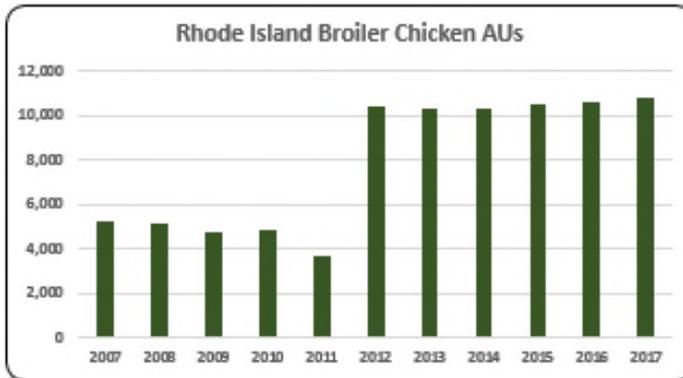
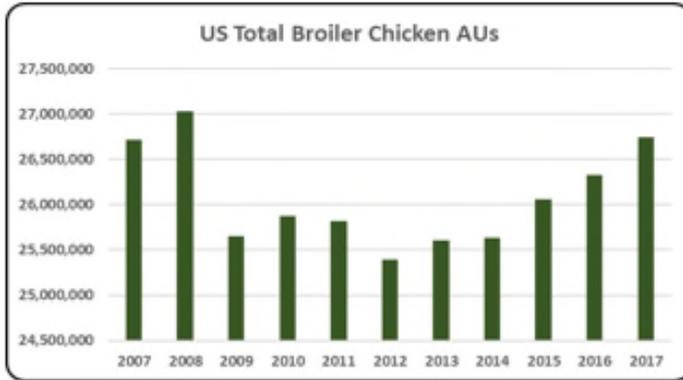
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Rhode Island, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (10,801 AUs), Turkeys (4,062 AUs), and Dairy Cows (1,120 AUs). Total animal units in Rhode Island during 2017 were 18,358 AUs.



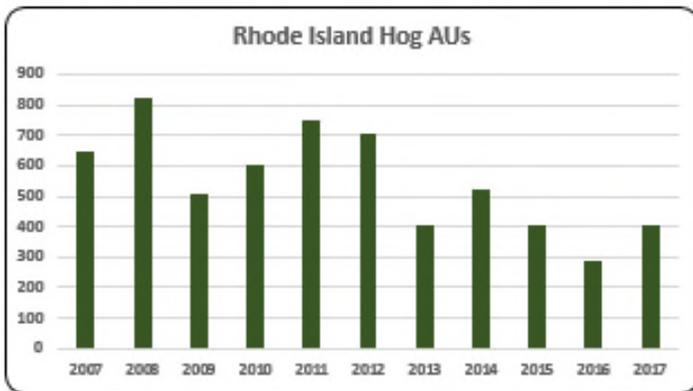
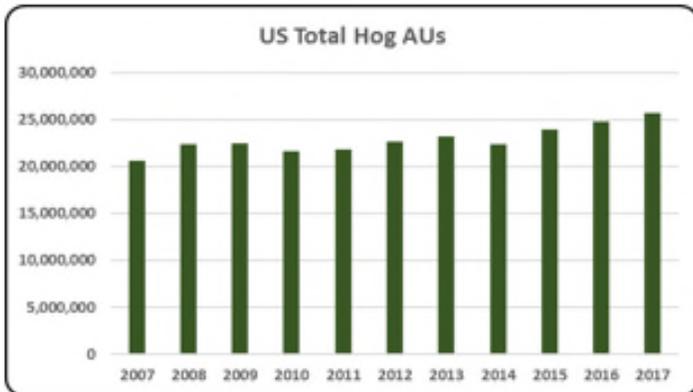
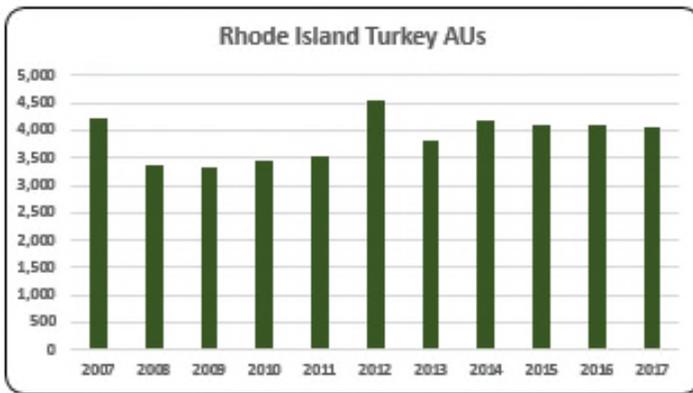
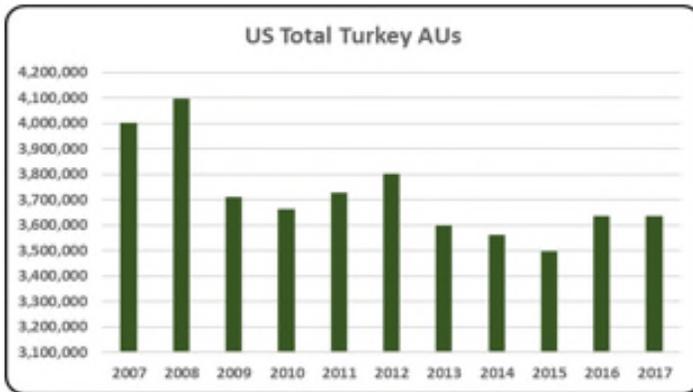
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.



- Rhode Island has a very little animal production contributing only 0.01% (18,358) of all AUs in the U.S. in 2017.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broilers are the largest animal sector in Rhode Island with 58.8% of all animal units in the state in 2017. There were 10,801 broiler AUs in the state in 2017, a record number for the decade.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 921 layer AUs in Rhode Island in 2017. Laying hen AUs increased 114% from 2007 to 2017.

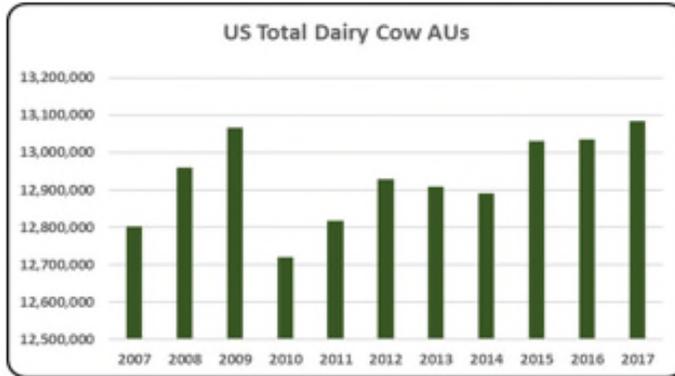


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

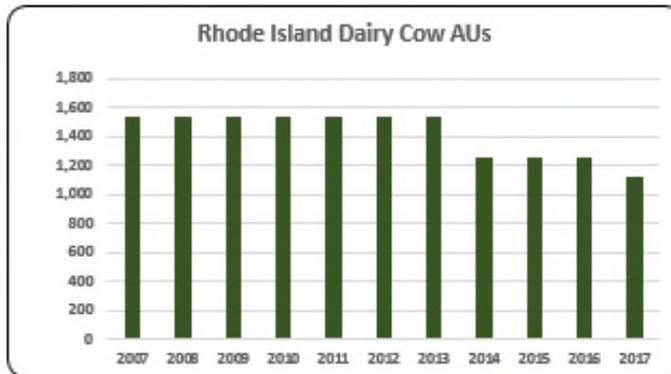
- On average, there were 3,880 turkey AUs from 2007 to 2017. 2012 was a record year for turkey numbers with 4,553 turkey AUs.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

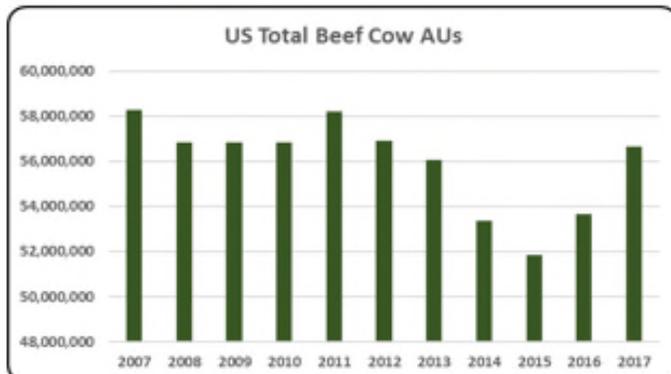
- Hog production was the smallest animal sector in the state in terms of animal units with an average of 551 hog AUs during last decade. There were 405 hog AUs in the state in 2017.



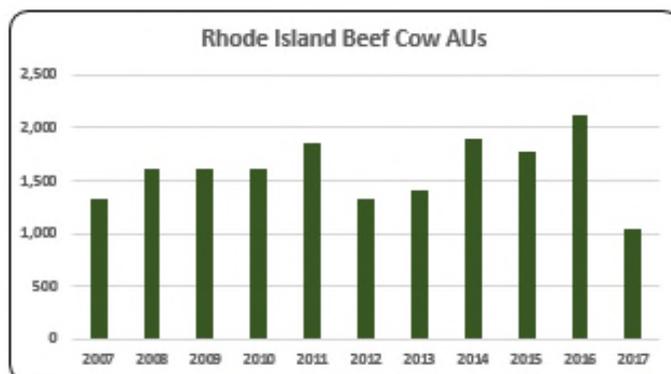
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy production declined 27% from 2007 to 2017. On average, there were 1,425 dairy cow AUs during the last decade.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- 6% (1,050) of all Rhode Island AUs were beef cows in 2017. Beef cow AUs declined 21% in the last decade.

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Animal agriculture is an important 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:

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	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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,335	1,620	1,620	1,620	1,860	1,335	1,410	1,890	1,770	2,130	1,050
	Hog and Pig AUs	645	825	510	600	750	705	405	525	405	285	405
	Broiler AUs	5,227	5,145	4,784	4,848	3,653	10,398	10,362	10,303	10,569	10,649	10,801
	Turkey AUs	4,230	3,381	3,312	3,450	3,511	4,553	3,798	4,193	4,102	4,088	4,062
	Egg Layer AUs	429	417	364	362	364	579	750	598	719	874	921
	Dairy AUs	1,540	1,540	1,540	1,540	1,540	1,540	1,540	1,260	1,260	1,260	1,120
	Total Animal Units	13,405	12,928	12,130	12,420	11,678	19,110	18,265	18,768	18,825	19,286	18,358
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 911	\$ 834	\$ 738	\$ 706	\$ 1,029	\$ 1,452	\$ 1,512	\$ 1,929	\$ 1,850	\$ 1,489	\$ 1,267
	Hogs and Pigs (\$1,000)	\$ 266	\$ 289	\$ 176	\$ 275	\$ 364	\$ 368	\$ 361	\$ 537	\$ 350	\$ 213	\$ 334
	Broilers (\$1,000)	\$ 4,034	\$ 4,121	\$ 3,556	\$ 3,716	\$ 3,253	\$ 10,361	\$ 12,625	\$ 13,244	\$ 11,554	\$ 10,273	\$ 12,063
	Turkeys (\$1,000)	\$ 3,532	\$ 4,310	\$ 4,085	\$ 7,087	\$ 5,572	\$ 5,992	\$ 4,343	\$ 2,873	\$ 3,840	\$ 4,342	\$ 2,940
	Eggs (\$1,000)	\$ 2,975	\$ 3,586	\$ 2,552	\$ 2,801	\$ 3,072	\$ 3,445	\$ 3,892	\$ 6,230	\$ 10,385	\$ 4,084	\$ 5,522
	Milk (\$1,000)	\$ 3,819	\$ 4,000	\$ 2,783	\$ 3,510	\$ 4,314	\$ 3,623	\$ 3,728	\$ 4,514	\$ 3,005	\$ 2,425	\$ 2,418
	Other	\$ 2,103	\$ 2,713	\$ 3,328	\$ 3,958	\$ 4,563	\$ 5,181	\$ 5,807	\$ 6,418	\$ 7,038	\$ 7,649	\$ 1,332
	Sheep and Lambs (\$1,000)	\$ 40	\$ 37	\$ 41	\$ 59	\$ 52	\$ 59	\$ 73	\$ 72	\$ 80	\$ 80	\$ 76
	Aquaculture (\$1,000)	\$ 2,064	\$ 2,675	\$ 3,287	\$ 3,899	\$ 4,511	\$ 5,122	\$ 5,734	\$ 6,346	\$ 6,958	\$ 7,569	\$ 1,256
	Total (\$1,000)	\$ 17,640	\$ 19,852	\$ 17,217	\$ 22,053	\$ 22,167	\$ 30,422	\$ 32,267	\$ 35,745	\$ 38,022	\$ 30,475	\$ 25,876

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	67	78	102	154
	Cattle feedlots (112112)	18	12	8	7
	Dairy cattle and milk production (11212)	32	30	34	13
	Hog and pig farming (1122)	22	20	31	20
	Poultry and egg production (1123)	21	26	49	88
	Sheep and goat farming (1124)	24	30	53	54
	Animal aquaculture and other animal production (1125,1129)	78	148	237	244
Value of Sales (\$1,000)	Cattle and Calves	778	735	846	1,180
	Hogs and Pigs	758	227	354	601
	Poultry and Eggs	2,020	1,766	1,908	2,177
	Milk and Other Dairy Products	4,875	3,859	4,599	3,902
	Aquaculture	n/a	863	1,653	1,917
	Other (calculated)	1,230	958	946	513
	Total	9,661	8,408	10,306	10,290
Input Purchases	Livestock and poultry purchased	(Farms) 161	169	203	349
		\$1,000 848	730	748	1,023
	Breeding livestock purchased	(Farms) n/a	75	90	136
		\$1,000 n/a	118	214	314
	Other livestock and poultry purchased	(Farms) n/a	122	143	287
		\$1,000 n/a	612	534	709
Feed purchased	(Farms) 271	425	583	693	
	\$1,000 2,924	3,121	5,171	6,287	

	2017 Animal Agriculture				
	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 1,740	\$ 321	7	\$ 79
	Hogs, Pigs, and Other	\$ 2,256	\$ 499	11	\$ 123
	Poultry and Eggs	\$ 29,639	\$ 6,053	128	\$ 1,487
	Dairy	\$ 3,678	\$ 786	18	\$ 193
	Total	\$ 37,314	\$ 7,659	164	\$ 1,882
	Change from 2007 to 2017				
	Animal Type	Output (\$)	Earnings (\$)	Employment (Jobs)	Taxes Paid (\$)
	Cattle and Calves	\$ 272	\$ 50	1	\$ 12
	Hogs, Pigs, and Other	\$ (1,511)	\$ (334)	(7)	\$ (82)
	Poultry and Eggs	\$ 11,773	\$ 2,404	51	\$ 591
	Dairy	\$ (3,140)	\$ (671)	(16)	\$ (165)
	Total	\$ 7,393	\$ 1,449	29	\$ 356
	RIMS II Multipliers				
	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	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		Rate		
	Federal effective income tax rate		13.5%		
Federal Social Security tax rate		6.2%			
State Effective Rate		4.9%			
Total		24.6%			

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$3.1 billion in economic output
- 21,224 jobs
- \$681.2 million in earnings
- \$158.0 million in income taxes paid at local, state, and federal levels
- \$43.3 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in South Carolina has increased economic output by over \$394.9 million, boosted household earnings by \$85.2 million, contributed 2,491 additional jobs and paid \$19.8 million in additional tax revenues.

South Carolina's animal agriculture consumed almost 474.5 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (409.4 thousand tons)
- Egg-Laying Hens (25.7 thousand tons)
- Hogs (14.7 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 2017, South Carolina's animal agriculture contributed the following to the economy:

- About \$3.1 billion in economic output
- \$681.2 million in household earnings
- 21,224 jobs
- \$158.0 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:

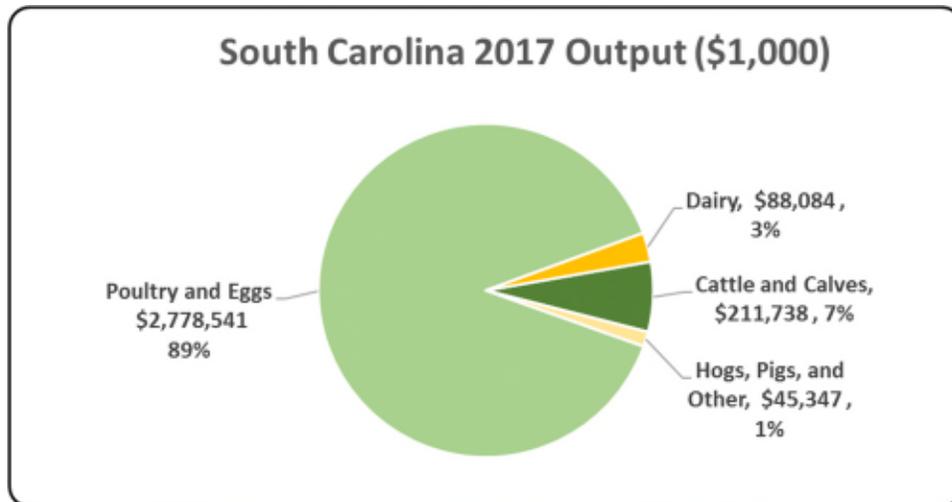
- Increased economic output by \$394.9 million
- Boosted household earnings by \$85.2 million
- Added 2,491 jobs
- Paid an additional \$19.8 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 3,123,711	\$ 394,914	14.47%
Earnings (\$1,000)	\$ 681,159	\$ 85,167	14.29%
Employment (Jobs)	21,224	2,491	13.30%
Income Taxes Paid (\$1,000)	\$ 158,029	\$ 19,759	14.29%
Property Taxes Paid in 2012 (\$1,000)	\$ 43,314		

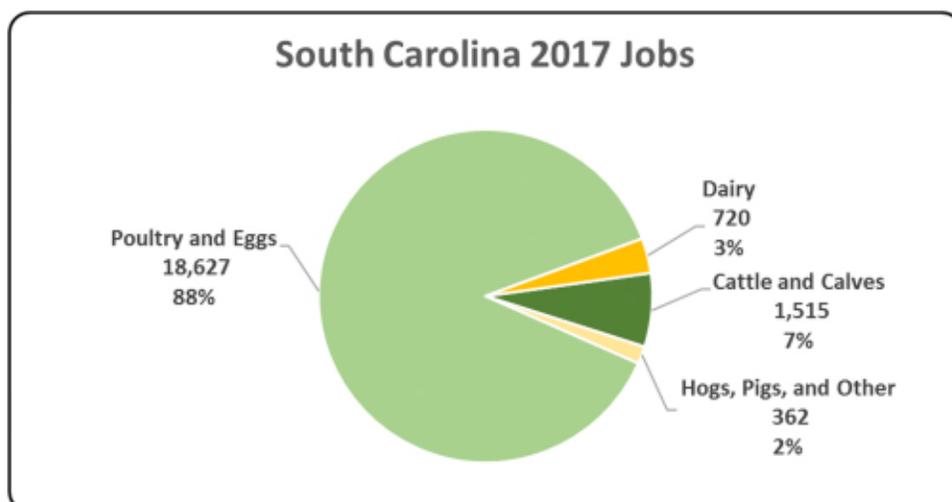
South Carolina Output

“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 \$3.1 billion.



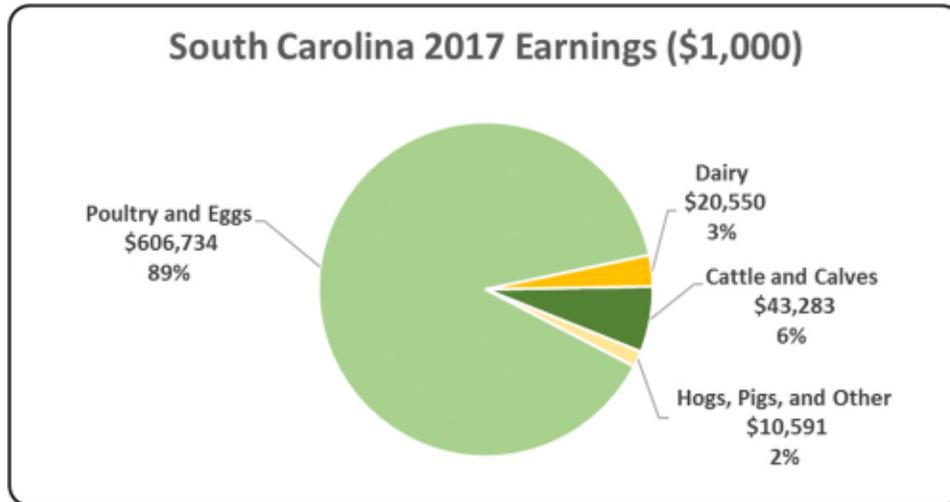
South Carolina Jobs

“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 21,224 jobs within and outside of animal agriculture.



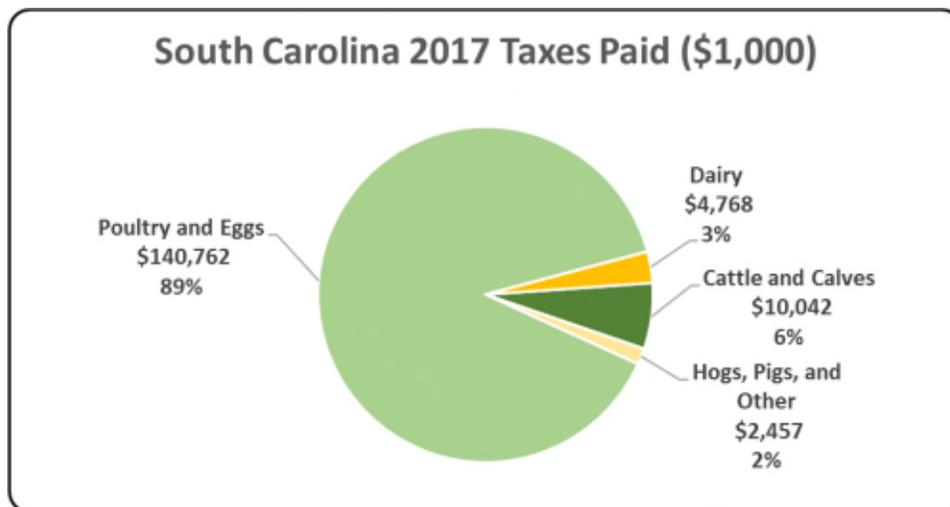
South Carolina Earnings

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 \$681.2 million to household earnings in 2017.



South Carolina Taxes Paid by Animal Agriculture

South Carolina’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$158.0 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$43.3 million in property taxes paid by all of South Carolina agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



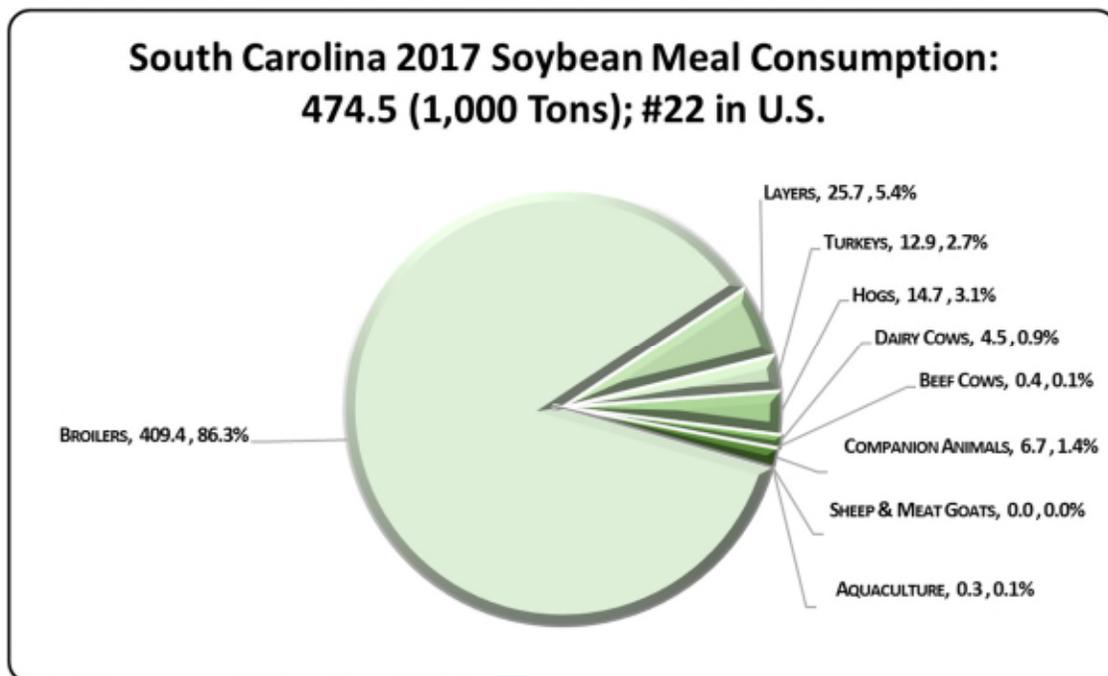
South Carolina Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

South Carolina's animal agriculture consumed almost 474.5 thousand tons of soybean meal in 2017, placing the state as #22 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in South Carolina consumed 3,379 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (409.4 thousand tons)
- Egg-Laying Hens (25.7 thousand tons)
- Hogs (14.7 thousand tons)

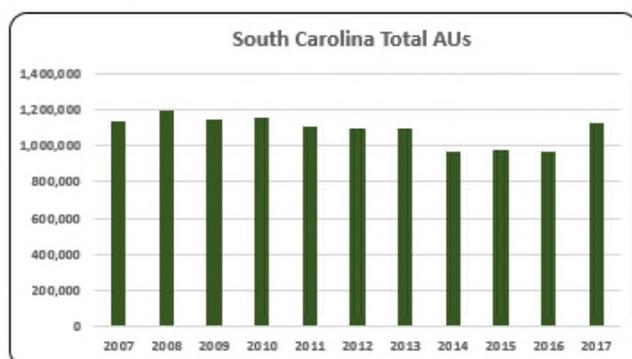
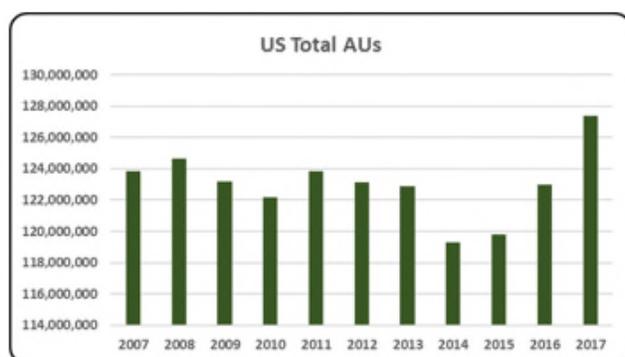


South Carolina Animal Unit (AU) Trends

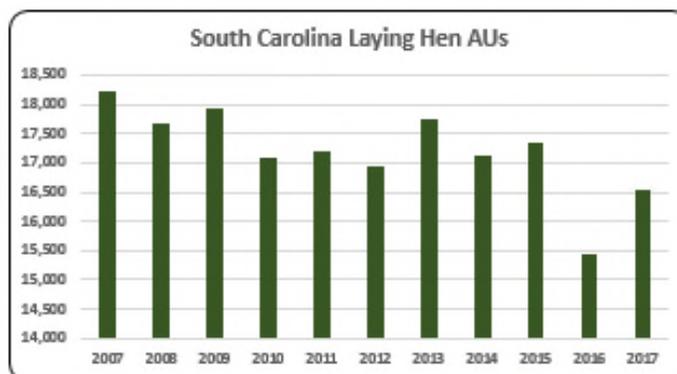
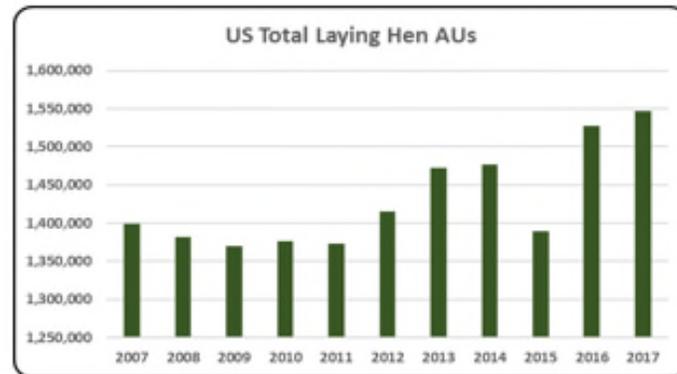
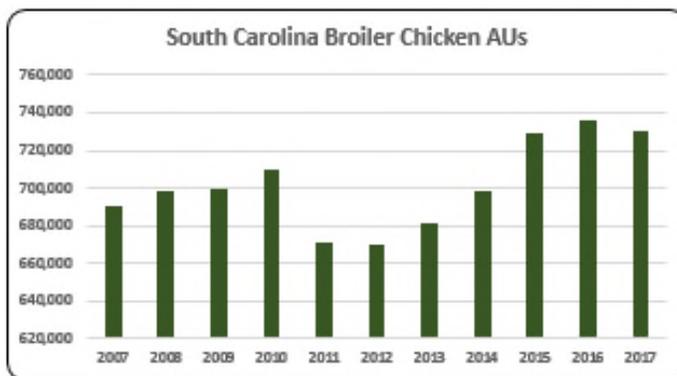
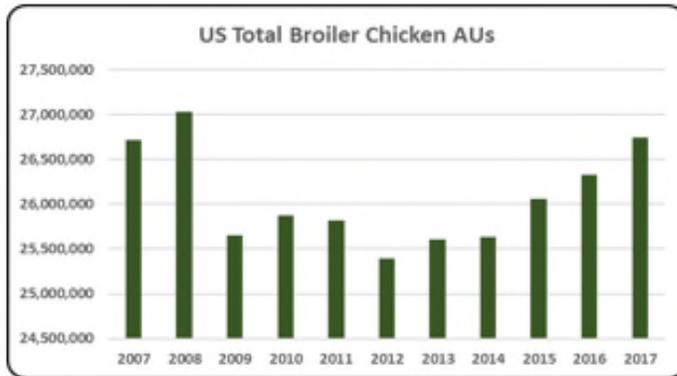
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of South Carolina. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

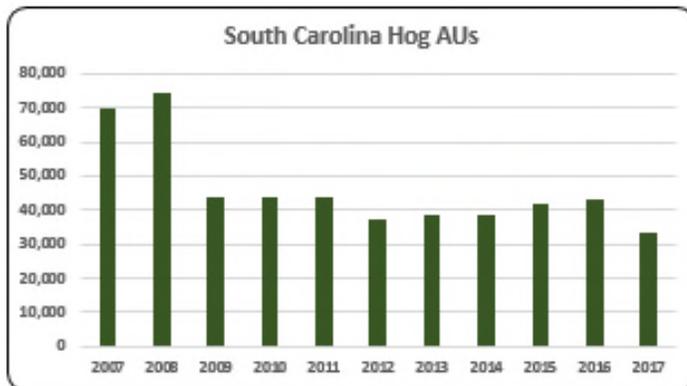
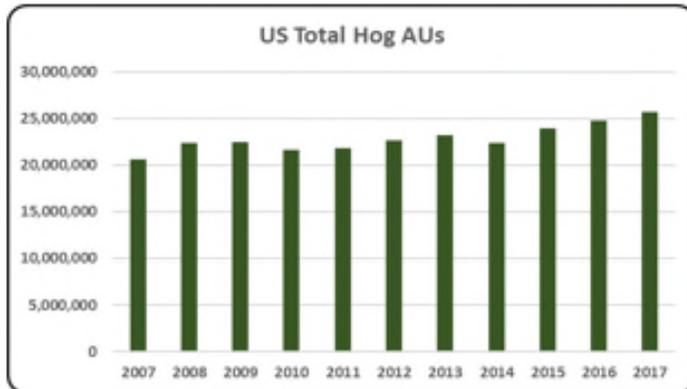
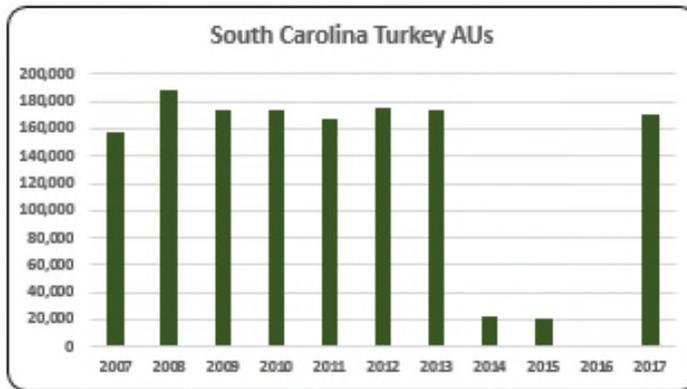
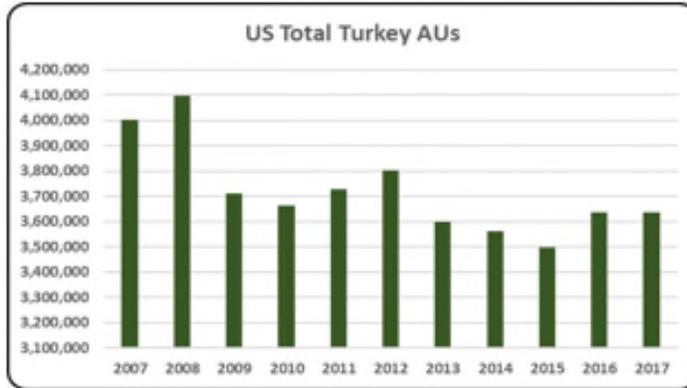
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In South Carolina, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (730,632 AUs), Turkeys (170,438 AUs), and Beef Cows (155,100 AUs). Total animal units in South Carolina during 2017 were 1.1 million AUs.



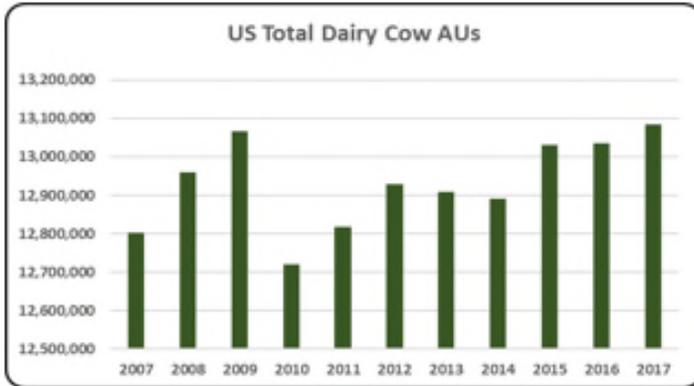
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Total animal units in South Carolina were 1,127,291 in 2017. South Carolina is the home to 0.88% of national AUs.



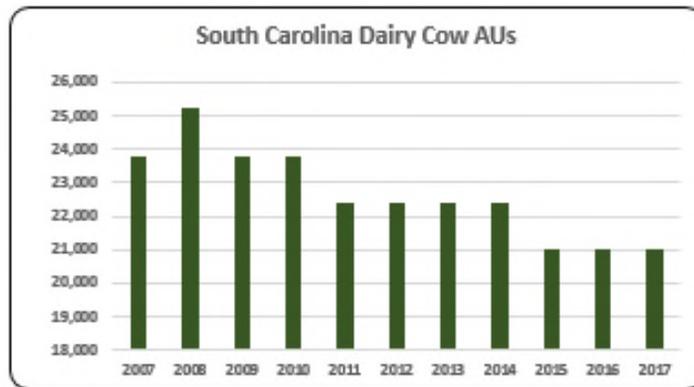
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broilers contributed 65% (730,632 broiler AUs) of total AUs in South Carolina in 2017. Broiler numbers increased 6% from 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (1,480,000 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens represented only 1.5% (16,521 AUs) of all South Carolina’s animal units in 2017. Laying hen numbers in 2017 decreased 9% compared to 2007.



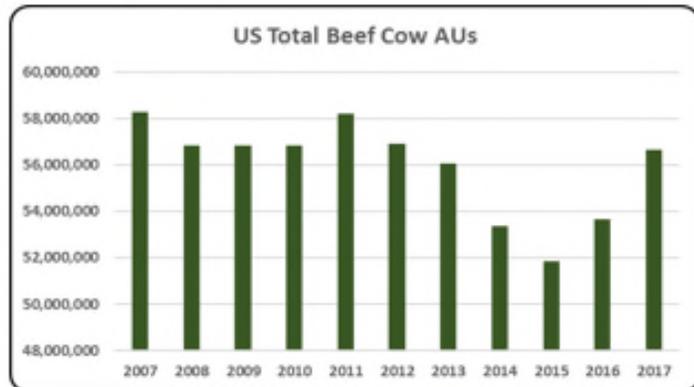
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- There were 170,438 turkey AUs in South Carolina in 2017, which is 8.5% more than in 2007.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- The average number of hog AUs from 2007 to 2017 was 46,193. Hog numbers decreased 52%; from 69,975 hog AUs in 2007 to 33,600 hog AUs in 2017.



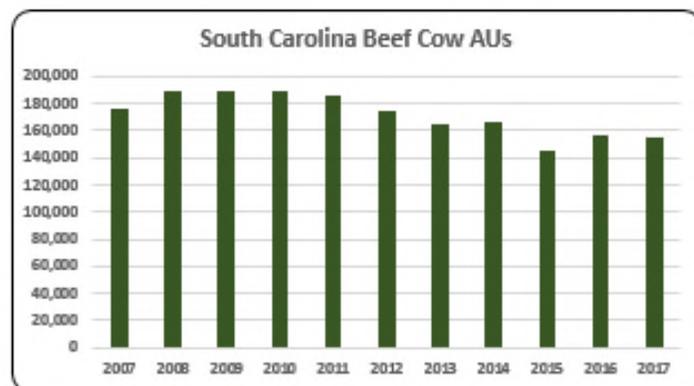
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- 2017 dairy cow AUs were at 21,000. Dairy cow AUs dropped 12% from 2007 to 2017. South Carolina saw the decade high dairy cow AUs in 2008 with 25,200 dairy cow AUs.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- About 14% (155,100) of AUs in 2017 were beef cows. Beef cow AUs trended downward during last decade showing an 12% 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	176,850	189,450	189,450	189,450	186,600	175,350	164,400	166,950	144,750	156,510	155,100
	Hog and Pig AUs	69,975	74,175	43,875	43,575	43,575	37,125	38,325	38,775	41,775	43,350	33,600
	Broiler AUs	690,855	698,521	699,705	709,217	671,211	669,689	681,380	698,786	729,153	735,495	730,632
	Turkey AUs	157,032	188,714	174,373	174,081	167,978	175,293	173,795	21,862	21,390	-	170,438
	Egg Layer AUs	18,216	17,680	17,932	17,080	17,212	16,956	17,750	17,114	17,353	15,426	16,521
	Dairy AUs	23,800	25,200	23,800	23,800	22,400	22,400	22,400	22,400	21,000	21,000	21,000
	Total Animal Units	1,136,728	1,193,740	1,149,135	1,157,203	1,108,976	1,096,813	1,098,050	965,887	975,420	971,781	1,127,291
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 128,623	\$ 115,953	\$ 113,488	\$ 131,192	\$ 152,030	\$ 157,102	\$ 139,357	\$ 193,129	\$ 173,087	\$ 127,433	\$ 130,606
	Hogs and Pigs (\$1,000)	\$ 43,174	\$ 44,605	\$ 22,035	\$ 29,016	\$ 31,544	\$ 30,712	\$ 30,992	\$ 36,769	\$ 34,036	\$ 29,498	\$ 25,751
	Broilers (\$1,000)	\$ 665,955	\$ 697,452	\$ 695,508	\$ 750,426	\$ 707,549	\$ 768,650	\$ 963,248	\$ 1,051,560	\$ 939,725	\$ 865,562	\$ 978,602
	Turkeys (\$1,000)	\$ 198,474	\$ 257,431	\$ 197,767	\$ 236,398	\$ 312,603	\$ 342,461	\$ 306,001	\$ 298,704	\$ 313,341	\$ 321,217	\$ 316,779
	Eggs (\$1,000)	\$ 92,809	\$ 104,178	\$ 85,739	\$ 86,243	\$ 101,561	\$ 109,457	\$ 116,175	\$ 130,092	\$ 167,384	\$ 95,367	\$ 92,710
	Milk (\$1,000)	\$ 67,942	\$ 69,445	\$ 51,675	\$ 56,914	\$ 63,612	\$ 57,132	\$ 60,720	\$ 71,799	\$ 51,678	\$ 44,500	\$ 47,177
	Other	\$ 4,889	\$ 4,866	\$ 4,864	\$ 4,917	\$ 4,875	\$ 4,886	\$ 4,922	\$ 4,903	\$ 4,919	\$ 4,901	\$ 3,932
	Sheep and Lambs (\$1,000)	\$ 146	\$ 138	\$ 151	\$ 219	\$ 192	\$ 218	\$ 269	\$ 265	\$ 296	\$ 293	\$ 279
	Aquaculture (\$1,000)	\$ 4,743	\$ 4,728	\$ 4,713	\$ 4,698	\$ 4,683	\$ 4,668	\$ 4,653	\$ 4,638	\$ 4,623	\$ 4,608	\$ 3,653
	Total (\$1,000)	\$ 1,201,866	\$ 1,293,930	\$ 1,171,075	\$ 1,295,106	\$ 1,373,774	\$ 1,470,400	\$ 1,621,415	\$ 1,786,956	\$ 1,684,170	\$ 1,488,478	\$ 1,595,557

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,746	7,638	6,931	5,851	
	Cattle feedlots (112112)	206	282	168	withheld	
	Dairy cattle and milk production (11212)	179	211	102	80	
	Hog and pig farming (1122)	565	436	300	236	
	Poultry and egg production (1123)	711	836	1,226	1,238	
	Sheep and goat farming (1124)	289	491	859	1,100	
	Animal aquaculture and other animal production (1125,1129)	1,511	3,392	3,747	4,157	
Value of Sales (\$1,000)	Cattle and Calves	81,970	76,146	105,282	92,352	
	Hogs and Pigs	68,793	61,589	77,211	93,527	
	Poultry and Eggs	630,540	694,290	1,289,876	1,476,817	
	Milk and Other Dairy Products	54,855	46,240	52,550	56,008	
	Aquaculture	4,630	3,173	4,775	5,138	
	Other (calculated)	n/a	363	24,496	6,263	
	Total		840,788	881,801	1,554,190	1,730,105
Input Purchases	Livestock and poultry purchased	(Farms)	4,480	4,828	4,097	4,977
		\$1,000	88,949	97,058	170,676	209,463
	Breeding livestock purchased	(Farms)	n/a	2,557	1,977	2,355
		\$1,000	n/a	6,302	14,017	19,545
	Other livestock and poultry purchased	(Farms)	n/a	2,654	2,613	3,309
		\$1,000	n/a	90,756	156,659	189,918
	Feed purchased	(Farms)	9,768	13,901	12,517	14,754
	\$1,000	410,005	369,275	761,414	917,181	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 211,738	\$ 43,283	1,515	\$ 10,042
	Hogs, Pigs, and Other	\$ 45,347	\$ 10,591	362	\$ 2,457
	Poultry and Eggs	\$ 2,778,541	\$ 606,734	18,627	\$ 140,762
	Dairy	\$ 88,084	\$ 20,550	720	\$ 4,768
	Total	\$ 3,123,711	\$ 681,159	21,224	\$ 158,029
Change from 2007 to 2017	Cattle and Calves	\$ (33,010)	\$ (6,748)	(236)	\$ (1,566)
	Hogs, Pigs, and Other	\$ (40,835)	\$ (9,537)	(326)	\$ (2,213)
	Poultry and Eggs	\$ 529,567	\$ 115,639	3,550	\$ 26,828
	Dairy	\$ (60,808)	\$ (14,187)	(497)	\$ (3,291)
	Total	\$ 394,914	\$ 85,167	2,491	\$ 19,759
	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	
Tax Rates	Federal effective income tax rate				13.5%
	Federal Social Security tax rate				6.2%
	State Effective Rate				3.5%
	Total				23.2%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$7.5 billion in economic output
- 33,206 jobs
- \$1.6 billion in earnings
- \$313.8 million in income taxes paid at local, state, and federal levels
- \$197.1 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in South Dakota has increased economic output by over \$1.8 billion, boosted household earnings by \$380.0 million, contributed 7,926 additional jobs and paid \$74.9 million in additional tax revenues.

South Dakota's animal agriculture consumed almost 355.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (219.4 thousand tons)
- Dairy Cows (45.0 thousand tons)
- Turkeys (37.7 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 2017, South Dakota's animal agriculture contributed the following to the economy:

- About \$7.5 billion in economic output
- \$1.6 billion in household earnings
- 33,206 jobs
- \$313.8 million in income taxes

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

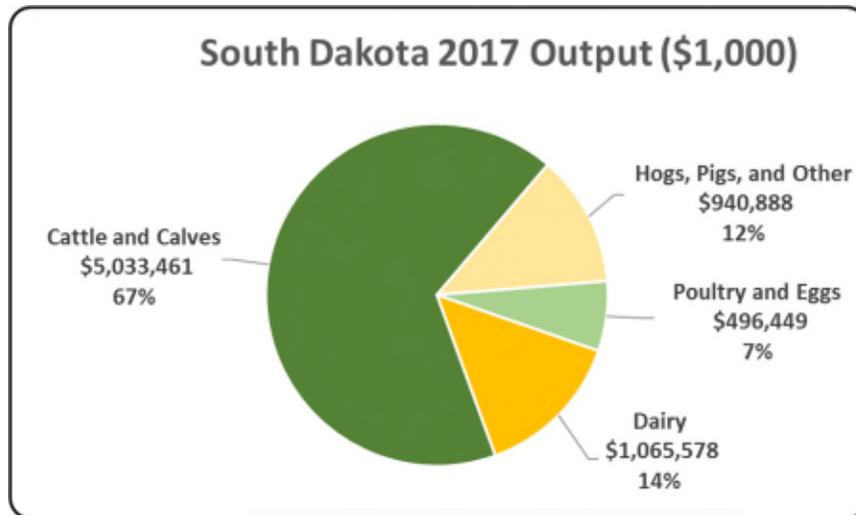
- Increased economic output by \$1.8 billion
- Boosted household earnings by \$380.0 million
- Added 7,926 jobs
- Paid an additional \$74.9 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 7,536,376	\$ 1,795,397	31.27%
Earnings (\$1,000)	\$ 1,593,056	\$ 380,046	31.33%
Employment (Jobs)	33,206	7,926	31.35%
Income Taxes Paid (\$1,000)	\$ 313,832	\$ 74,869	31.33%
Property Taxes Paid in 2012 (\$1,000)	\$ 197,123		

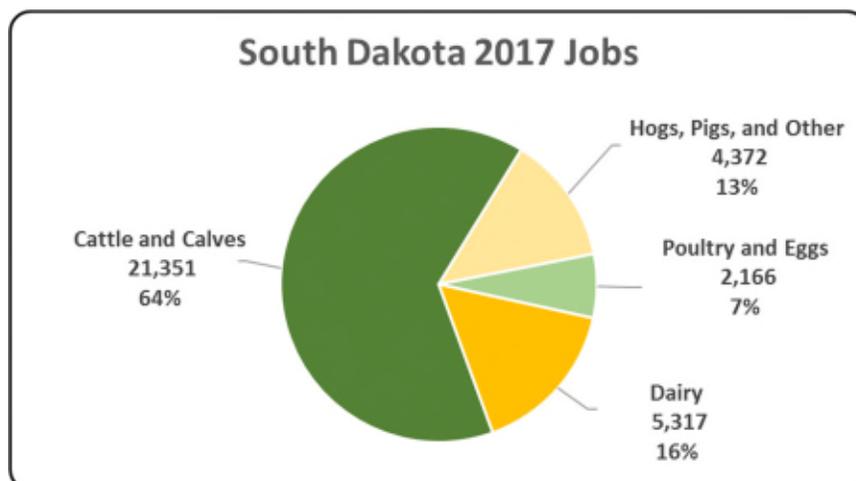
South Dakota Output

“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 \$7.5 billion.



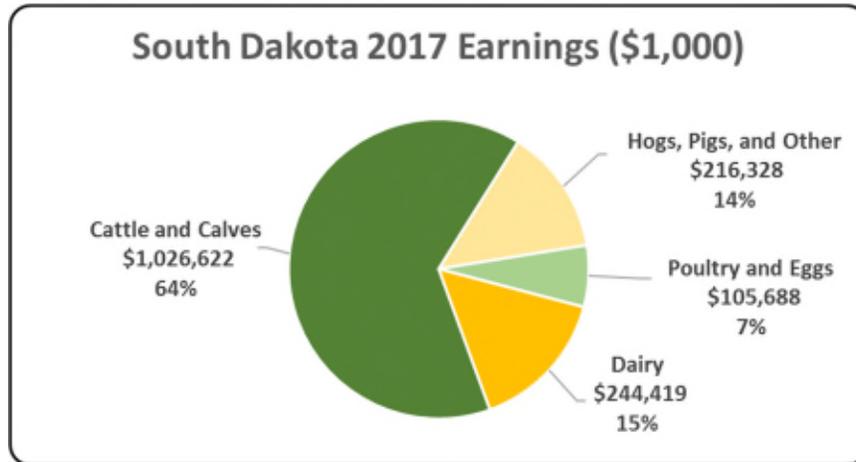
South Dakota Jobs

“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 significantly to South Dakota total jobs, contributing 33,206 jobs within and outside of animal agriculture.



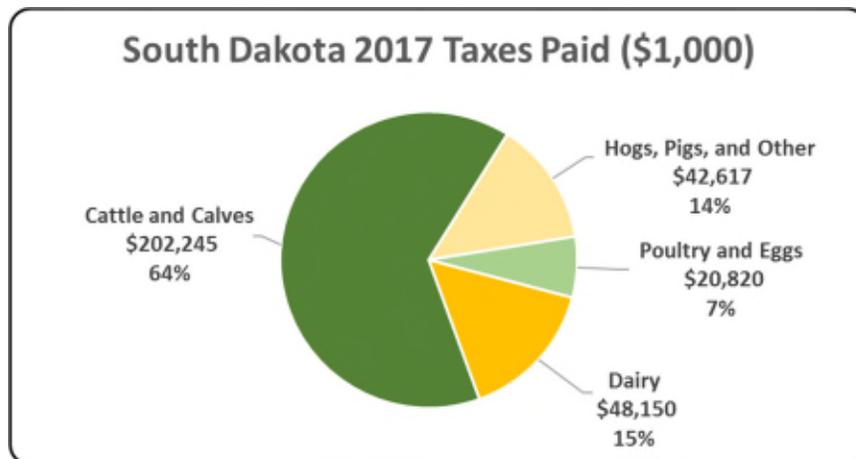
South Dakota Earnings

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 2017.



South Dakota Taxes Paid by Animal Agriculture

South Dakota’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$313.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$197.1 million in property taxes paid by all of South Dakota agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



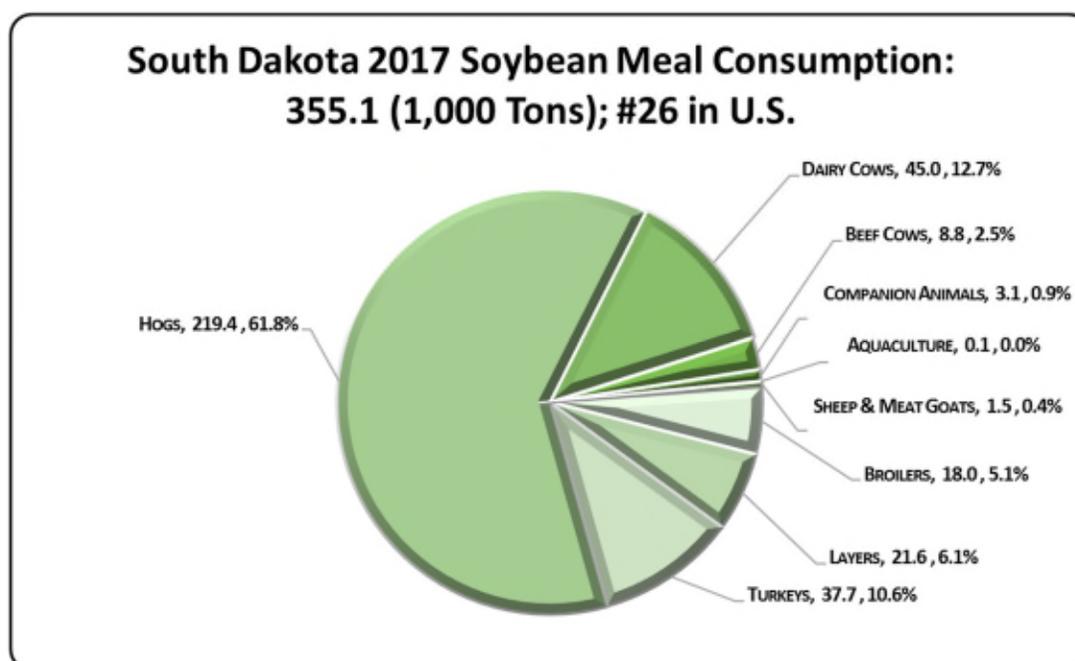
South Dakota Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

South Dakota's animal agriculture consumed almost 355.1 thousand tons of soybean meal in 2017, placing the state as #26 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in South Dakota consumed 78,215 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (219.4 thousand tons)
- Dairy Cows (45.0 thousand tons)
- Turkeys (37.7 thousand tons)

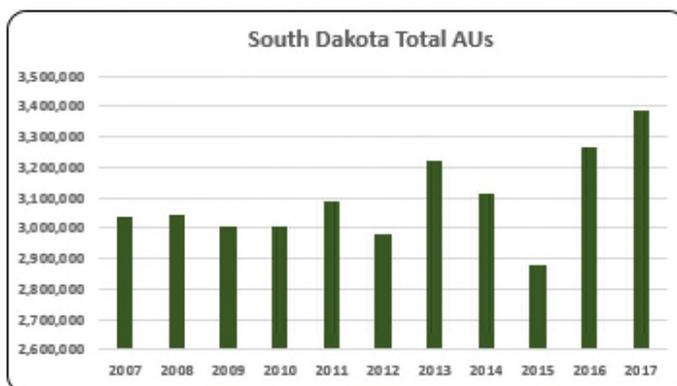
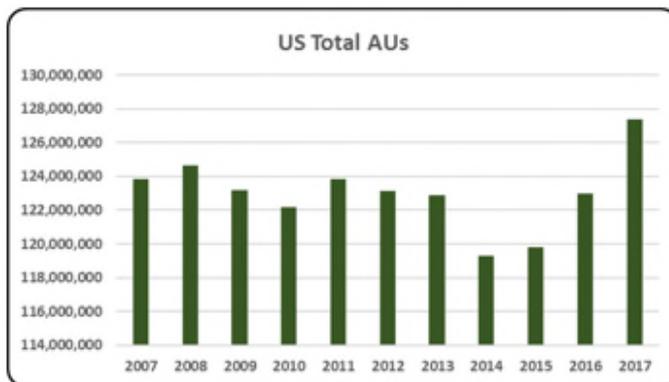


South Dakota Animal Unit (AU) Trends

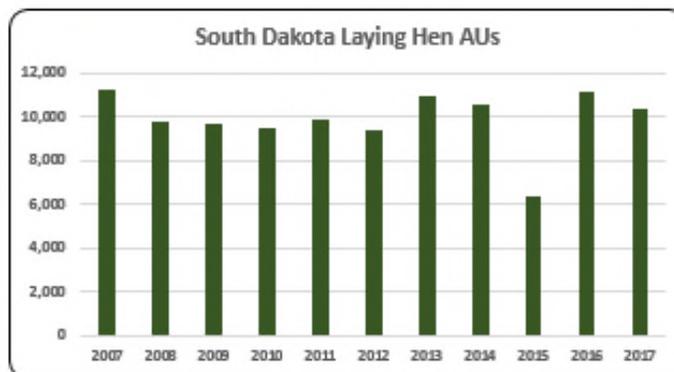
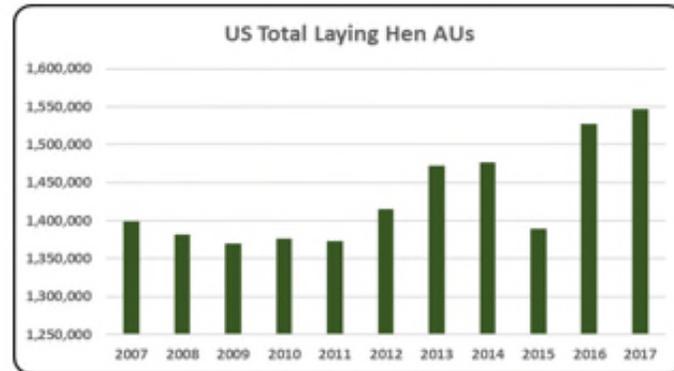
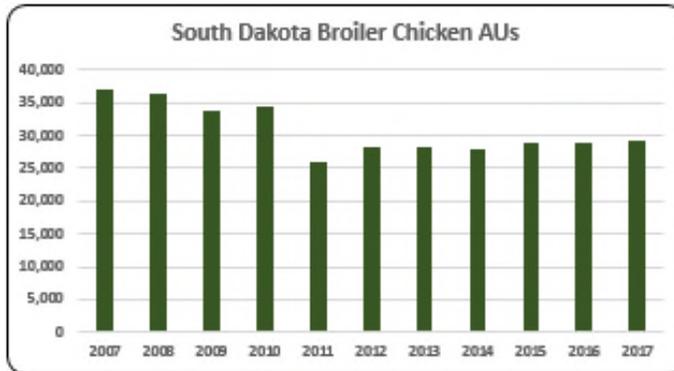
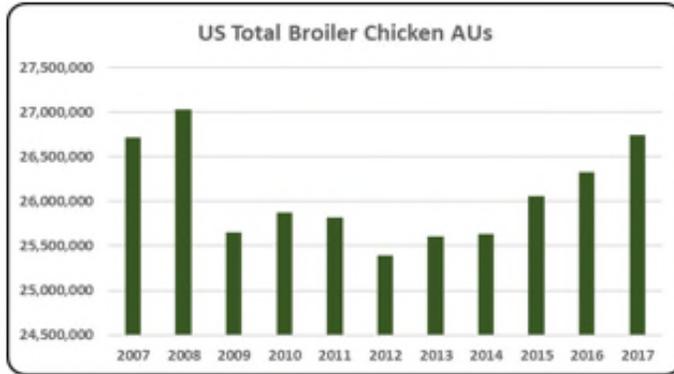
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of South Dakota. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

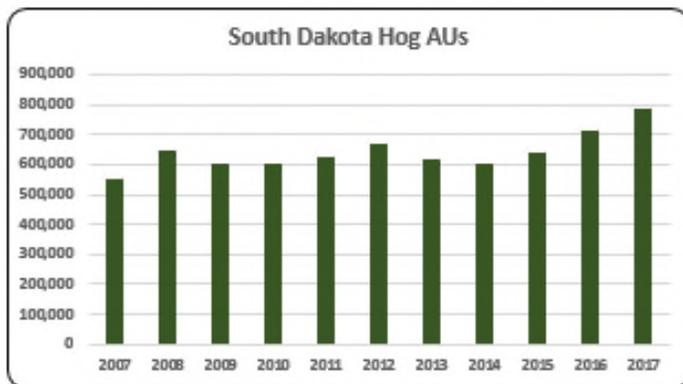
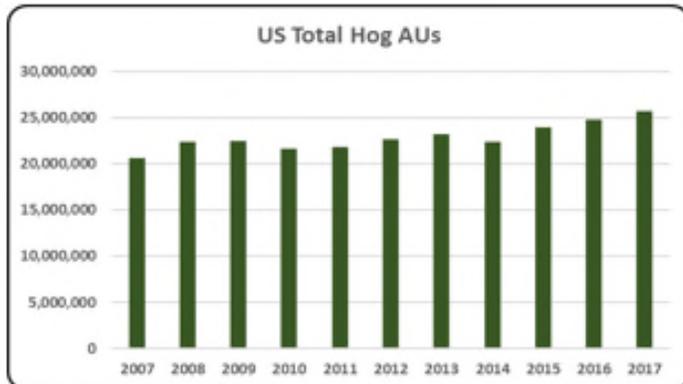
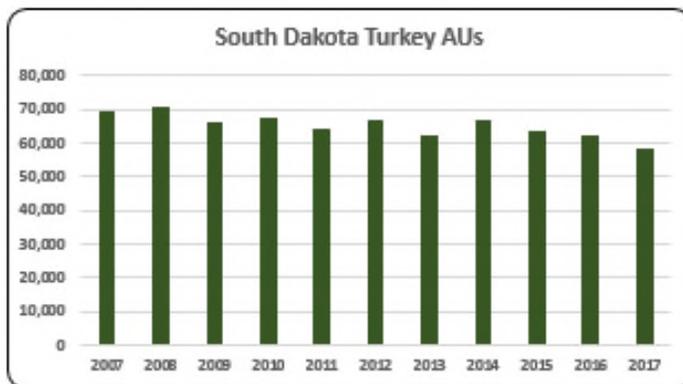
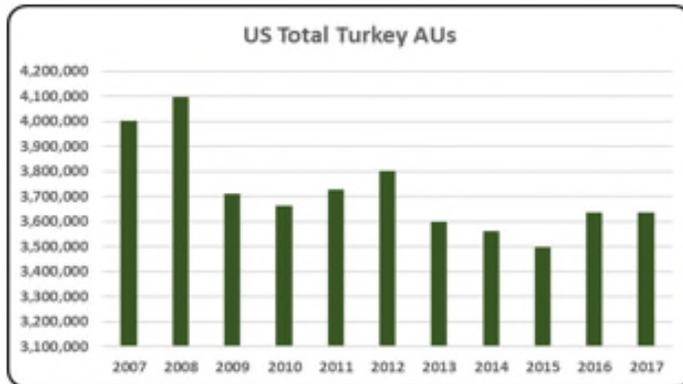
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In South Dakota, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (2.3 million AUs), Hogs (786,750 AUs), and Dairy Cows (162,400 AUs). Total animal units in South Dakota during 2017 were 3.4 million AUs.



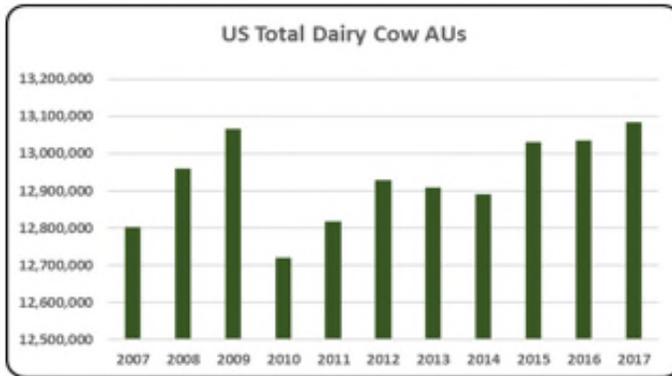
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 3.4 million AUs in South Dakota in 2017. This is the highest animal unit count in more than a decade. Overall AU numbers increased 11.5% from 2007 to 2017.



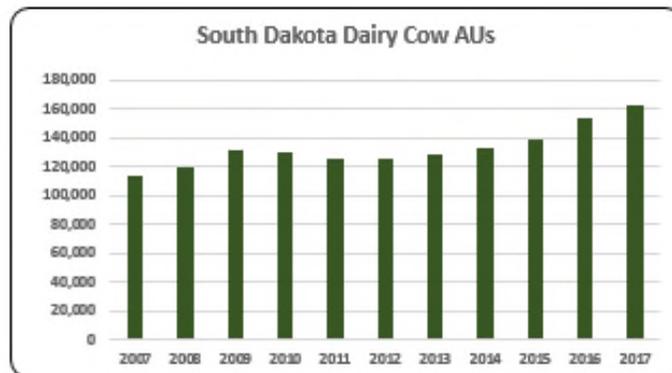
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There were 37,023 broiler AUs in 2007 in contrast to 29,370 broiler AUs in 2017. Broiler AUs declined 20.7% between those years.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 during the last decade. There were 10,368 layer AUs in 2017 declining 7.7% compared to 2007 (11,236 AUs).



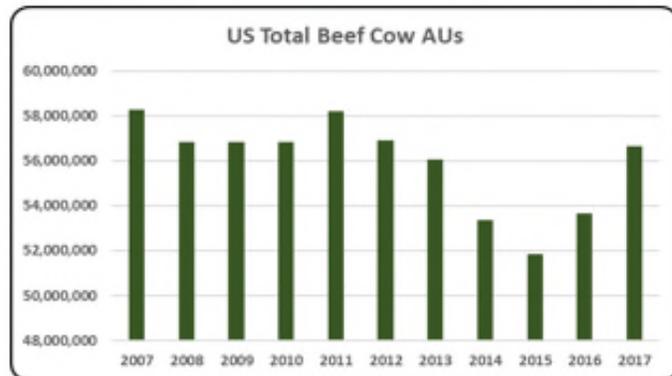
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkey AUs fluctuated throughout the decade from a high in 2008 (70,956 turkey AUs) to a low in 2017 (58,669 turkey AUs). Turkey AUs averaged 65,401 AUs for the decade.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- In 2017, hogs (786750 hog AUs) represented 23% of animal units in South Dakota. Hog AUs in 2017 increased 42% relative to the level in 2007 (551,700 hog AUs).



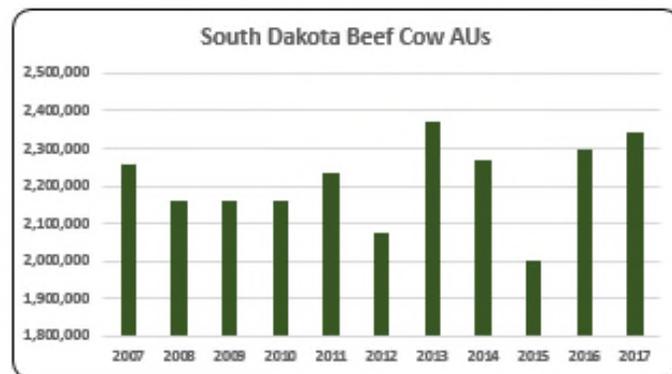
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- There were 162,400 dairy cow AUs in 2017. The number of dairy cow AUs in 2017 increased 43% compared to 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cows are the largest AU sector in South Dakota accounting for 69% (2.3 million beef cow AUs) of all South Dakota AUs in 2017.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	2,256,450	2,160,900	2,160,900	2,160,900	2,234,850	2,076,300	2,373,600	2,269,950	1,999,800	2,297,400	2,341,800
	Hog and Pig AUs	551,700	644,250	604,500	605,850	627,000	671,700	618,750	603,600	638,550	714,300	786,750
	Broiler AUs	37,023	36,445	33,886	34,341	25,877	28,276	28,177	28,017	28,740	28,957	29,370
	Turkey AUs	69,456	70,956	65,939	67,292	64,270	67,196	62,276	67,043	63,938	62,376	58,669
	Egg Layer AUs	11,236	9,820	9,744	9,544	9,936	9,419	10,931	10,602	6,350	11,138	10,368
	Dairy AUs	113,400	120,400	131,600	130,200	126,000	126,000	128,800	133,000	138,600	154,000	162,400
	Total Animal Units	3,039,265	3,042,772	3,006,569	3,008,127	3,087,932	2,978,891	3,222,535	3,112,211	2,875,979	3,268,172	3,389,356
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 1,409,731	\$ 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
	Hogs and Pigs (\$1,000)	\$ 320,577	\$ 348,707	\$ 292,574	\$ 417,399	\$ 529,653	\$ 532,239	\$ 503,056	\$ 537,918	\$ 453,938	\$ 446,979	\$ 535,612
	Broilers (\$1,000)	\$ 28,572	\$ 29,190	\$ 25,185	\$ 26,319	\$ 23,042	\$ 28,174	\$ 34,330	\$ 36,015	\$ 31,420	\$ 27,936	\$ 32,804
	Turkeys (\$1,000)	\$ 74,175	\$ 85,704	\$ 73,561	\$ 103,615	\$ 120,750	\$ 134,151	\$ 112,674	\$ 138,801	\$ 147,799	\$ 148,408	\$ 112,397
	Eggs (\$1,000)	\$ 51,420	\$ 55,752	\$ 37,936	\$ 37,696	\$ 44,110	\$ 44,576	\$ 57,804	\$ 63,348	\$ 73,798	\$ 22,482	\$ 40,673
	Milk (\$1,000)	\$ 313,431	\$ 343,036	\$ 261,096	\$ 310,860	\$ 387,711	\$ 393,600	\$ 424,830	\$ 521,170	\$ 436,415	\$ 448,096	\$ 492,184
	Other	\$ 24,973	\$ 22,382	\$ 21,161	\$ 27,345	\$ 27,565	\$ 37,233	\$ 24,663	\$ 28,728	\$ 32,551	\$ 30,643	\$ 29,656
	Sheep and Lambs (\$1,000)	\$ 24,302	\$ 21,617	\$ 20,302	\$ 26,393	\$ 26,520	\$ 36,094	\$ 23,430	\$ 27,401	\$ 31,131	\$ 29,129	\$ 27,012
	Aquaculture (\$1,000)	\$ 671	\$ 765	\$ 859	\$ 952	\$ 1,046	\$ 1,139	\$ 1,233	\$ 1,327	\$ 1,420	\$ 1,514	\$ 2,643
	Total (\$1,000)	\$ 2,222,879	\$ 2,285,302	\$ 2,029,066	\$ 2,492,875	\$ 2,882,579	\$ 3,122,685	\$ 3,095,476	\$ 3,826,251	\$ 3,556,494	\$ 3,029,766	\$ 3,443,072

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,957	10,702	9,031	8,288
	Cattle feedlots (112112)	977	1,463	794	646
	Dairy cattle and milk production (11212)	932	662	348	276
	Hog and pig farming (1122)	868	493	313	223
	Poultry and egg production (1123)	89	125	274	186
	Sheep and goat farming (1124)	751	710	706	690
	Animal aquaculture and other animal production (1125,1129)	1,135	2,076	2,094	2,809
Value of Sales (\$1,000)	Cattle and Calves	1,333,193	1,693,838	2,307,618	2,968,996
	Hogs and Pigs	282,598	withheld	381,360	446,756
	Poultry and Eggs	73,683	70,820	140,798	182,076
	Milk and Other Dairy Products	167,213	156,498	279,765	374,490
	Aquaculture	996	withheld	3,108	2,498
	Other (calculated)	62,009	337,559	74,304	98,859
	Total	1,919,692	2,258,715	3,186,953	4,073,675
Input Purchases	Livestock and poultry purchased	(Farms) 12,882	11,307	10,196	11,987
		\$1,000 452,194	580,920	881,582	978,174
	Breeding livestock purchased	(Farms) <i>n/a</i>	8,111	7,637	8,959
		\$1,000 <i>n/a</i>	64,732	160,850	205,411
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	5,317	4,644	5,537
		\$1,000 <i>n/a</i>	516,188	720,732	772,763
Feed purchased	(Farms) 19,837	19,389	15,462	18,795	
	\$1,000 369,705	433,345	617,725	1,282,133	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 5,033,461	\$ 1,026,622	21,351	\$ 202,245
	Hogs, Pigs, and Other	\$ 940,888	\$ 216,328	4,372	\$ 42,617
	Poultry and Eggs	\$ 496,449	\$ 105,688	2,166	\$ 20,820
	Dairy	\$ 1,065,578	\$ 244,419	5,317	\$ 48,150
	Total	\$ 7,536,376	\$ 1,593,056	33,206	\$ 313,832

Change from 2007 to 2017	Cattle and Calves	\$ 1,247,330	\$ 254,405	5,291	\$ 50,118
	Hogs, Pigs, and Other	\$ 265,800	\$ 61,112	1,235	\$ 12,039
	Poultry and Eggs	\$ 13,152	\$ 2,800	57	\$ 552
	Dairy	\$ 269,116	\$ 61,729	1,343	\$ 12,161
	Total	\$ 1,795,397	\$ 380,046	7,926	\$ 74,869

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	0.0%
	Total	19.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$2.7 billion in economic output
- 17,407 jobs
- \$584.1 million in earnings
- \$144.3 million in income taxes paid at local, state, and federal levels
- \$99.2 million in the form of property taxes

Tennessee's animal agriculture consumed almost 388.7 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (297.4 thousand tons)
- Hogs (30.6 thousand tons)
- Egg-Laying Hens (26.6 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 part of Tennessee's economy. In 2017, Tennessee's animal agriculture contributed the following to the economy:

- About \$2.7 billion in economic output
- \$584.1 million in household earnings
- 17,407 jobs
- \$144.3 million in income taxes

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

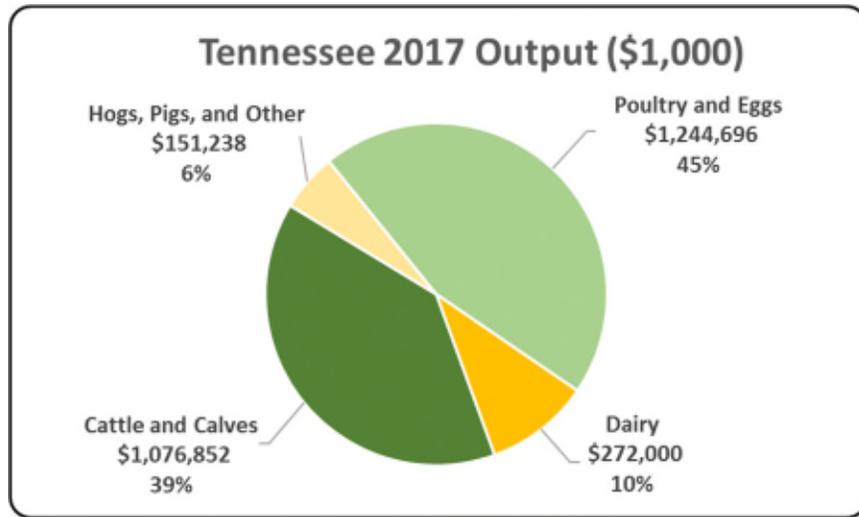
- Decreased economic output by \$374.6 million
- Reduced household earnings by \$81.3 million
- Shrunk by 2,647 jobs
- Paid \$20.1 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,744,786	\$ (374,551)	-12.01%
Earnings (\$1,000)	\$ 584,118	\$ (81,293)	-12.22%
Employment (Jobs)	17,407	(2,647)	-13.20%
Income Taxes Paid (\$1,000)	\$ 144,277	\$ (20,079)	-12.22%
Property Taxes Paid in 2012 (\$1,000)	\$ 99,159		

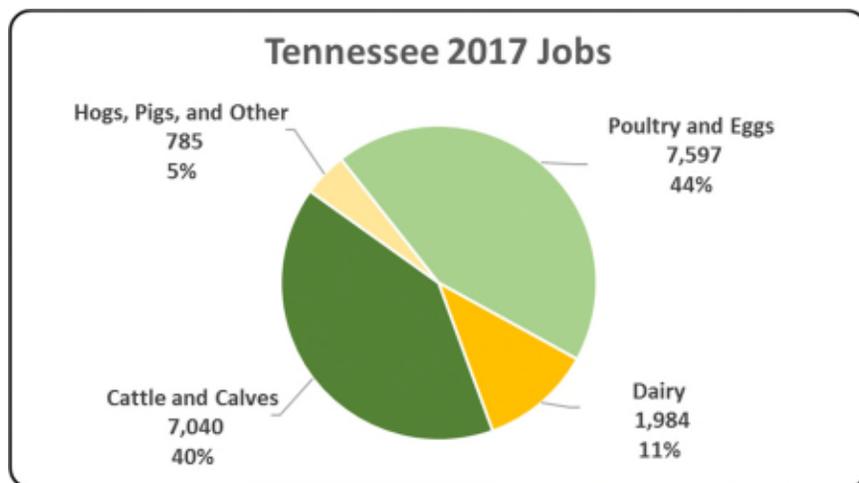
Tennessee Output

“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.



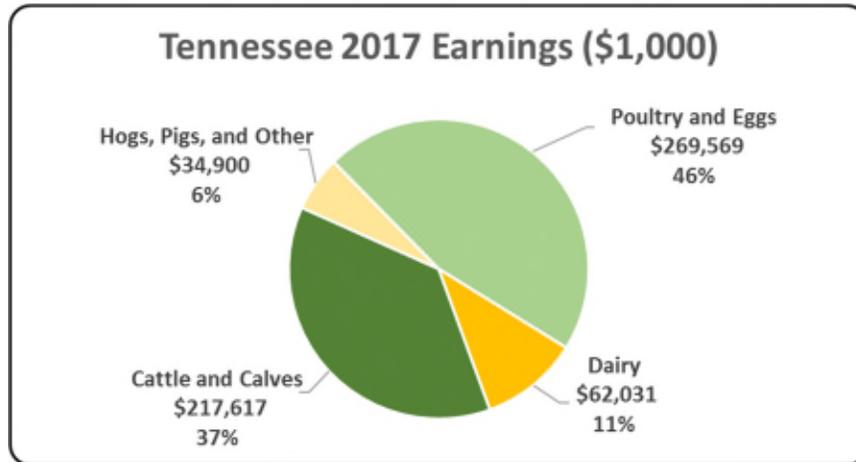
Tennessee Jobs

“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 17,407 jobs within and outside of animal agriculture.



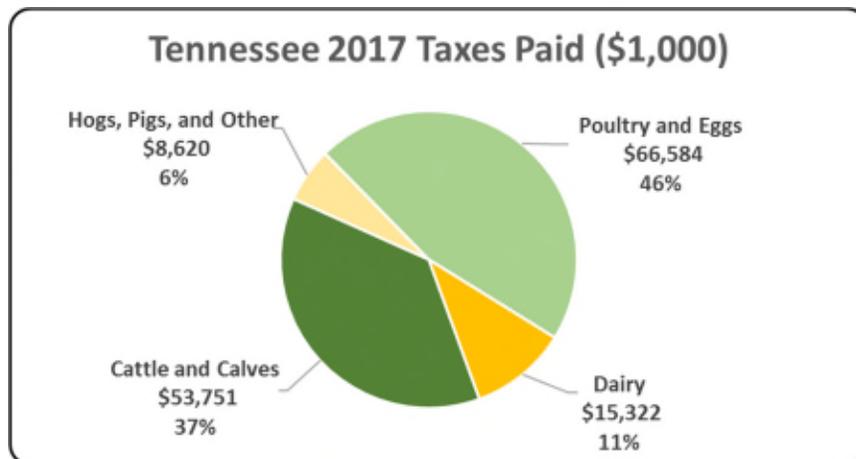
Tennessee Earnings

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 \$584.1 million to household earnings in 2017.



Tennessee Taxes Paid by Animal Agriculture

Tennessee’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$144.3 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$99.2 million in property taxes paid by all of Tennessee agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



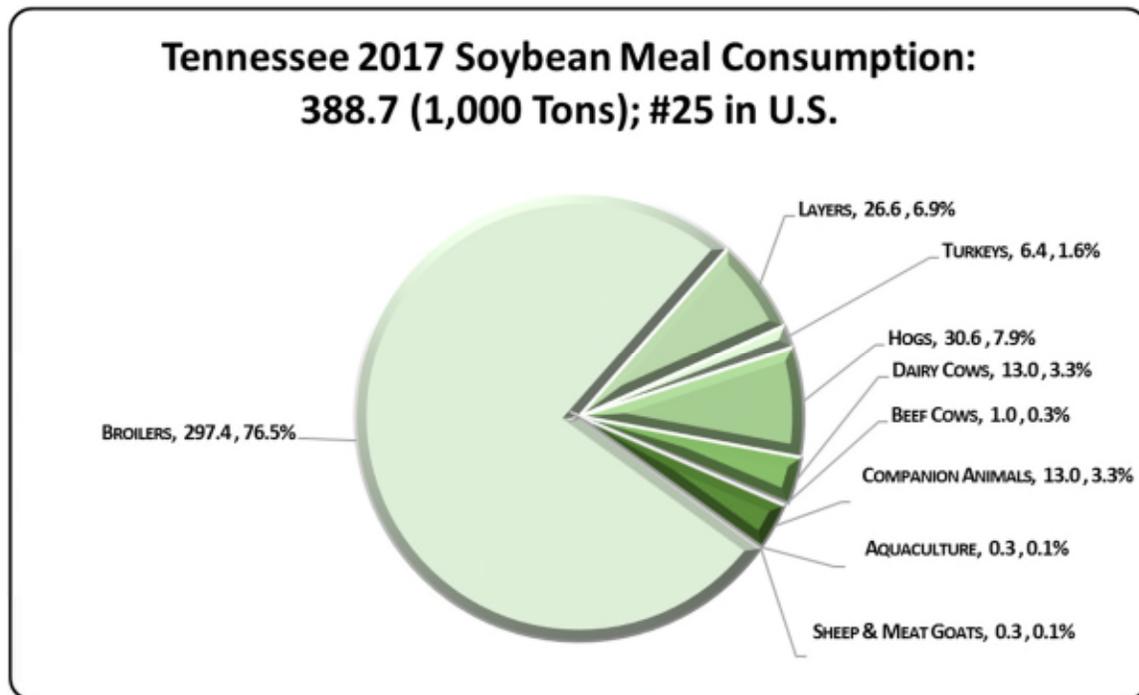
Tennessee Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Tennessee's animal agriculture consumed almost 388.7 thousand tons of soybean meal in 2017, placing the state as #25 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Tennessee consumed 16,842 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (297.4 thousand tons)
- Hogs (30.6 thousand tons)
- Egg-Laying Hens (26.6 thousand tons)

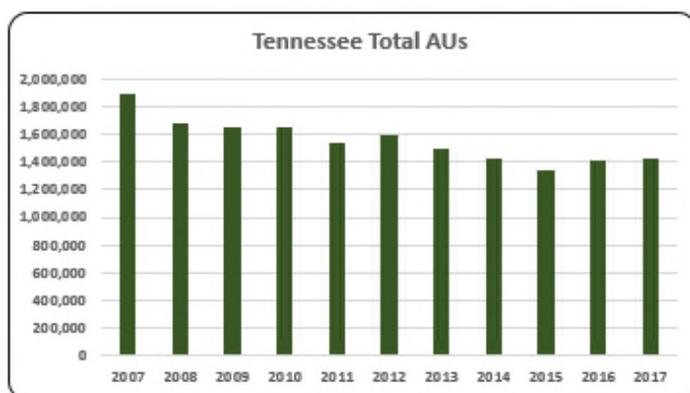
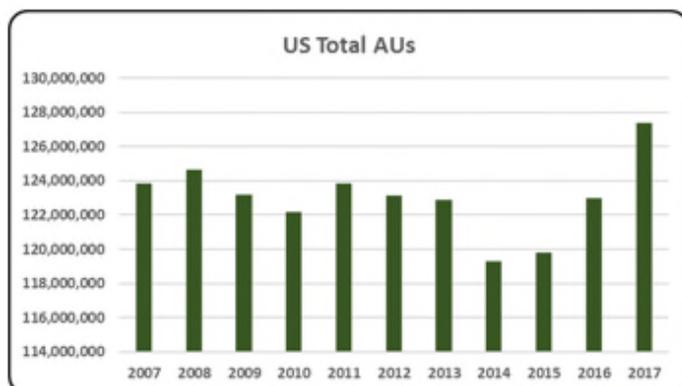


Tennessee Animal Unit (AU) Trends

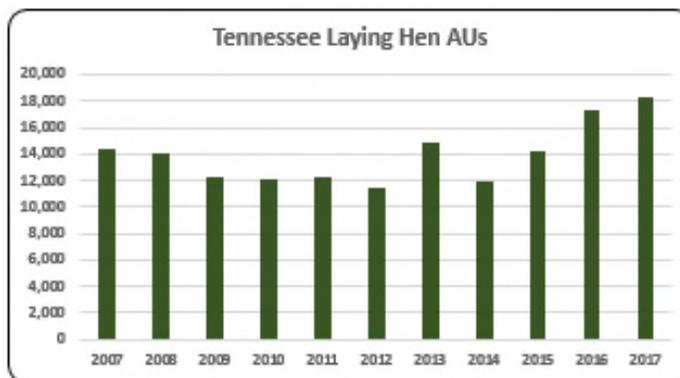
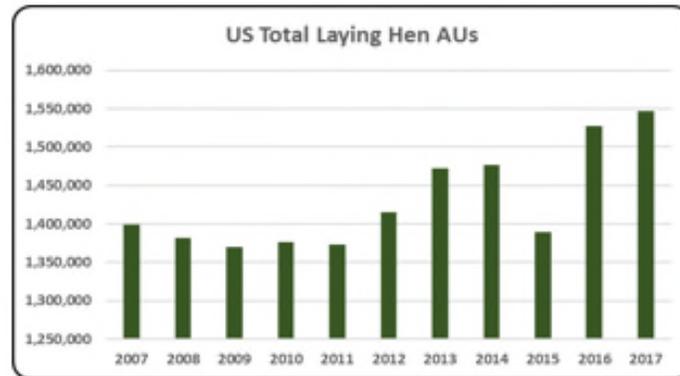
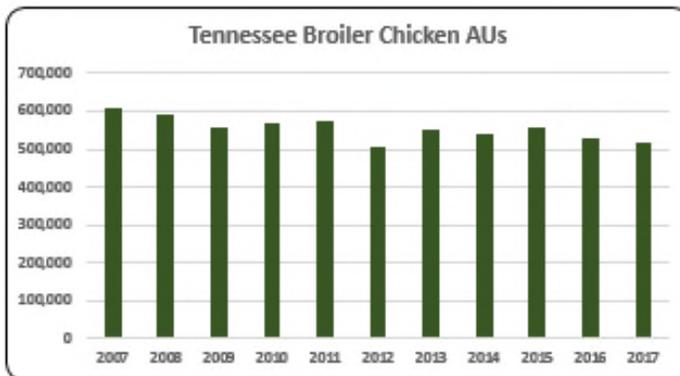
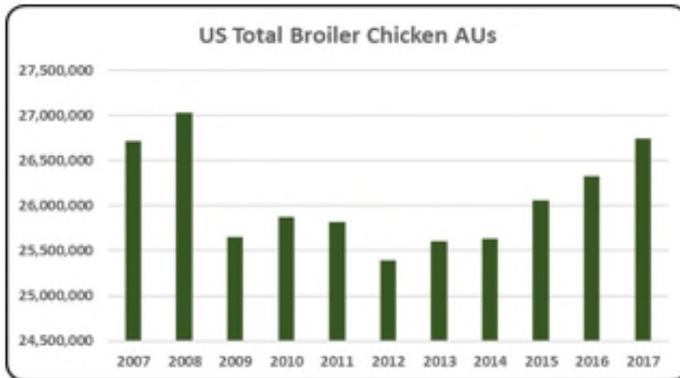
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Tennessee. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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 Tennessee and to give perspective on Tennessee'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.

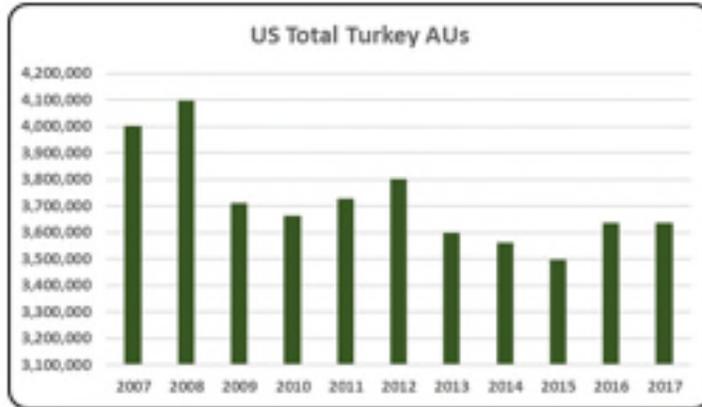
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Tennessee, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (735,450 AUs), Broiler Chickens (515,440 AUs), and Hogs (90,600 AUs). Total animal units in Tennessee during 2017 were 1.4 million AUs.



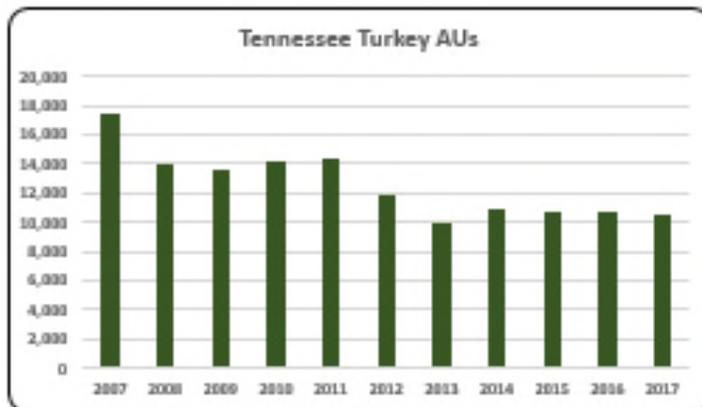
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Tennessee animal units reached 1.4 million AUs in 2017. Tennessee's AUs represent 1.12% of the U.S. total AUs. Animal unit numbers declined 25% from 2007 to 2017.



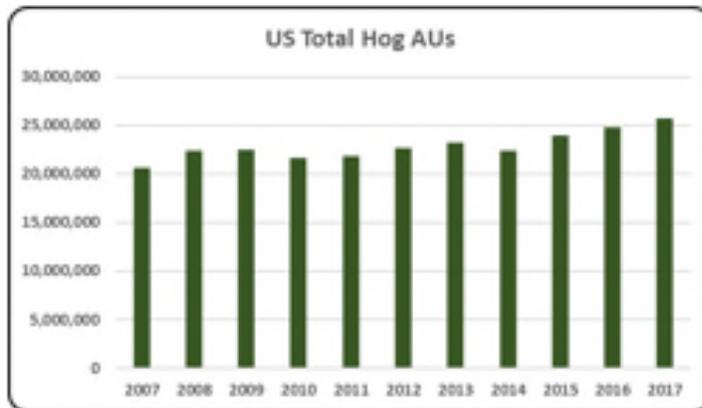
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There were 553,333 broiler AUs, on average, during the last decade. Broiler AUs decreased 15% from 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There was a 27% increase in laying hen AUs from 2007 (18,268) to 2017 (14,411).



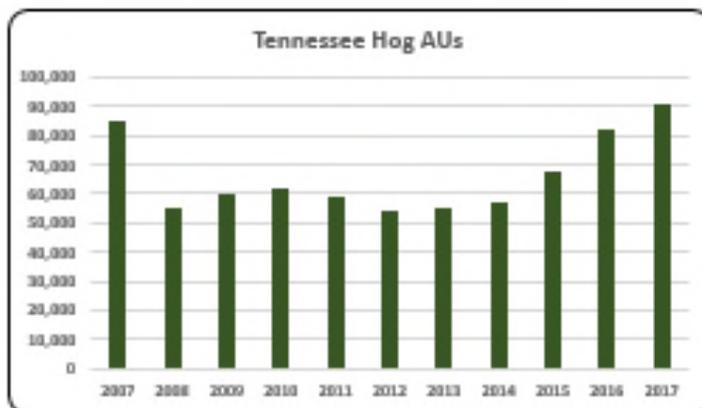
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.



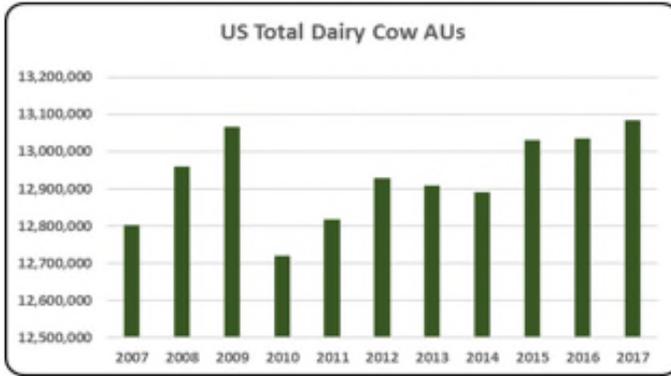
- Turkey AUs shrank 39% from 2007 (17,390 turkey AUs) to 2017 (10,541 turkey AUs).



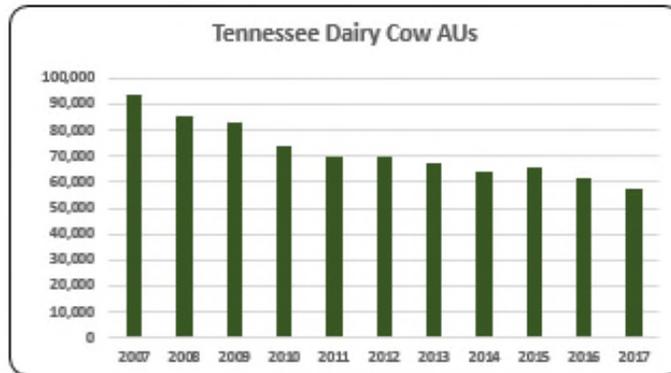
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.



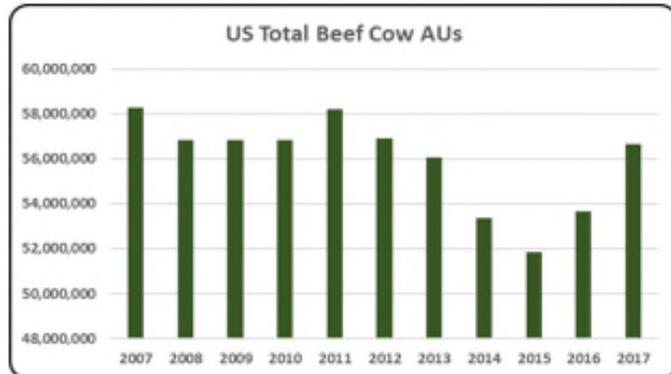
- The average number of hog AUs was 66,191 during the last decade. The number of hog AUs in 2017 (90,600) was 6.7% above the number of hog AUs in 2007 (84,900).



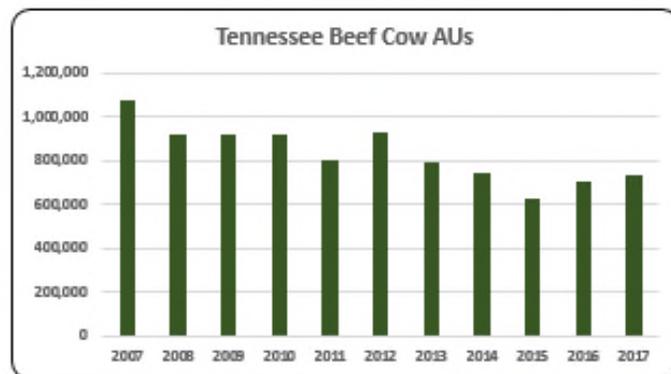
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cow numbers consistently declined from 2007 (93,800) to 2017 (61,600). The decline represented a 39% drop in the level of dairy cow AUs.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cows accounted for 52% of all AUs in the state in 2017. The 2017 beef cow AUs were 735,450, dropping 32% compared to 2007 (1,078,950 beef cow 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,078,950	922,350	922,350	922,350	807,450	934,050	796,050	741,000	628,500	705,300	735,450
	Hog and Pig AUs	84,900	54,750	60,300	62,250	58,500	54,300	55,350	57,150	67,950	82,050	90,600
	Broiler AUs	605,565	588,834	558,175	568,256	571,761	504,070	548,531	542,799	556,633	526,599	515,440
	Turkey AUs	17,390	13,900	13,616	14,182	14,435	11,815	9,856	10,881	10,646	10,610	10,541
	Egg Layer AUs	14,411	14,000	12,245	12,164	12,235	11,496	14,884	11,860	14,270	17,332	18,268
	Dairy AUs	93,800	85,400	82,600	74,200	70,000	70,000	67,200	64,400	65,800	61,600	57,400
	Total Animal Units	1,895,016	1,679,234	1,649,286	1,653,402	1,534,382	1,585,731	1,491,871	1,428,090	1,343,799	1,403,491	1,427,698
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 514,160	\$ 450,099	\$ 441,237	\$ 503,087	\$ 568,034	\$ 594,656	\$ 548,543	\$ 751,415	\$ 773,195	\$ 516,055	\$ 545,407
	Hogs and Pigs (\$1,000)	\$ 50,213	\$ 42,010	\$ 36,343	\$ 52,823	\$ 60,198	\$ 54,349	\$ 59,395	\$ 69,503	\$ 64,056	\$ 74,422	\$ 85,711
	Broilers (\$1,000)	\$ 451,543	\$ 468,510	\$ 442,148	\$ 475,589	\$ 454,226	\$ 436,000	\$ 576,043	\$ 598,207	\$ 528,101	\$ 443,871	\$ 494,496
	Turkeys (\$1,000)	\$ 22,316	\$ 27,230	\$ 25,807	\$ 29,134	\$ 22,909	\$ 24,632	\$ 17,854	\$ 11,812	\$ 9,965	\$ 11,269	\$ 7,630
	Eggs (\$1,000)	\$ 46,602	\$ 42,815	\$ 38,665	\$ 43,922	\$ 59,717	\$ 55,816	\$ 61,387	\$ 67,998	\$ 66,970	\$ 76,518	\$ 68,391
	Milk (\$1,000)	\$ 202,797	\$ 191,496	\$ 128,169	\$ 152,150	\$ 175,770	\$ 157,780	\$ 164,475	\$ 192,210	\$ 139,496	\$ 119,712	\$ 130,977
	Other	\$ 3,315	\$ 3,835	\$ 4,110	\$ 5,123	\$ 5,185	\$ 5,920	\$ 5,992	\$ 6,409	\$ 7,201	\$ 8,420	\$ 8,589
	Sheep and Lambs (\$1,000)	\$ 1,487	\$ 1,737	\$ 1,741	\$ 2,483	\$ 2,274	\$ 2,738	\$ 2,540	\$ 2,686	\$ 3,207	\$ 4,156	\$ 3,990
	Aquaculture (\$1,000)	\$ 1,828	\$ 2,098	\$ 2,369	\$ 2,640	\$ 2,911	\$ 3,181	\$ 3,452	\$ 3,723	\$ 3,994	\$ 4,264	\$ 4,599
	Total (\$1,000)	\$ 1,290,946	\$ 1,225,995	\$ 1,116,479	\$ 1,261,828	\$ 1,346,038	\$ 1,329,152	\$ 1,433,690	\$ 1,697,554	\$ 1,588,984	\$ 1,250,267	\$ 1,341,200

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	39,017	42,602	41,886	34,457	
	Cattle feedlots (112112)	1,183	31	37	37	
	Dairy cattle and milk production (11212)	1,183	947	893	472	
	Hog and pig farming (1122)	751	400	504	251	
	Poultry and egg production (1123)	875	1,320	1,694	1,480	
	Sheep and goat farming (1124)	560	1,633	2,023	2,139	
	Animal aquaculture and other animal production (1125,1129)	4,993	10,731	9,010	6,769	
Value of Sales (\$1,000)	Cattle and Calves	444,707	499,143	633,303	735,511	
	Hogs and Pigs	76,745	42,632	33,797	48,245	
	Poultry and Eggs	321,790	359,286	572,866	552,015	
	Milk and Other Dairy Products	207,296	173,410	180,503	145,445	
	Aquaculture	3,901	4,799	4,893	withheld	
	Other (calculated)	34,822	47,996	44,246	8,906	
	Total	1,089,261	1,127,266	1,469,608	1,490,122	
Input Purchases	Livestock and poultry purchased	(Farms)	20,054	21,962	16,930	17,664
		\$1,000	148,848	175,145	213,700	283,304
	Breeding livestock purchased	(Farms)	n/a	12,957	10,548	10,870
		\$1,000	n/a	32,136	47,611	62,754
	Other livestock and poultry purchased	(Farms)	n/a	11,274	8,552	9,202
		\$1,000	n/a	143,009	166,089	220,551
Feed purchased	(Farms)	42,712	57,492	49,442	48,003	
	\$1,000	312,849	386,790	547,993	679,459	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,076,852	\$ 217,617	7,040	\$ 53,751
	Hogs, Pigs, and Other	\$ 151,238	\$ 34,900	785	\$ 8,620
	Poultry and Eggs	\$ 1,244,696	\$ 269,569	7,597	\$ 66,584
	Dairy	\$ 272,000	\$ 62,031	1,984	\$ 15,322
	Total	\$ 2,744,786	\$ 584,118	17,407	\$ 144,277
Change from 2007 to 2017	Cattle and Calves	\$ (114,662)	\$ (23,172)	(750)	\$ (5,723)
	Hogs, Pigs, and Other	\$ 50,477	\$ 11,648	262	\$ 2,877
	Poultry and Eggs	\$ (88,054)	\$ (19,070)	(537)	\$ (4,710)
	Dairy	\$ (222,312)	\$ (50,699)	(1,622)	\$ (12,523)
	Total	\$ (374,551)	\$ (81,293)	(2,647)	\$ (20,079)
	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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.0%	
	Total			24.7%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal ag contributed:

- \$31.9 billion in economic output
- 208,791 jobs
- \$6.9 billion in earnings
- \$1.4 billion in income taxes paid at local, state, and federal levels
- \$553.9 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Texas has increased economic output by over \$3.5 billion, boosted household earnings by \$791.8 million, contributed 23,412 additional jobs and paid \$156.0 million in additional tax revenues.

Texas's animal agriculture consumed over 1.6 million tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (1.1 million tons)
- Egg-Laying Hens (159.5 thousand tons)
- Dairy Cows (150.6 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 2017, Texas's animal agriculture contributed the following to the economy:

- About \$31.9 billion in economic output
- \$6.9 billion in household earnings
- 208,791 jobs
- \$1.4 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:

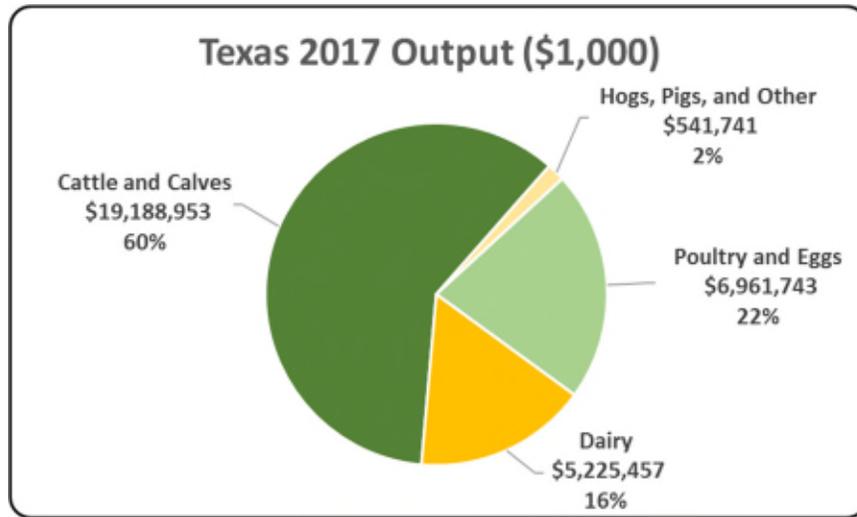
- Increased economic output by \$3.5 billion
- Boosted household earnings by \$791.8 million
- Added 23,412 jobs
- Paid an additional \$156.0 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 31,917,895	\$ 3,531,756	12.44%
Earnings (\$1,000)	\$ 6,941,129	\$ 791,841	12.88%
Employment (Jobs)	208,791	23,412	12.63%
Income Taxes Paid (\$1,000)	\$ 1,367,402	\$ 155,993	12.88%
Property Taxes Paid in 2012 (\$1,000)	\$ 553,870		

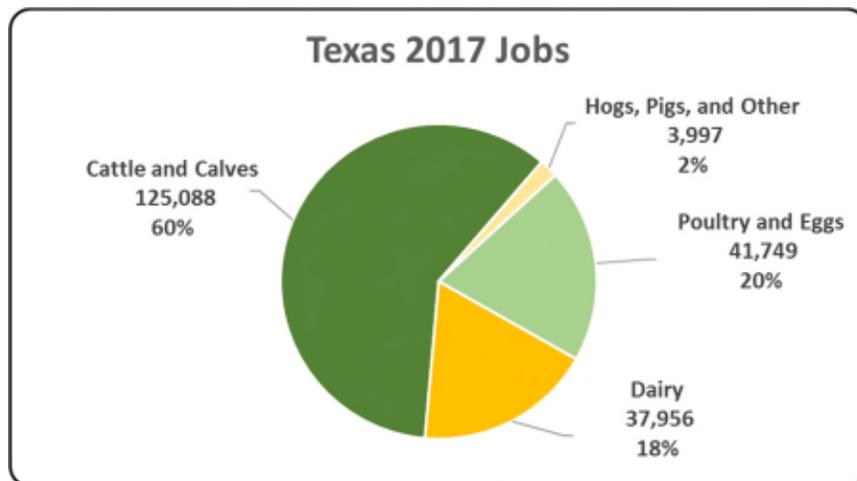
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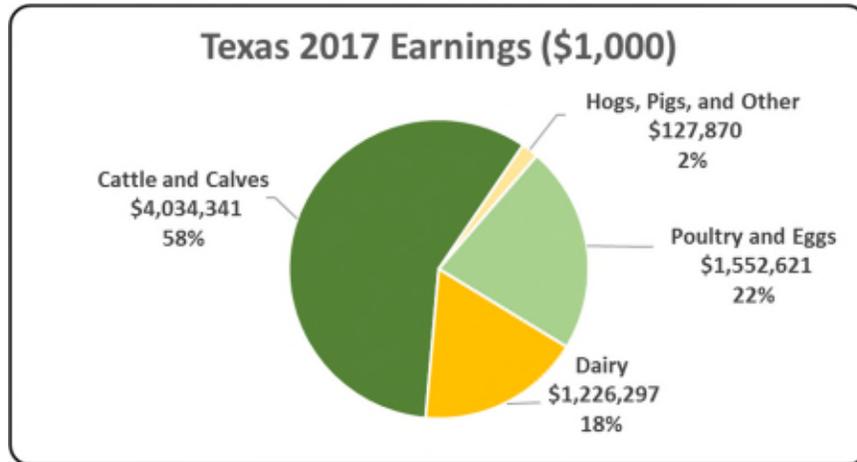
Texas Jobs

“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 208,791 jobs within and outside of animal agriculture.



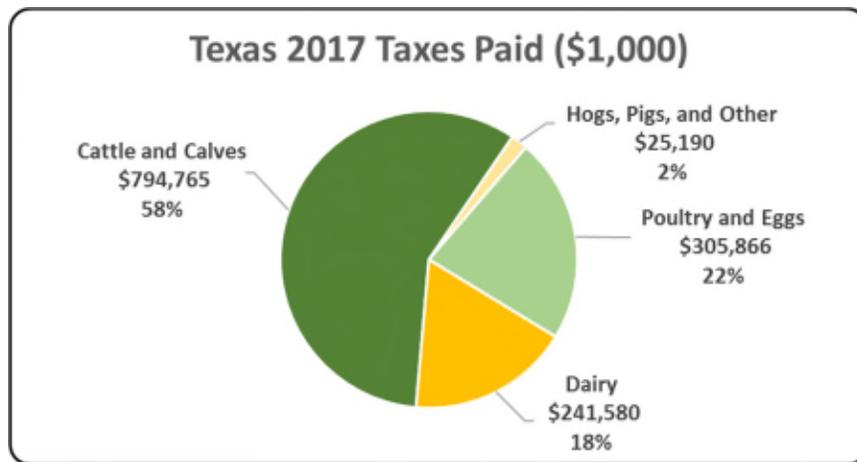
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Earnings includes wages and salaries plus proprietors’ income, which is the net earnings of sole-proprietors and partnerships. The table illustrates the impact of animal agriculture to the Texas economy in terms of earnings. Texas’s animal agriculture contributed about \$6.9 billion to household earnings in 2017.



Texas Taxes Paid by Animal Agriculture

Texas’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$1.4 billion in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$553.9 million in property taxes paid by all of Texas agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



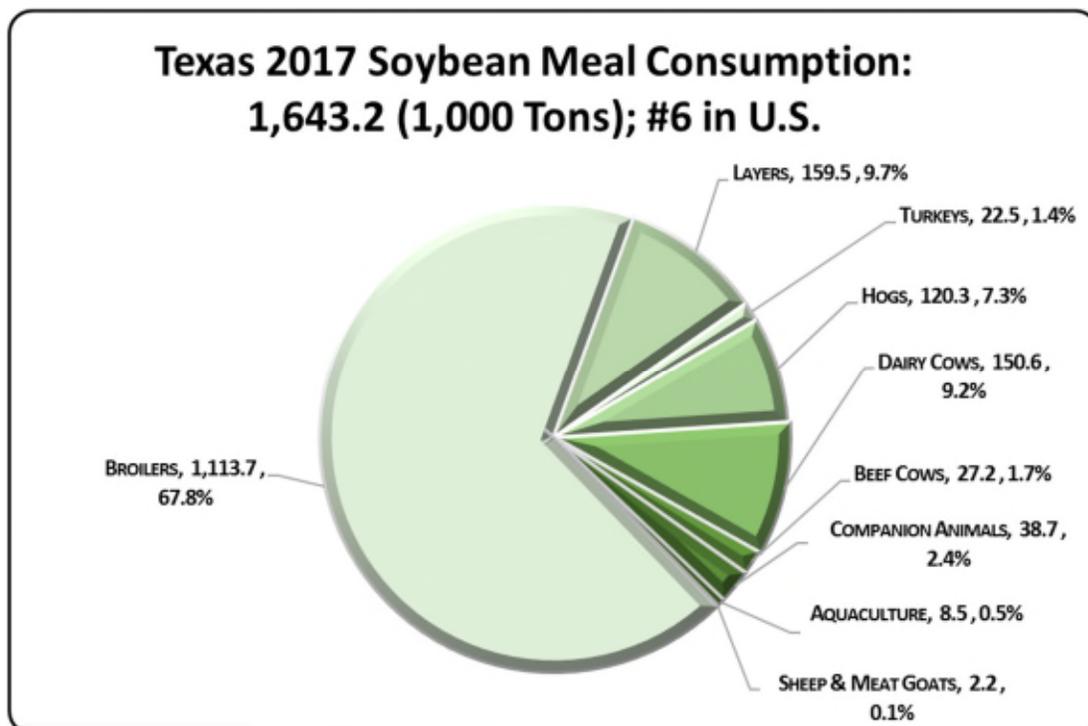
Texas Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Texas's animal agriculture consumed over 1.6 million tons of soybean meal in 2017, placing the state as #6 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Texas consumed 148,912 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (1.1 million tons)
- Egg-Laying Hens (159.5 thousand tons)
- Dairy Cows (150.6 thousand tons)

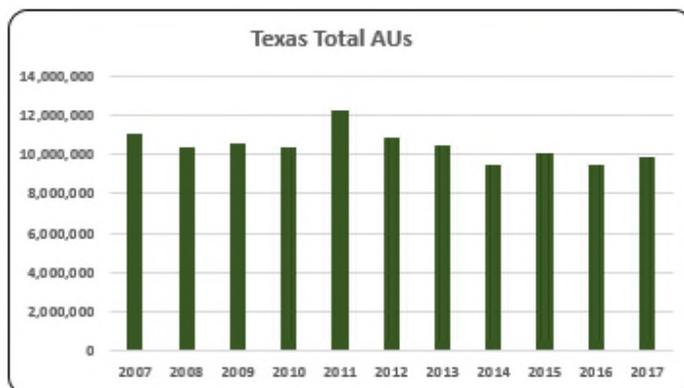
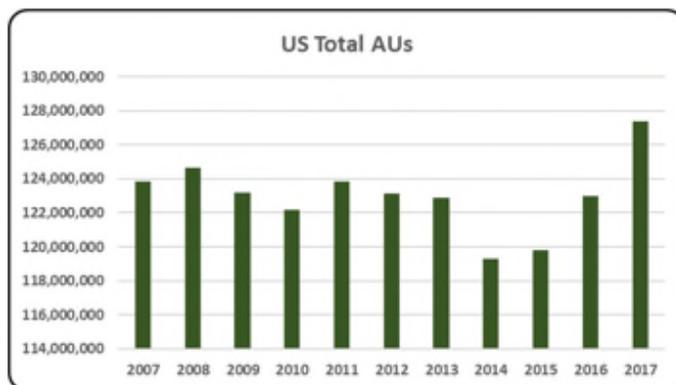


Texas Animal Unit (AU) Trends

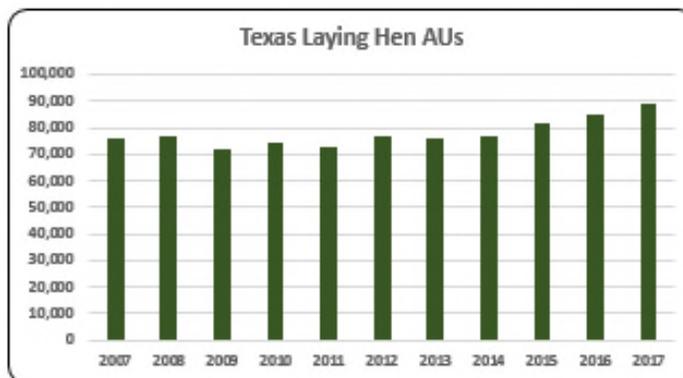
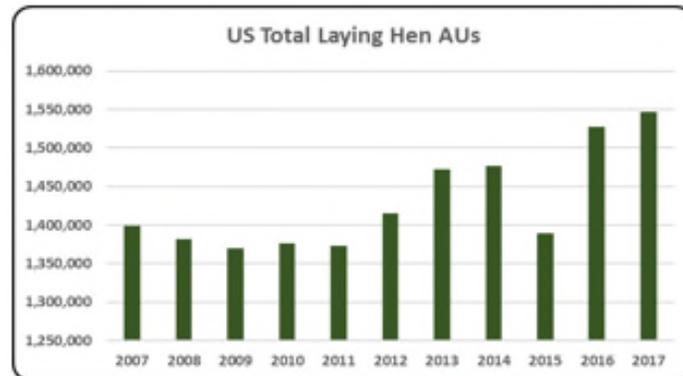
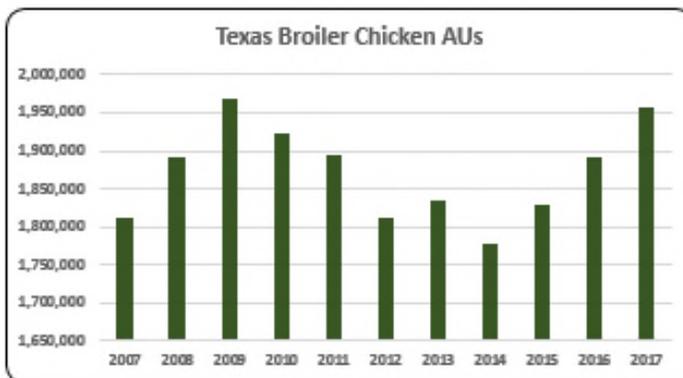
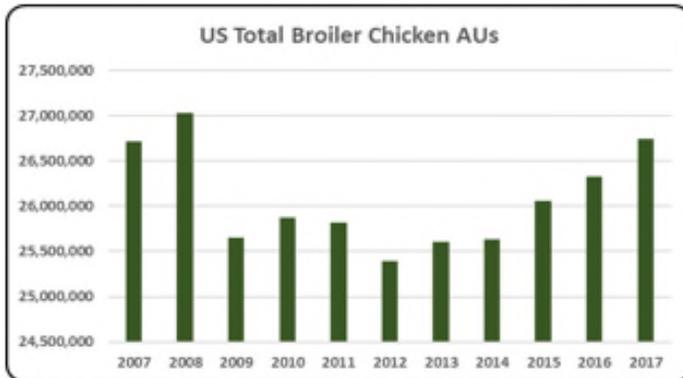
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Texas. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

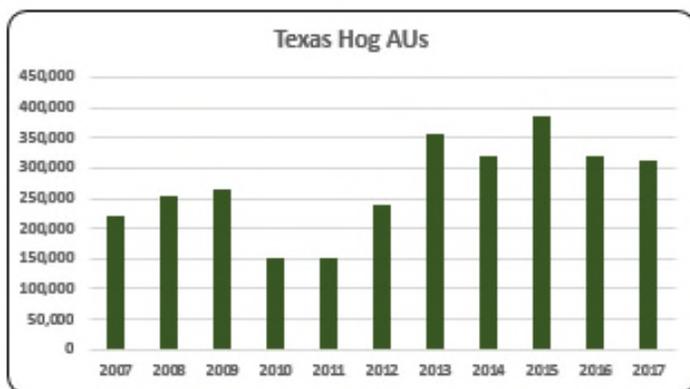
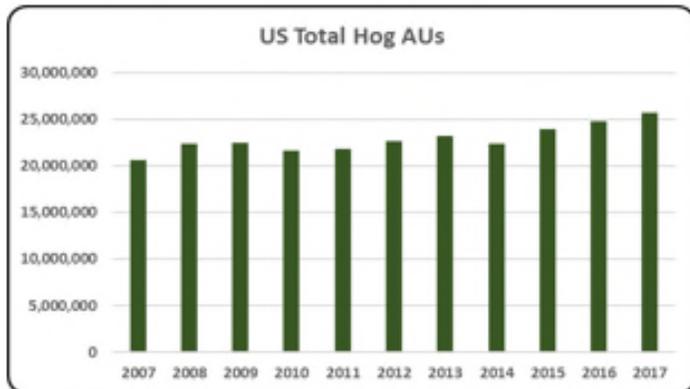
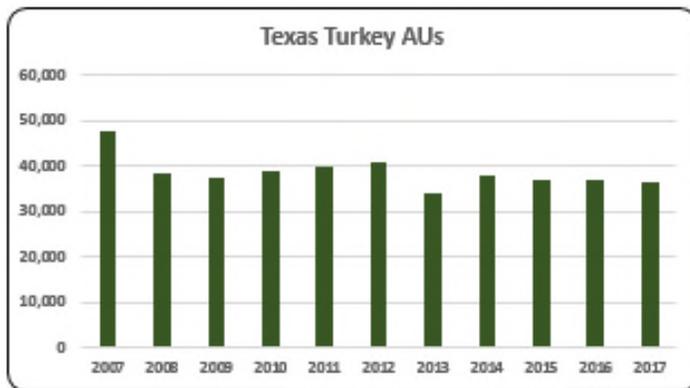
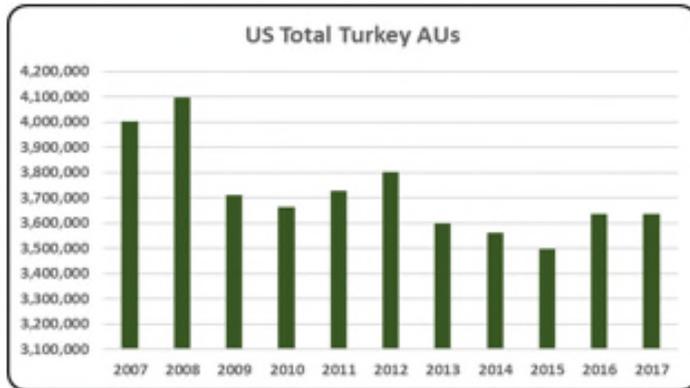
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Texas, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (6.8 million AUs), Broiler Chickens (2.0 million AUs), and Dairy Cows (686,000 AUs). Total animal units in Texas during 2017 were 9.9 million AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 9.9 million AUs in Texas in 2017. 7.7% of all AUs in the U.S. were in Texas in 2017.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler AUs in Texas contributed 19.9% (1.95 million broiler AUs) of all animal units in the state in 2017. There was record broiler AUs in 2009 with 1.97 million broiler AUs.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Less than 1% (88,576 layer AUs) of all AUs in 2017 were from laying hens. 2017 AUs were almost 16.2% above the level of layer AUs in 2007 (76,226).

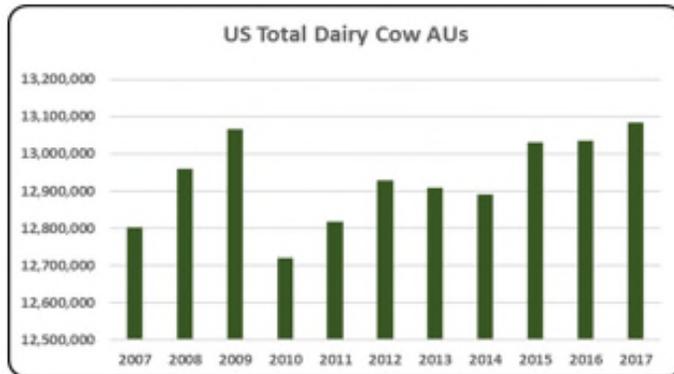


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

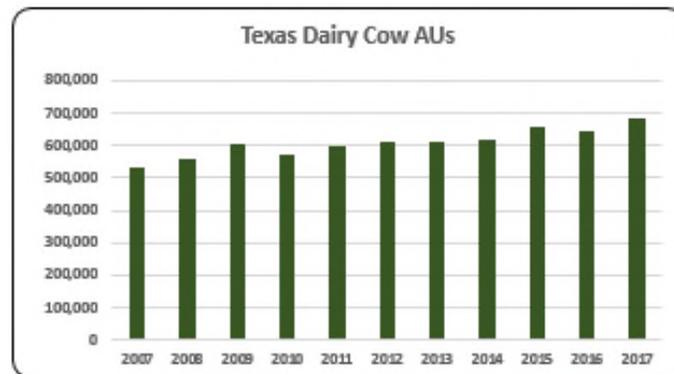
- Turkey AU numbers in Texas were the smallest of all animal sectors in terms of animal units in the state, contributing only 0.37% (36,650) to Texas' animal units in 2017.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

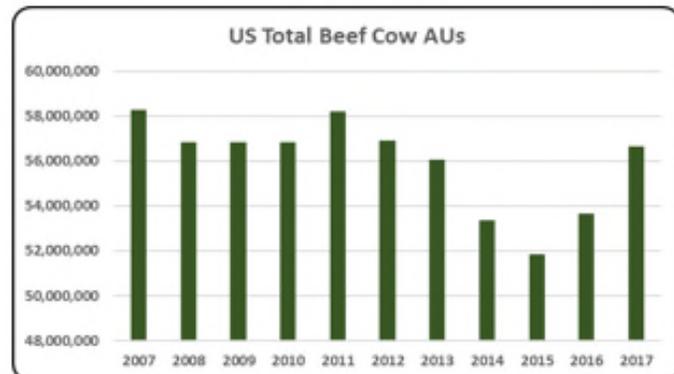
- On average, there were 270,200 hog AUs in Texas from 2007 to 2017. Texas hog inventories in 2017 (313,200 hog AUs) were 41% higher than in 2007 (221,550 hog AUs).



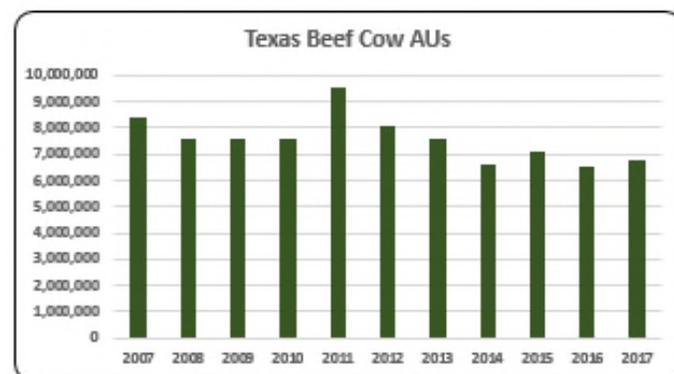
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Dairy cow numbers in 2017 (686,000 dairy cow AUs) made up 6.96% of all AUs in the state, a 29% increase from 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- 68.7% (6.8 million) of Texas AUs were from beef cows. Beef cow AUs declined 19% from the beginning of the decade.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

Given the long-term presence of animal agriculture in Texas, of interest is the degree to which the industry impacts the Texas economy. Estimates of output, jobs, earnings, taxes paid, and multipliers for Texas 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 Texas'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 2007-2017 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 Texas which have occurred. As shown in this state report, Texas 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 Texas. 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	8,393,250	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
	Hog and Pig AUs	221,550	255,150	264,300	151,050	151,800	239,850	354,900	321,000	385,500	319,800	313,200
	Broiler AUs	1,812,577	1,890,047	1,967,590	1,922,536	1,894,354	1,811,287	1,833,746	1,778,675	1,829,495	1,892,089	1,957,169
	Turkey AUs	47,940	38,319	37,535	39,097	39,794	41,083	34,271	37,833	37,017	36,891	36,650
	Egg Layer AUs	76,228	76,676	71,992	74,488	72,672	77,001	76,268	76,554	81,492	84,504	88,576
	Dairy AUs	532,000	560,000	602,000	574,000	595,000	609,000	609,000	616,000	658,000	644,000	686,000
	Total Animal Units	11,083,544	10,401,942	10,525,167	10,342,921	12,277,120	10,894,122	10,501,334	9,459,462	10,077,129	9,480,910	9,857,396
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 6,025,583	\$ 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
	Hogs and Pigs (\$1,000)	\$ 107,819	\$ 131,583	\$ 106,533	\$ 75,023	\$ 103,262	\$ 266,045	\$ 197,889	\$ 238,528	\$ 222,851	\$ 191,892	\$ 199,298
	Broilers (\$1,000)	\$ 1,404,552	\$ 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
	Turkeys (\$1,000)	\$ 79,632	\$ 97,166	\$ 92,087	\$ 80,316	\$ 63,153	\$ 67,904	\$ 49,220	\$ 32,563	\$ 34,649	\$ 39,182	\$ 26,529
	Eggs (\$1,000)	\$ 373,500	\$ 462,283	\$ 347,480	\$ 395,052	\$ 421,982	\$ 445,497	\$ 471,264	\$ 525,954	\$ 728,753	\$ 361,309	\$ 392,538
	Milk (\$1,000)	\$ 1,454,648	\$ 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
	Other	\$ 75,786	\$ 71,214	\$ 84,557	\$ 93,346	\$ 100,062	\$ 100,340	\$ 101,474	\$ 113,970	\$ 121,510	\$ 129,884	\$ 106,684
	Sheep and Lambs (\$1,000)	\$ 31,824	\$ 22,951	\$ 31,992	\$ 36,480	\$ 38,895	\$ 34,872	\$ 31,704	\$ 39,898	\$ 43,138	\$ 47,210	\$ 46,117
	Aquaculture (\$1,000)	\$ 43,962	\$ 48,263	\$ 52,565	\$ 56,866	\$ 61,167	\$ 65,469	\$ 69,770	\$ 74,071	\$ 78,373	\$ 82,674	\$ 60,567
	Total (\$1,000)	\$ 9,521,519	\$ 10,377,290	\$ 8,938,033	\$ 10,011,934	\$ 12,436,345	\$ 11,845,324	\$ 12,501,749	\$ 14,750,436	\$ 14,198,171	\$ 11,650,572	\$ 12,608,632

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	123,248	127,974	124,992	127,726
	Cattle feedlots (112112)	2,481	5,035	2,229	898
	Dairy cattle and milk production (11212)	1,888	1,221	1,027	656
	Hog and pig farming (1122)	1,785	1,760	1,732	1,184
	Poultry and egg production (1123)	2,065	3,032	5,829	3,980
	Sheep and goat farming (1124)	5,580	8,786	13,272	15,603
	Animal aquaculture and other animal production (1125,1129)	9,703	23,378	28,622	26,587
Value of Sales (\$1,000)	Cattle and Calves	7,271,061	8,083,024	10,503,774	13,013,127
	Hogs and Pigs	116,079	128,231	237,504	239,358
	Poultry and Eggs	1,164,596	1,260,951	2,113,086	2,624,759
	Milk and Other Dairy Products	741,735	676,703	1,245,441	1,698,264
	Aquaculture	20,403	31,058	46,102	82,033
	Other (calculated)	226,460	223,026	289,592	201,944
	Total	9,540,334	10,402,993	14,435,499	17,859,485
Input Purchases	Livestock and poultry purchased	(Farms) 61,645	65,435	55,194	61,054
		\$1,000 3,221,969	4,524,369	6,017,794	6,860,573
	Breeding livestock purchased	(Farms) <i>n/a</i>	43,559	36,667	39,929
		\$1,000 <i>n/a</i>	186,906	420,373	418,586
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	30,388	25,541	29,879
		\$1,000 <i>n/a</i>	4,337,463	5,597,421	6,441,987
	Feed purchased	(Farms) 130,839	167,033	158,144	185,019
	\$1,000 2,868,805	2,700,281	4,226,444	7,272,692	

	Animal Type		Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	2017 Animal Agriculture	Cattle and Calves		\$ 19,188,953	\$ 4,034,341	125,088
Hogs, Pigs, and Other			\$ 541,741	\$ 127,870	3,997	\$ 25,190
Poultry and Eggs			\$ 6,961,743	\$ 1,552,621	41,749	\$ 305,866
Dairy			\$ 5,225,457	\$ 1,226,297	37,956	\$ 241,580
Total			\$ 31,917,895	\$ 6,941,129	208,791	\$ 1,367,402
Change from 2007 to 2017	Cattle and Calves		\$ 933,063	\$ 196,170	6,082	\$ 38,645
	Hogs, Pigs, and Other		\$ 160,197	\$ 37,812	1,182	\$ 7,449
	Poultry and Eggs		\$ 1,235,563	\$ 275,558	7,410	\$ 54,285
	Dairy		\$ 1,202,933	\$ 282,301	8,738	\$ 55,613
	Total		\$ 3,531,756	\$ 791,841	23,412	\$ 155,993
RIMS II Multipliers	Animal Type		Output(\$)	Earnings (\$)	Employment (Jobs)	
	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				13.5%	
	Federal Social Security tax rate				6.2%	
	State Effective Rate				0.0%	
	Total				19.7%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$2.5 billion in economic output
- 18,231 jobs
- \$562.3 million in earnings
- \$138.9 million in income taxes paid at local, state, and federal levels
- \$34.0 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Utah has increased economic output by over \$586.5 million, boosted household earnings by \$125.8 million, contributed 3,954 additional jobs and paid \$31.1 million in additional tax revenues.

Utah's animal agriculture consumed almost 202.2 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (63.2 thousand tons)
- Egg-Laying Hens (52.9 thousand tons)
- Turkeys (46.4 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 2017, Utah's animal agriculture contributed the following to the economy:

- About \$2.5 billion in economic output
- \$562.3 million in household earnings
- 18,231 jobs
- \$138.9 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 \$586.5 million
- Boosted household earnings by \$125.8 million
- Added 3,954 jobs
- Paid an additional \$31.1 million in income taxes

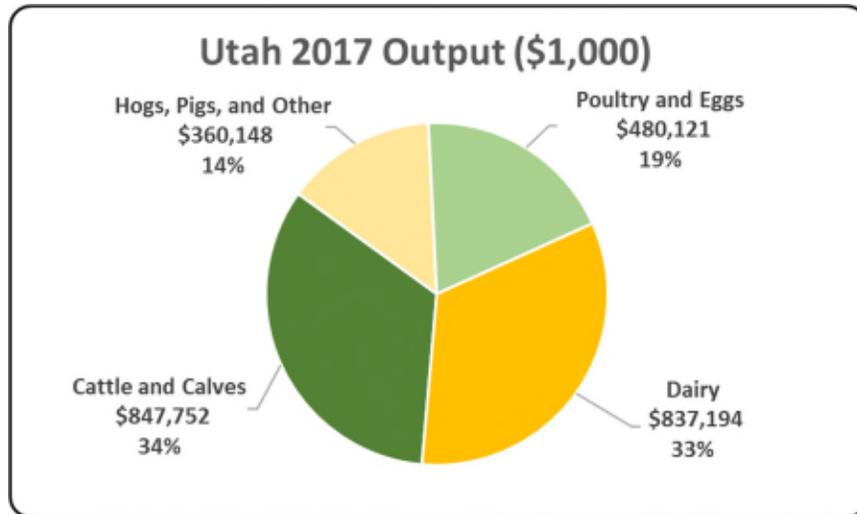
Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 2,525,216	\$ 586,547	30.26%
Earnings (\$1,000)	\$ 562,276	\$ 125,822	28.83%
Employment (Jobs)	18,231	3,954	27.70%
Income Taxes Paid (\$1,000)	\$ 138,882	\$ 31,078	28.83%
Property Taxes Paid in 2012 (\$1,000)	\$ 33,965		

Utah Output

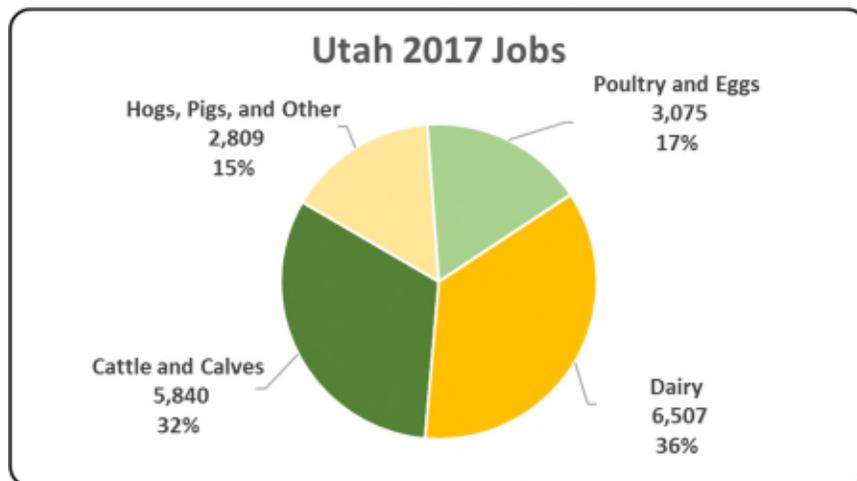
Utah Output

“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 \$2.5 billion.



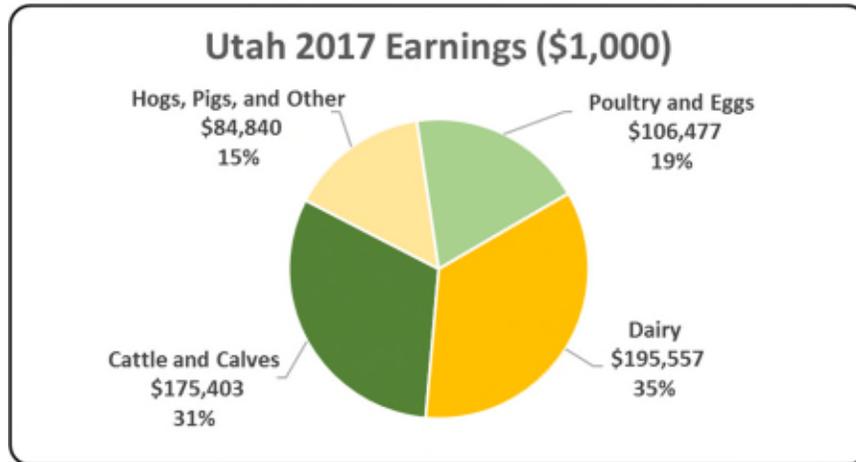
Utah Jobs

“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 18,231 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 \$562.3 million to household earnings in 2017.



Utah Taxes Paid by Animal Agriculture

Utah’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$138.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$34.0 million in property taxes paid by all of Utah agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



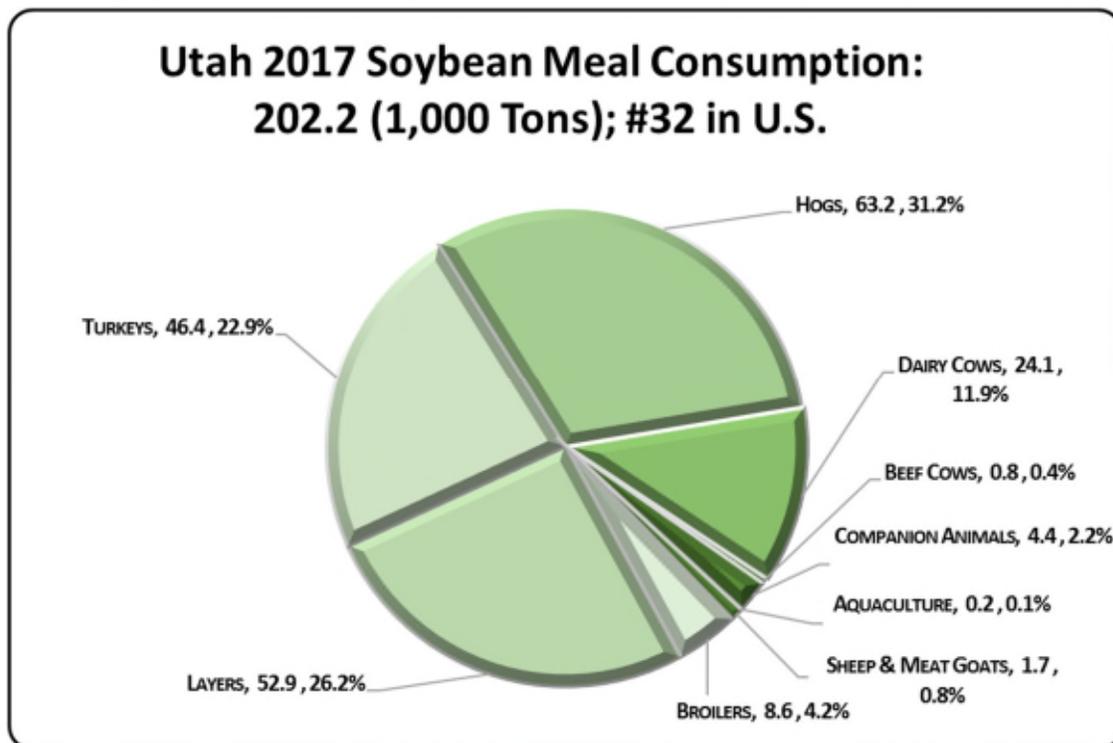
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Utah's animal agriculture consumed almost 202.2 thousand tons of soybean meal in 2017, placing the state as #32 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Utah consumed 8,226 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

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- Egg-Laying Hens (52.9 thousand tons)
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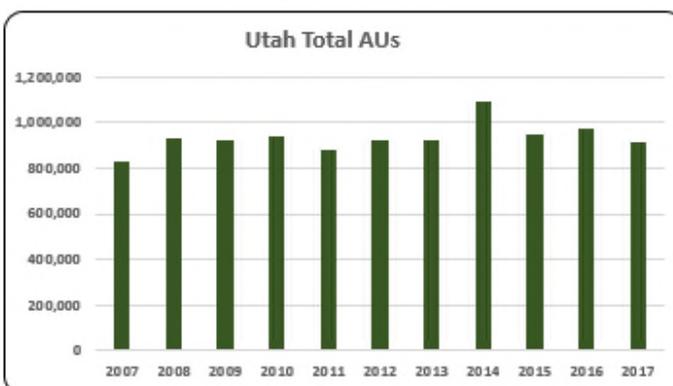
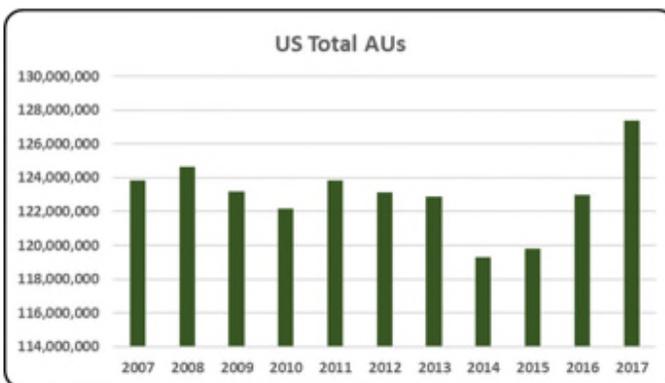


Utah Animal Unit (AU) Trends

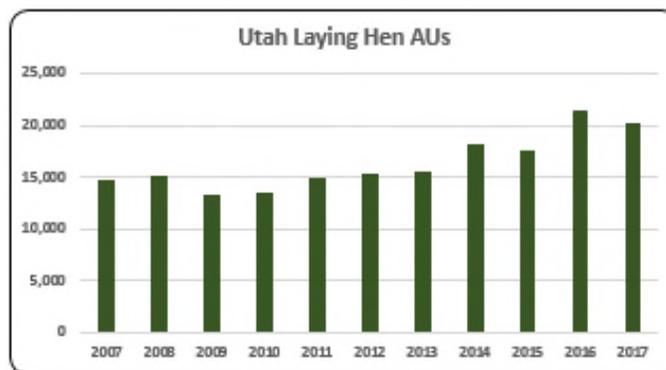
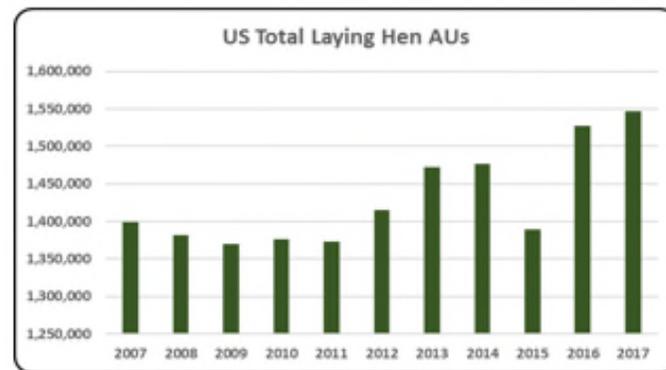
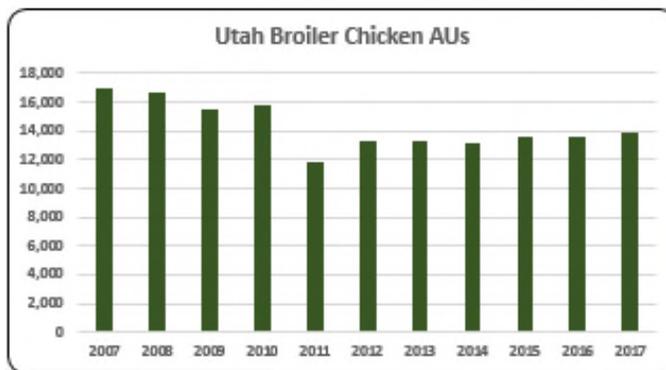
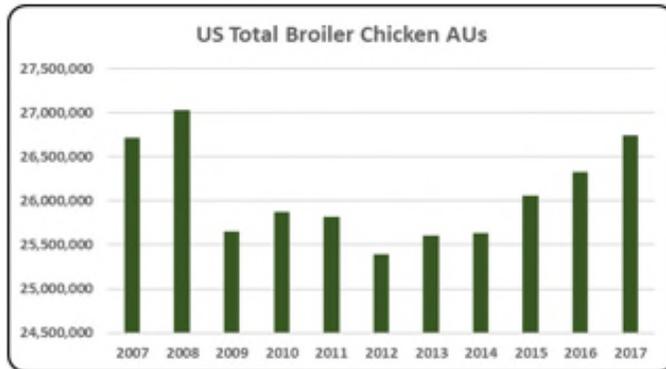
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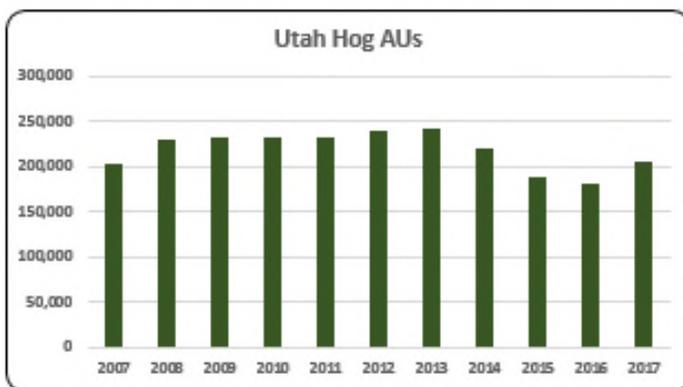
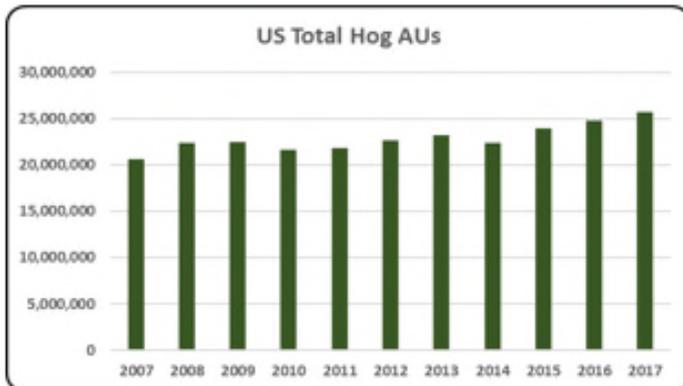
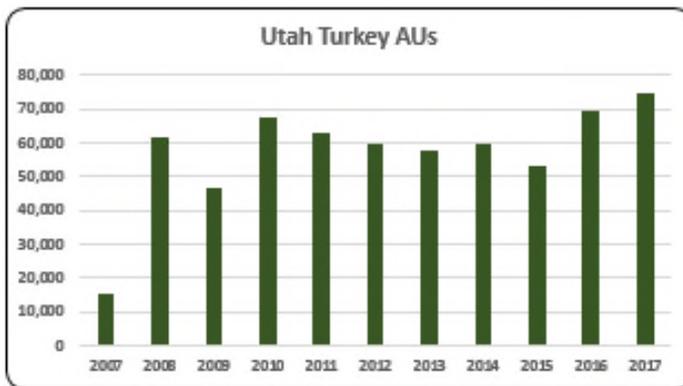
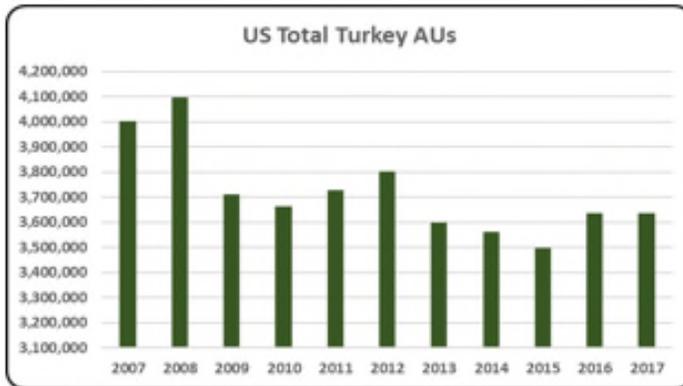
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Utah, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (467,175 AUs), Hogs (205,125 AUs), and Dairy Cows (128,800 AUs). Total animal units in Utah during 2017 were 909,534 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- Less than 1% (909,534) of animal units in the U.S. were in Utah in 2017. Animal units in Utah in 2017 were 9.4% up from 2007.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the U.S. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Only 1.5% (13,832 broiler AUs) of all animal units in Utah in 2017 were concentrated in the broiler sector. Broiler AUs in 2007 (16,987 broiler AUs) were 19% above 2017 broiler production.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Utah laying hens were only 2.22% (20,192 layer AUs) of all animal units in 2017. Layer AUs in 2017 were 38% higher than a decade earlier (14,617 layer AUs).

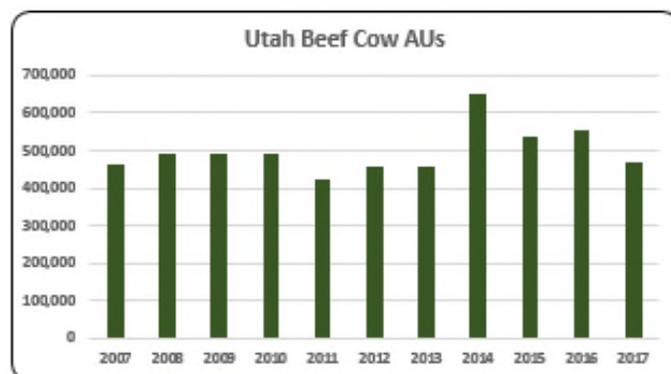
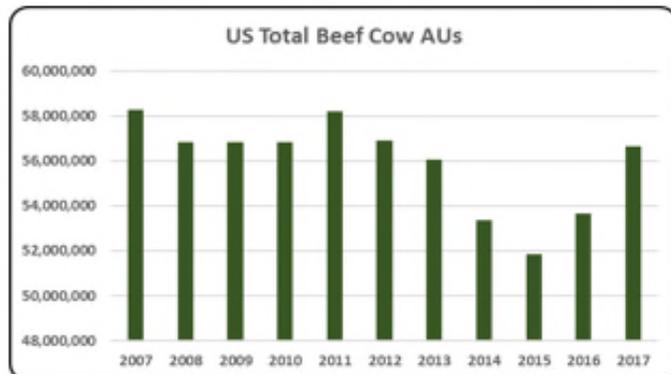
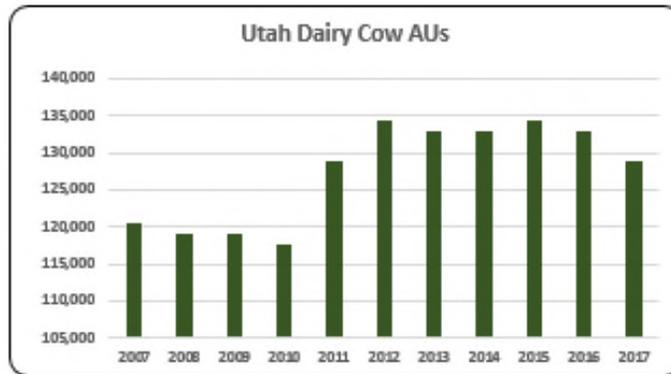
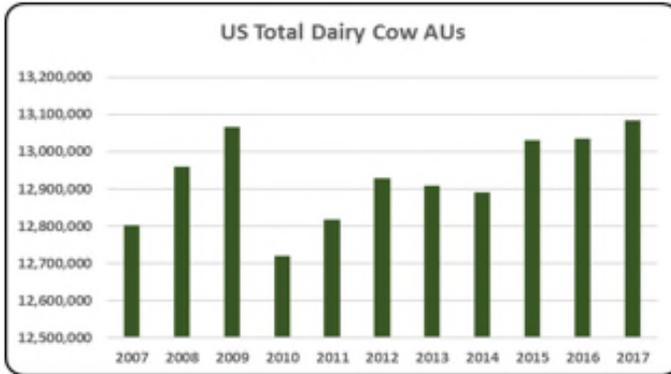


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

- Turkey AUs in 2017 (74,409 turkey AUs) were 390% higher than in 2007 (15,197 turkey AUs).

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

- There were 205,125 hog AUs in Utah in 2017. Hog AUs increased 1.5% from 2007, making up 23% of Utah's AUs.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- There were, on average, 127,400 dairy cow AUs during the 2007-2017 period. The level of dairy cow AUs in 2017 (128,800) was 7% above the level of dairy cow AUs in 2007 (120,400).
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- About 51% of all AUs in Utah in 2017 were concentrated in beef cows. Beef cow AUs in 2017 (467,175 beef cow AUs) were 1% larger than in 2007 (461,850 beef cow 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

Utah 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 Utah’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 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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	461,850	492,450	492,450	492,450	425,700	459,825	456,150	650,250	538,800	552,000	467,175
	Hog and Pig AUs	202,200	229,050	233,100	232,350	233,850	240,450	242,475	220,275	188,325	181,725	205,125
	Broiler AUs	16,987	16,722	15,548	15,757	11,873	13,317	13,270	13,195	13,536	13,638	13,832
	Turkey AUs	15,197	61,898	46,890	67,292	62,809	59,892	57,932	59,593	53,529	69,802	74,409
	Egg Layer AUs	14,617	15,069	13,360	13,584	14,848	15,220	15,600	18,249	17,609	21,425	20,192
	Dairy AUs	120,400	119,000	119,000	117,600	128,800	134,400	133,000	133,000	134,400	133,000	128,800
	Total Animal Units	831,250	934,189	920,348	939,032	877,880	923,104	918,427	1,094,563	946,199	971,590	909,534
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 222,428	\$ 194,220	\$ 185,264	\$ 231,323	\$ 272,474	\$ 302,585	\$ 374,285	\$ 482,669	\$ 454,189	\$ 359,301	\$ 415,056
	Hogs and Pigs (\$1,000)	\$ 152,190	\$ 163,240	\$ 153,912	\$ 184,623	\$ 209,304	\$ 192,252	\$ 210,555	\$ 229,904	\$ 154,473	\$ 140,477	\$ 172,717
	Broilers (\$1,000)	\$ 13,110	\$ 13,393	\$ 11,555	\$ 12,076	\$ 10,572	\$ 13,269	\$ 16,168	\$ 16,962	\$ 14,798	\$ 13,157	\$ 15,449
	Turkeys (\$1,000)	\$ 21,192	\$ 58,607	\$ 36,525	\$ 68,017	\$ 68,510	\$ 73,450	\$ 69,534	\$ 71,601	\$ 74,478	\$ 100,264	\$ 85,531
	Eggs (\$1,000)	\$ 52,618	\$ 72,422	\$ 52,470	\$ 64,329	\$ 70,840	\$ 72,537	\$ 81,139	\$ 107,255	\$ 199,491	\$ 73,238	\$ 102,375
	Milk (\$1,000)	\$ 327,348	\$ 322,904	\$ 216,062	\$ 312,174	\$ 403,956	\$ 382,272	\$ 415,545	\$ 517,608	\$ 377,400	\$ 339,390	\$ 392,055
	Other	\$ 16,712	\$ 18,198	\$ 18,003	\$ 22,294	\$ 25,753	\$ 37,927	\$ 26,337	\$ 22,987	\$ 30,489	\$ 28,662	\$ 34,766
	Sheep and Lambs (\$1,000)	\$ 16,129	\$ 17,603	\$ 17,395	\$ 21,674	\$ 25,121	\$ 37,283	\$ 25,681	\$ 22,318	\$ 29,809	\$ 27,970	\$ 27,096
	Aquaculture (\$1,000)	\$ 583	\$ 595	\$ 608	\$ 620	\$ 632	\$ 644	\$ 656	\$ 668	\$ 680	\$ 692	\$ 7,670
	Total (\$1,000)	\$ 805,598	\$ 842,985	\$ 673,791	\$ 894,836	\$ 1,061,410	\$ 1,074,292	\$ 1,193,564	\$ 1,448,985	\$ 1,305,318	\$ 1,054,490	\$ 1,217,949

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	5,309	4,202	5,183	5,231	
	Cattle feedlots (112112)	433	583	415	126	
	Dairy cattle and milk production (11212)	614	464	335	248	
	Hog and pig farming (1122)	114	179	205	199	
	Poultry and egg production (1123)	171	334	359	214	
	Sheep and goat farming (1124)	667	582	895	763	
	Animal aquaculture and other animal production (1125,1129)	1,878	3,482	2,813	3,760	
Value of Sales (\$1,000)	Cattle and Calves	260,758	371,418	347,299	364,214	
	Hogs and Pigs	40,758	153,112	196,595	290,632	
	Poultry and Eggs	68,129	84,178	140,359	140,131	
	Milk and Other Dairy Products	196,448	196,812	292,141	326,364	
	Aquaculture	1,931	5,746	4,074	6,709	
	Other (calculated)	65,219	46,835	62,813	93,368	
	Total	633,243	858,101	1,043,281	1,221,418	
Input Purchases	Livestock and poultry purchased	(Farms) 5,266	5,172	4,826	6,025	
		\$1,000	82,463	158,687	132,323	114,862
	Breeding livestock purchased	(Farms) <i>n/a</i>	2,702	2,864	3,353	
		\$1,000	<i>n/a</i>	18,789	31,074	38,315
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	3,092	2,836	3,566	
		\$1,000	<i>n/a</i>	139,898	101,250	76,547
	Feed purchased	(Farms) 7,655	9,479	9,214	11,921	
	\$1,000	198,854	244,175	389,568	611,302	

2017 Animal Agriculture	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
	Cattle and Calves	\$ 847,752	\$ 175,403	5,840	\$ 43,324
Hogs, Pigs, and Other	\$ 360,148	\$ 84,840	2,809	\$ 20,955	
Poultry and Eggs	\$ 480,121	\$ 106,477	3,075	\$ 26,300	
Dairy	\$ 837,194	\$ 195,557	6,507	\$ 48,303	
Total	\$ 2,525,216	\$ 562,276	18,231	\$ 138,882	

Change from 2007 to 2017	Cattle and Calves	\$ 314,519	\$ 65,075	2,167	\$ 16,074
	Hogs, Pigs, and Other	\$ 16,036	\$ 3,777	125	\$ 933
	Poultry and Eggs	\$ 239,253	\$ 53,059	1,532	\$ 13,106
	Dairy	\$ 16,740	\$ 3,910	130	\$ 966
	Total	\$ 586,547	\$ 125,822	3,954	\$ 31,078

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	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	5.0%
	Total	24.7%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 in animal agriculture's success in the State of Vermont. The success of Vermont animal agriculture in turn has a large impact on the rest of the state and regional economies. For example, in the State of Vermont during 2017 animal agriculture contributed:

- \$1.2 billion in economic output
- 9,045 jobs
- \$262.4 million in earnings
- \$68.1 million in income taxes paid at local, state, and federal levels
- \$34.0 million in the form of property taxes

Vermont's animal agriculture consumed almost 111.7 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (49.7 thousand tons)
- Broilers (38.7 thousand tons)
- Turkeys (13.4 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 part of Vermont's economy. In 2017, Vermont's animal agriculture contributed the following to the economy:

- About \$1.2 billion in economic output
- \$262.4 million in household earnings
- 9,045 jobs
- \$68.1 million in income taxes

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

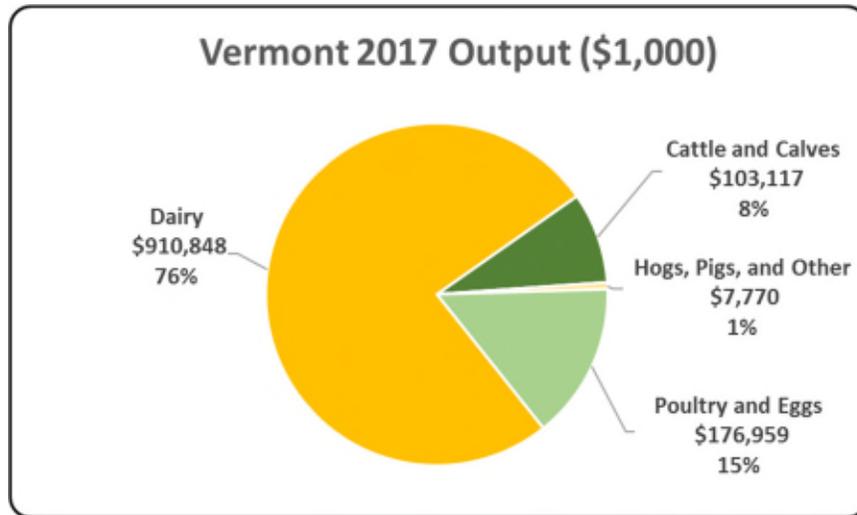
- Decreased economic output by \$94.8 million
- Reduced household earnings by \$22.8 million
- Shrunk by 898 jobs
- Paid \$5.9 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 1,198,694	\$ (94,850)	-7.33%
Earnings (\$1,000)	\$ 262,433	\$ (22,806)	-8.00%
Employment (Jobs)	9,045	(898)	-9.03%
Income Taxes Paid (\$1,000)	\$ 68,101	\$ (5,918)	-8.00%
Property Taxes Paid in 2012 (\$1,000)	\$ 34,005		

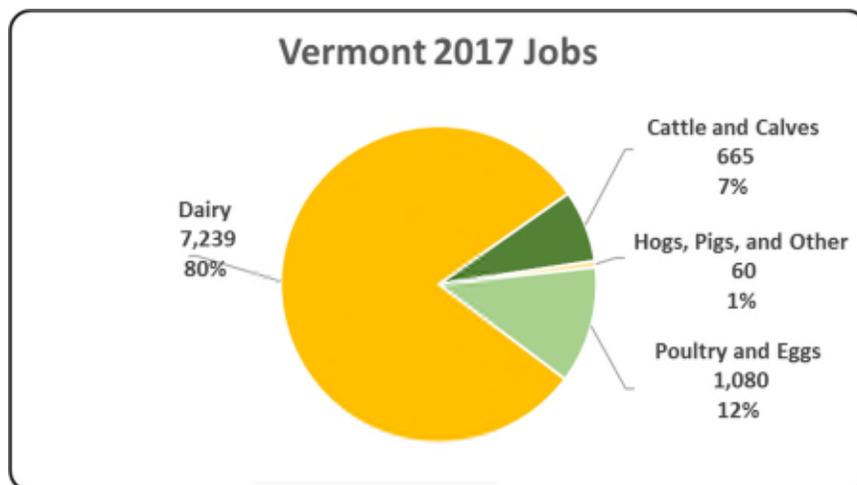
Vermont Output

“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 \$1.2 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 9,045 jobs within and outside of animal agriculture.



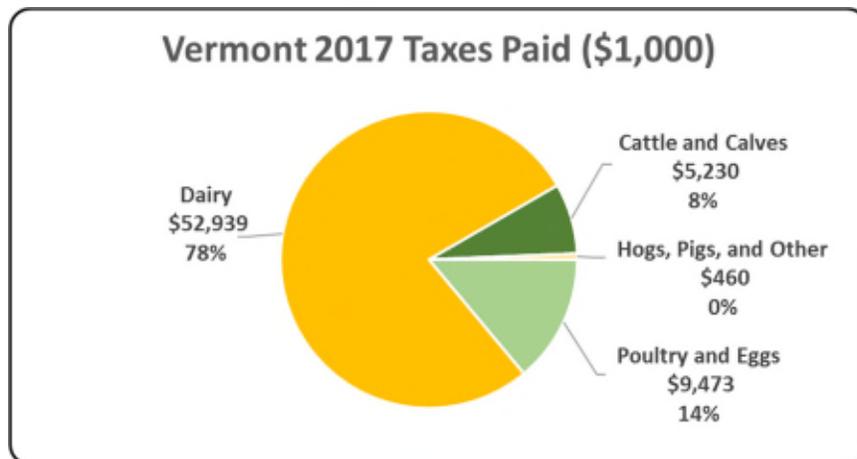
Vermont Earnings

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 \$262.4 million to household earnings in 2017.



Vermont Taxes Paid by Animal Agriculture

Vermont’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$68.1 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$34.0 million in property taxes paid by all of Vermont agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



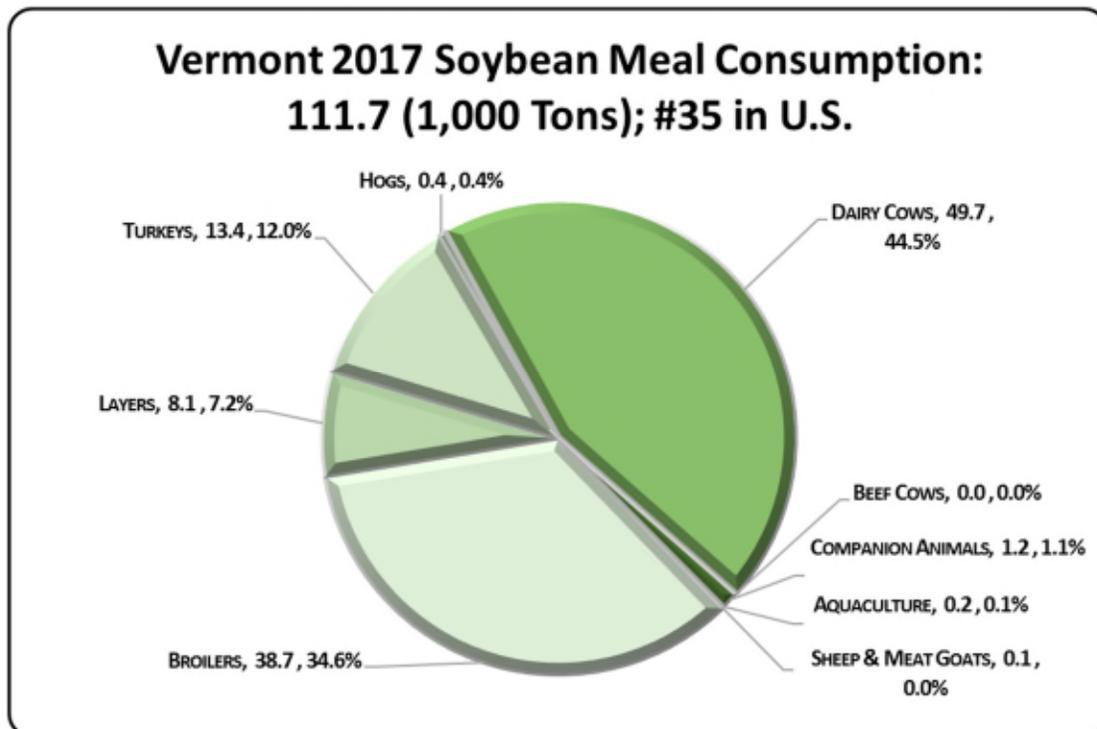
Vermont Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Vermont's animal agriculture consumed almost 111.7 thousand tons of soybean meal in 2017, placing the state as #35 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Vermont consumed 255 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (49.7 thousand tons)
- Broilers (38.7 thousand tons)
- Turkeys (13.4 thousand tons)

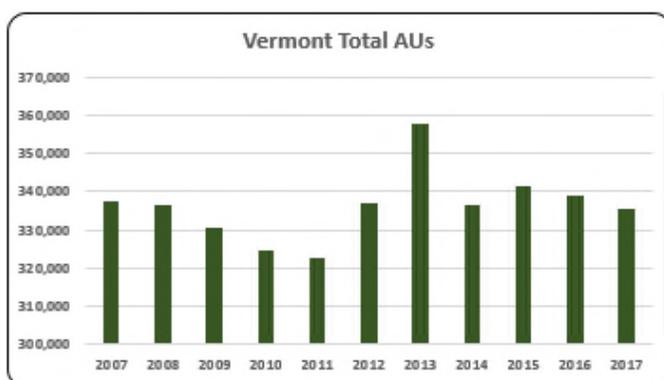
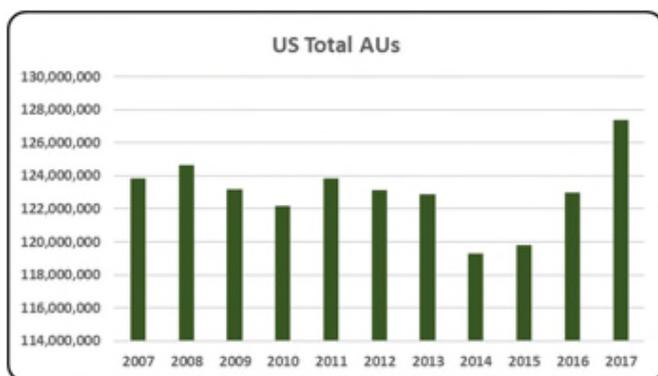


Vermont Animal Unit (AU) Trends

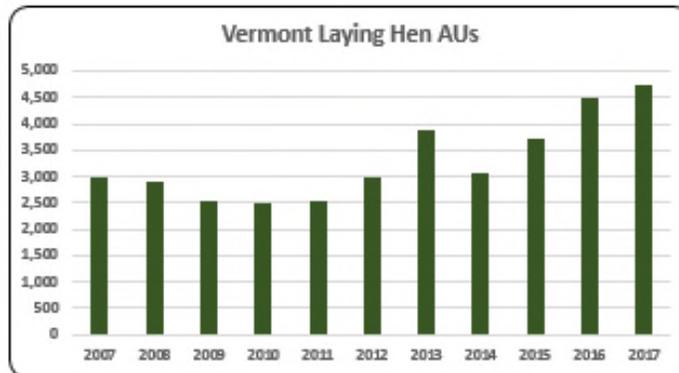
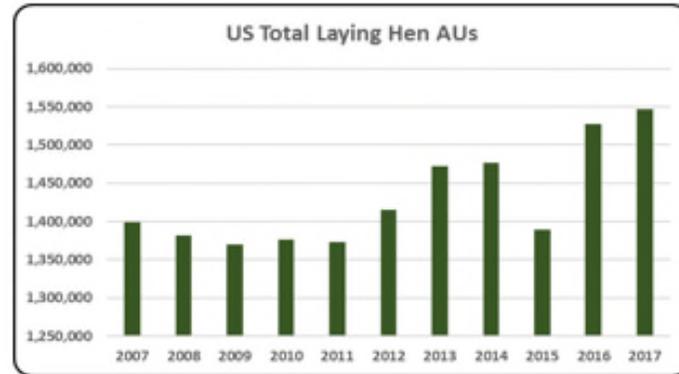
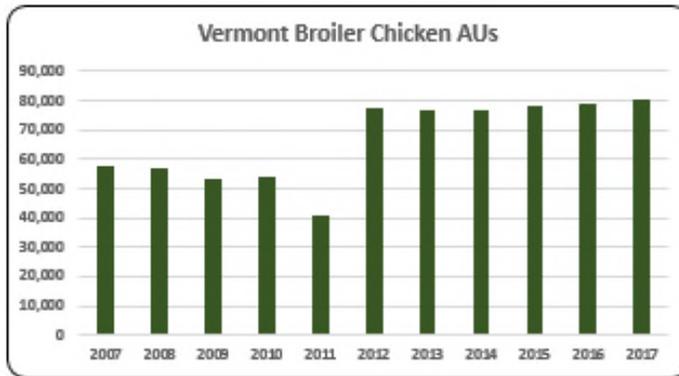
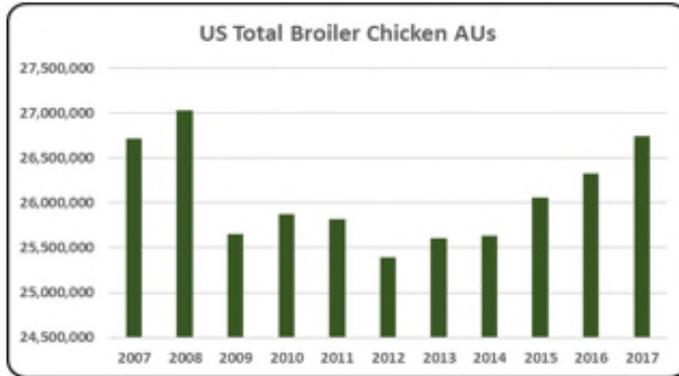
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Vermont. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

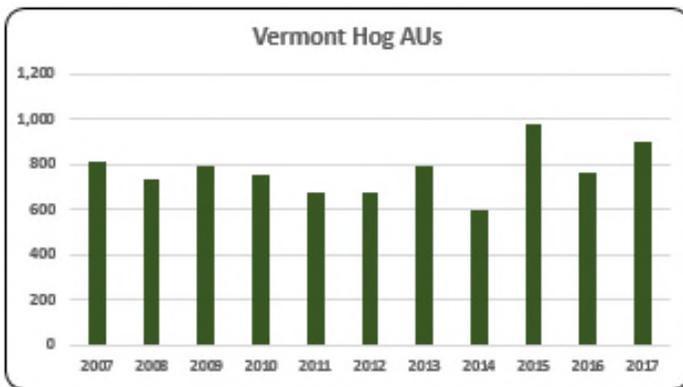
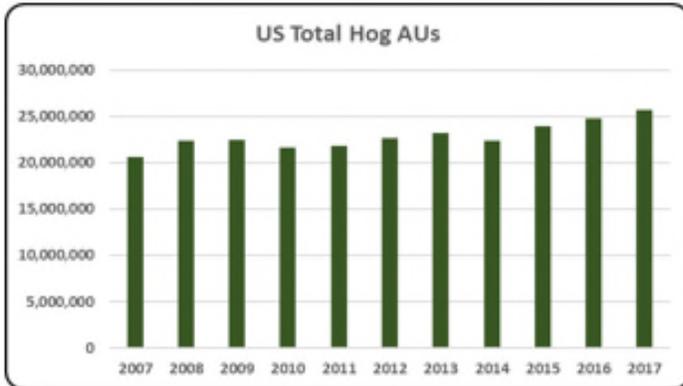
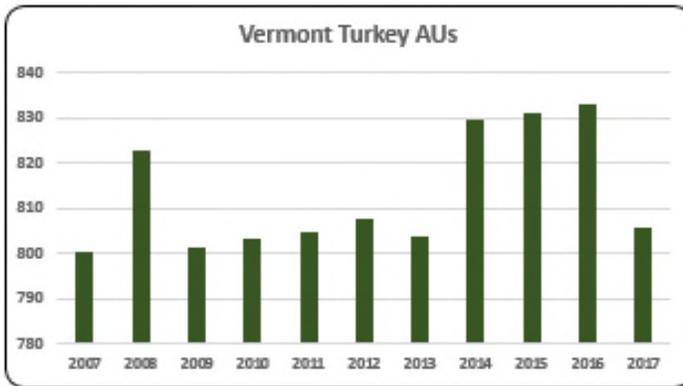
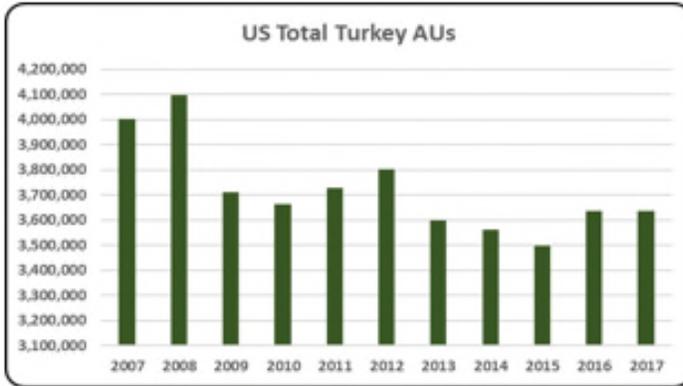
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Vermont, the largest three segments of animal agriculture in terms of AUs during 2017 were: Dairy Cows (180,600 AUs), Broiler Chickens (80,152 AUs), and Beef Cows (68,190 AUs). Total animal units in Vermont during 2017 were 335,384 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- In 2017 Vermont had 335,384 AUs, down 0.67% from a decade earlier, and less than 1 percent of total U.S. AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- There were 80,152 broiler AUs in Vermont in 2017. This represented 23.9% of all AUs in the state. Broiler AUs increased from 28% from 2007 to 2017.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- There were 4,737 layer AUs in 2017. 2013 was the highest year prior to 2017 for laying hens in Vermont with 3,859 layer AUs.

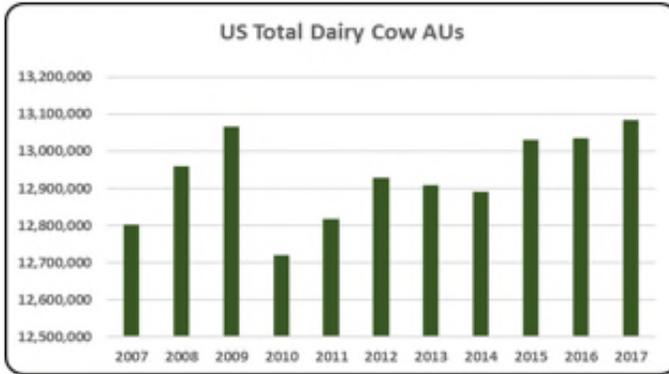


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

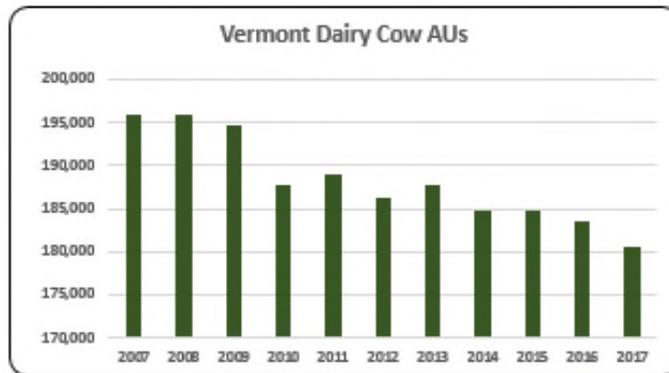
- Only 0.24% (806 turkey AUs) of all AUs in Vermont were in turkey production in 2017.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

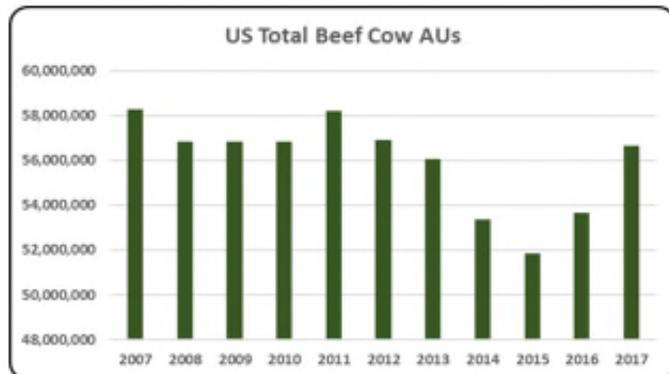
- Vermont had an average of 770 hog AUs from 2007 to 2017.



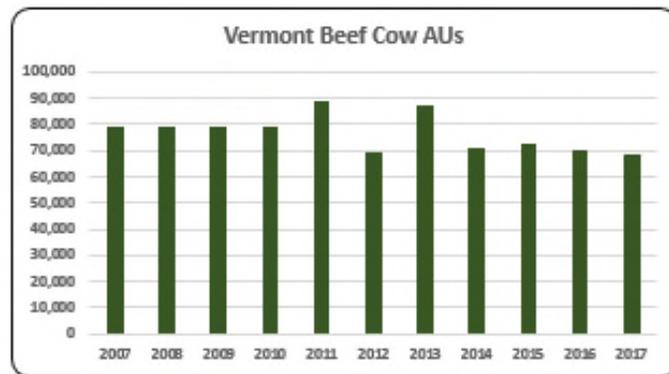
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- In 2017 dairy cows accounted for 54% (180,600 dairy cow AUs) of all animal units in the state. Dairy cow AUs in 2017 were 8% below 2007.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- About 20.3% of AUs in Vermont came from beef cow production in 2017 (68,190 AUs). The beef cow AUs in 2017 were 14% less than 2007 (79,125 beef cow AUs).

Vermont Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 soybean marketing year for up to sixteen specific animal species has been estimated.

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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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	79,125	79,050	79,050	79,050	89,175	69,045	87,525	70,725	72,885	70,605	68,190
	Hog and Pig AUs	810	735	795	750	675	675	795	600	975	765	900
	Broiler AUs	57,930	57,026	53,021	53,734	40,489	77,166	76,896	76,460	78,433	79,024	80,152
	Turkey AUs	800	823	802	803	805	808	804	830	831	833	806
	Egg Layer AUs	2,974	2,889	2,527	2,510	2,525	2,981	3,859	3,075	3,700	4,494	4,737
	Dairy AUs	196,000	196,000	194,600	187,600	189,000	186,200	187,600	184,800	184,800	183,400	180,600
	Total Animal Units	337,638	336,523	330,794	324,447	322,669	336,874	357,479	336,489	341,625	339,121	335,384
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 45,503	\$ 43,469	\$ 39,438	\$ 40,186	\$ 57,745	\$ 72,300	\$ 68,087	\$ 90,964	\$ 92,141	\$ 61,405	\$ 62,689
	Hogs and Pigs (\$1,000)	\$ 384	\$ 390	\$ 501	\$ 581	\$ 814	\$ 871	\$ 883	\$ 989	\$ 1,017	\$ 736	\$ 913
	Broilers (\$1,000)	\$ 44,707	\$ 45,674	\$ 39,407	\$ 41,182	\$ 36,054	\$ 76,889	\$ 93,688	\$ 98,286	\$ 85,745	\$ 76,239	\$ 89,522
	Turkeys (\$1,000)	\$ 1,897	\$ 1,881	\$ 1,796	\$ 1,862	\$ 2,013	\$ 2,084	\$ 2,130	\$ 2,283	\$ 2,331	\$ 2,367	\$ 2,394
	Eggs (\$1,000)	\$ 4,271	\$ 5,252	\$ 3,782	\$ 3,769	\$ 4,384	\$ 4,855	\$ 3,701	\$ 4,274	\$ 5,152	\$ 1,829	\$ 2,628
	Milk (\$1,000)	\$ 521,386	\$ 502,320	\$ 340,722	\$ 446,217	\$ 548,208	\$ 503,524	\$ 555,078	\$ 679,830	\$ 495,876	\$ 471,771	\$ 510,136
	Other	\$ 354	\$ 345	\$ 374	\$ 502	\$ 460	\$ 513	\$ 610	\$ 610	\$ 672	\$ 673	\$ 4,385
	Sheep and Lambs (\$1,000)	\$ 261	\$ 245	\$ 268	\$ 390	\$ 341	\$ 387	\$ 478	\$ 472	\$ 527	\$ 521	\$ 497
	Aquaculture (\$1,000)	\$ 93	\$ 100	\$ 106	\$ 113	\$ 119	\$ 126	\$ 132	\$ 139	\$ 145	\$ 152	\$ 3,888
	Total (\$1,000)	\$ 618,501	\$ 599,331	\$ 426,020	\$ 534,299	\$ 649,679	\$ 661,036	\$ 724,177	\$ 877,236	\$ 682,935	\$ 615,019	\$ 672,668

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	858	647	668	862
	Cattle feedlots (112112)	62	92	61	18
	Dairy cattle and milk production (11212)	1,767	1,367	1,141	904
	Hog and pig farming (1122)	42	45	26	57
	Poultry and egg production (1123)	59	102	235	203
	Sheep and goat farming (1124)	220	248	371	390
	Animal aquaculture and other animal production (1125,1129)	392	763	855	1,035
Value of Sales (\$1,000)	Cattle and Calves	36,551	45,106	57,581	61,905
	Hogs and Pigs	757	374	697	1,345
	Poultry and Eggs	5,707	5,875	10,996	13,136
	Milk and Other Dairy Products	349,163	342,440	330,344	504,884
	Aquaculture	n/a	1,325	1,989	1,890
	Other (calculated)	22,829	6,362	172,844	8,688
	Total	415,007	401,482	574,451	591,848
Input Purchases	Livestock and poultry purchased	(Farms) 1,911	1,660	1,541	2,205
		\$1,000 24,005	23,993	25,230	21,865
	Breeding livestock purchased	(Farms) n/a	1,042	789	1,021
		\$1,000 n/a	14,949	16,178	13,916
	Other livestock and poultry purchased	(Farms) n/a	803	970	1,536
		\$1,000 n/a	9,045	9,052	7,950
	Feed purchased	(Farms) 3,498	3,978	3,637	4,535
	\$1,000 119,251	108,693	144,129	210,804	

	<u>Animal Type</u>	<u>Output (\$1,000)</u>	<u>Earnings (\$1,000)</u>	<u>Employment (Jobs)</u>	<u>Taxes Paid (\$1,000)</u>
2017 Animal Agriculture	Cattle and Calves	\$ 103,117	\$ 20,155	665	\$ 5,230
	Hogs, Pigs, and Other	\$ 7,770	\$ 1,771	60	\$ 460
	Poultry and Eggs	\$ 176,959	\$ 36,504	1,080	\$ 9,473
	Dairy	\$ 910,848	\$ 204,003	7,239	\$ 52,939
	Total	\$ 1,198,694	\$ 262,433	9,045	\$ 68,101
Change from 2007 to 2017	Cattle and Calves	\$ 15,266	\$ 2,984	98	\$ 774
	Hogs, Pigs, and Other	\$ 6,500	\$ 1,482	50	\$ 385
	Poultry and Eggs	\$ 65,195	\$ 13,449	398	\$ 3,490
	Dairy	\$ (181,811)	\$ (40,720)	(1,445)	\$ (10,567)
	Total	\$ (94,850)	\$ (22,806)	(898)	\$ (5,918)
RIMS II Multipliers	<u>Animal Type</u>	<u>Output(\$)</u>	<u>Earnings (\$)</u>	<u>Employment (Jobs)</u>	
	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				13.5%
	Federal Social Security tax rate				6.2%
	State Effective Rate				6.3%
	Total				26.0%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$4.1 billion in economic output
- 19,293 jobs
- \$863.1 million in earnings
- \$203.5 million in income taxes paid at local, state, and federal levels
- \$110.2 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Virginia has increased economic output by over \$120.1 million, boosted household earnings by \$22.1 million, contributed 376 additional jobs and paid \$5.2 million in additional tax revenues.

Virginia's animal agriculture consumed 666.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (446.3 thousand tons)
- Turkeys (150.7 thousand tons)
- Dairy Cows (26.2 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 2017, Virginia's animal agriculture contributed the following to the economy:

- About \$4.1 billion in economic output
- \$863.1 million in household earnings
- 19,293 jobs
- \$203.5 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:

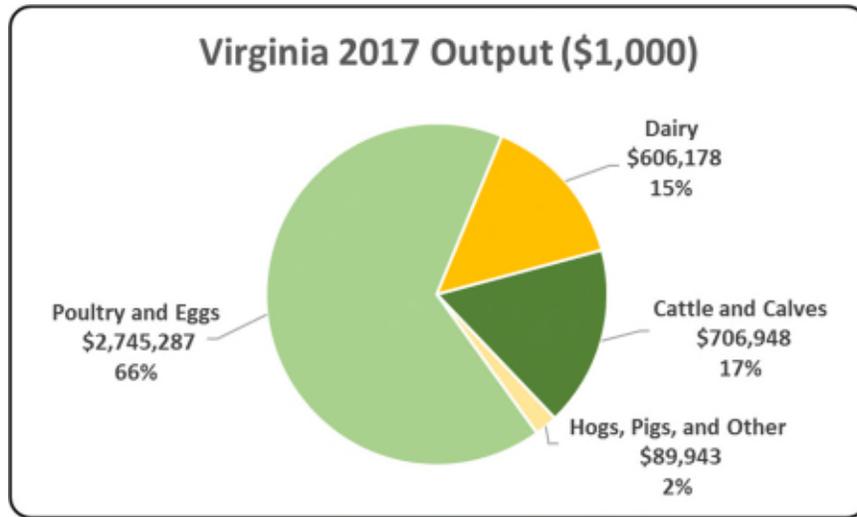
- Increased economic output by \$120.1 million
- Boosted household earnings by \$22.1 million
- Added 376 jobs
- Paid an additional \$5.2 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 4,148,356	\$ 120,146	2.98%
Earnings (\$1,000)	\$ 863,068	\$ 22,113	2.63%
Employment (Jobs)	19,293	376	1.99%
Income Taxes Paid (\$1,000)	\$ 203,468	\$ 5,213	2.63%
Property Taxes Paid in 2012 (\$1,000)	\$ 110,161		

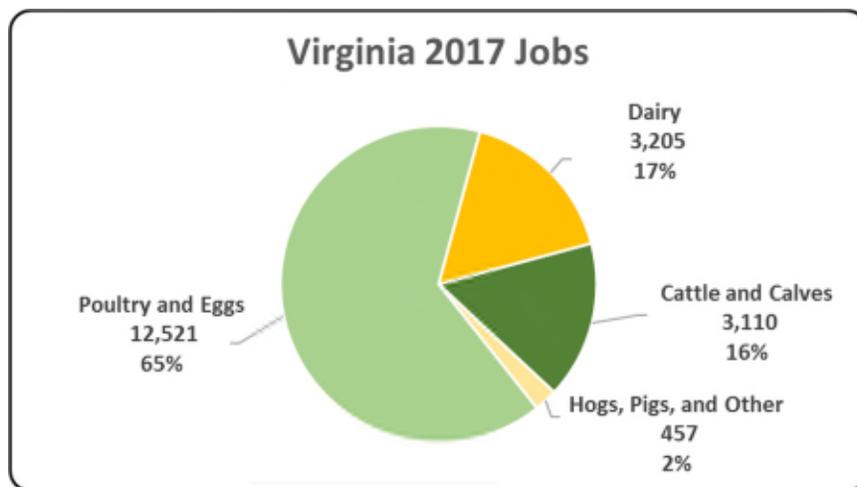
Virginia Output

“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.



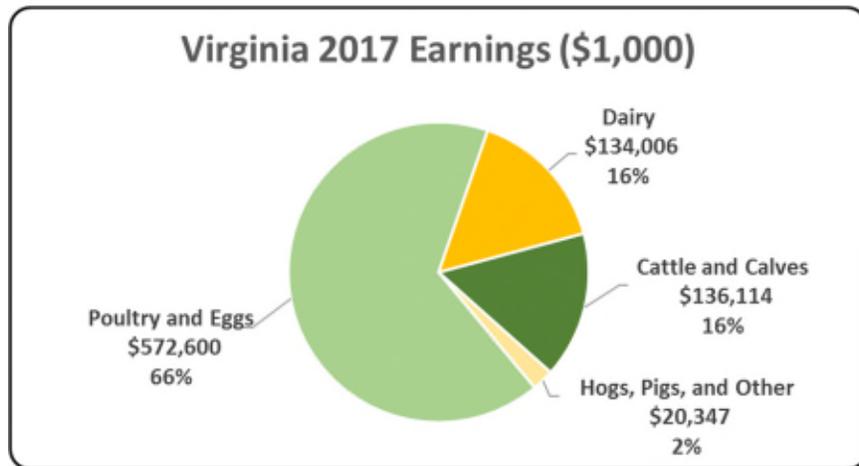
Virginia Jobs

“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 19,293 jobs within and outside of animal agriculture.



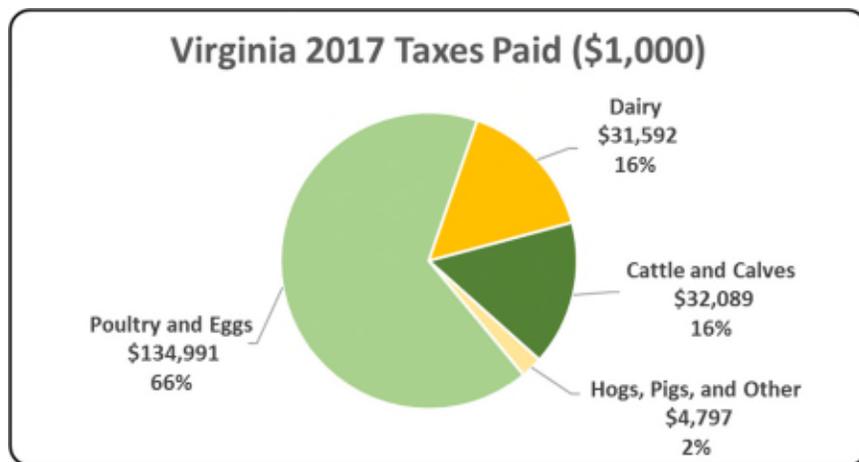
Virginia Earnings

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 \$863.1 million to household earnings in 2017.



Virginia Taxes Paid by Animal Agriculture

Virginia’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$203.5 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$110.2 million in property taxes paid by all of Virginia agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



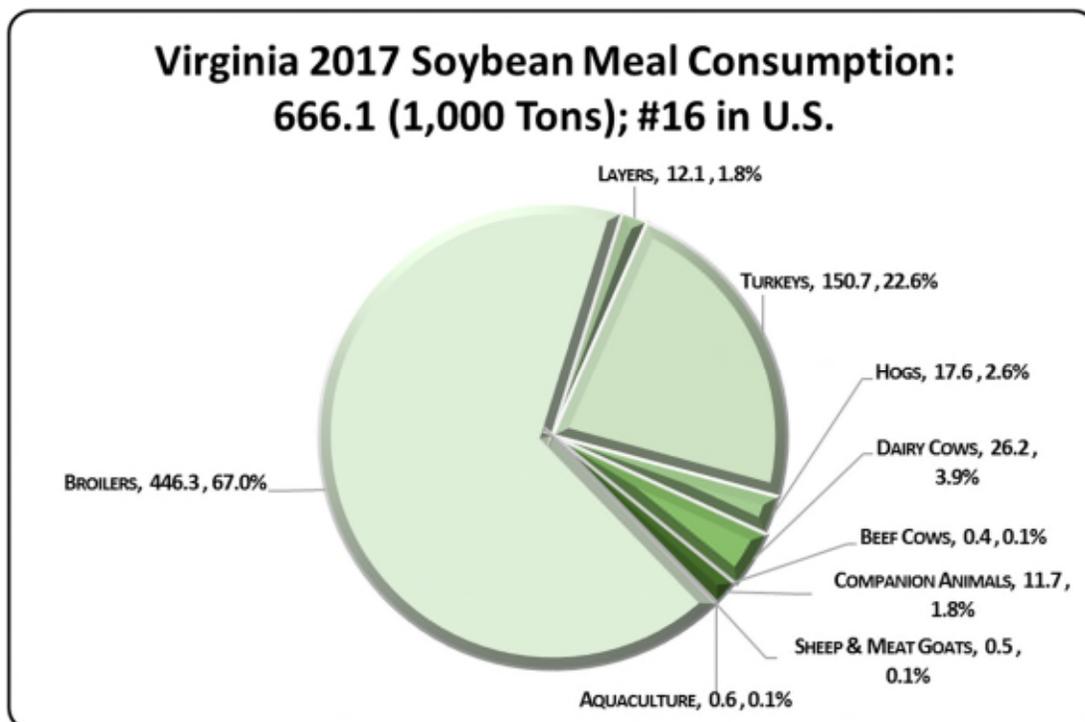
Virginia Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Virginia's animal agriculture consumed almost 666.1 thousand tons of soybean meal in 2017, placing the state as #16 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Virginia consumed 24,259 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (446.3 thousand tons)
- Turkeys (150.7 thousand tons)
- Dairy Cows (26.2 thousand tons)

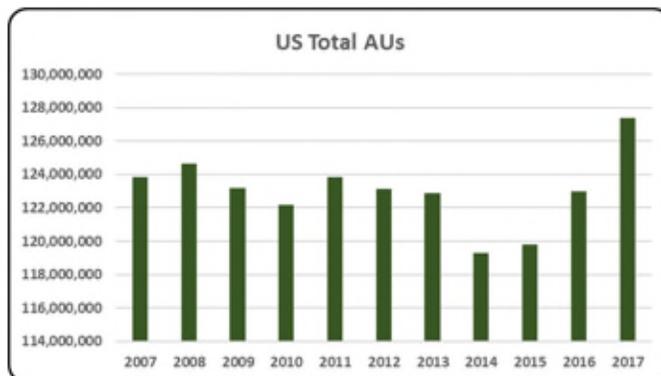


Virginia Animal Unit (AU) Trends

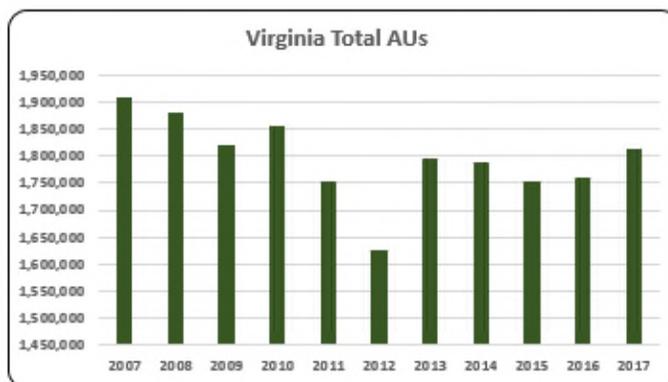
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Virginia. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

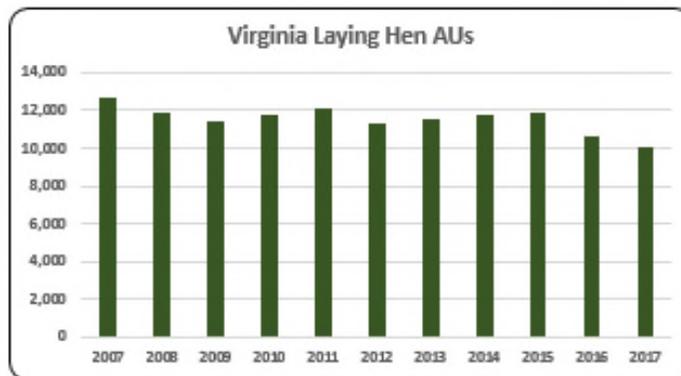
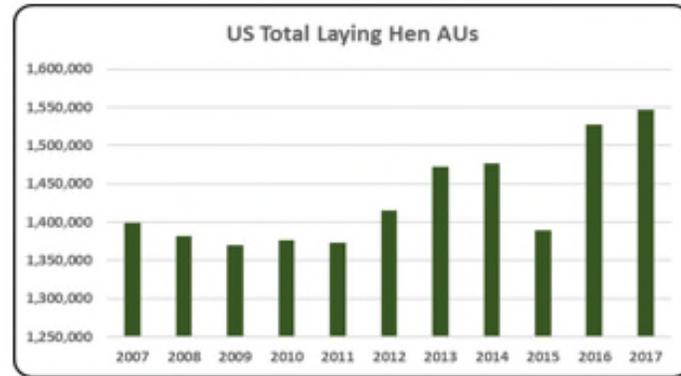
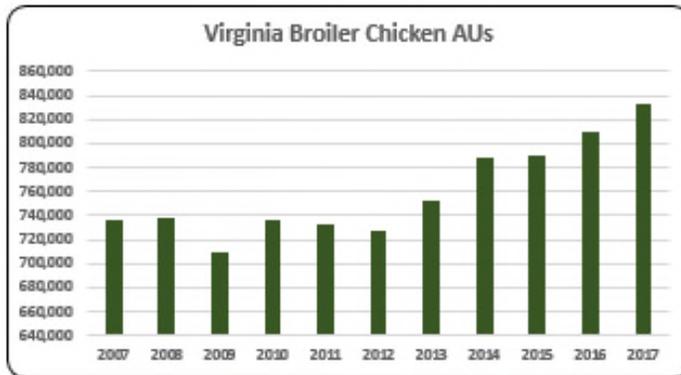
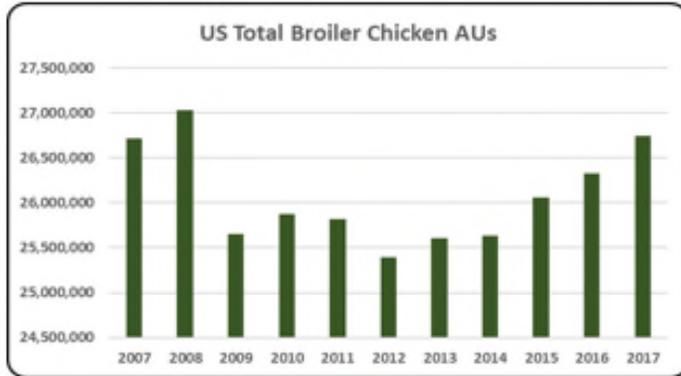
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Virginia, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (833,720 AUs), Beef Cows (558,900 AUs), and Turkeys (240,398 AUs). Total animal units in Virginia during 2017 were 1.8 million AUs.



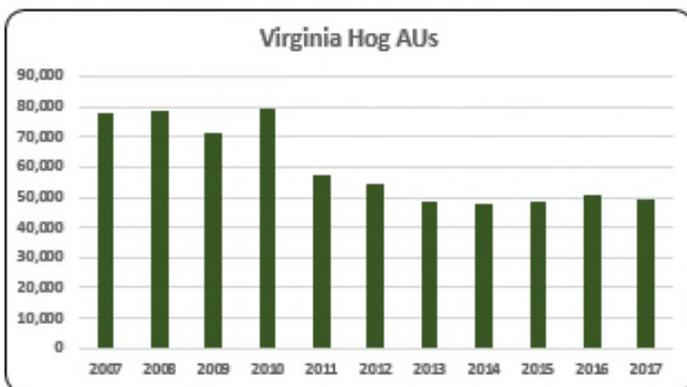
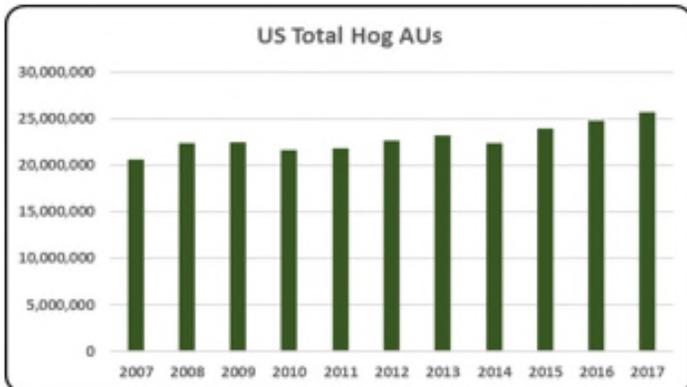
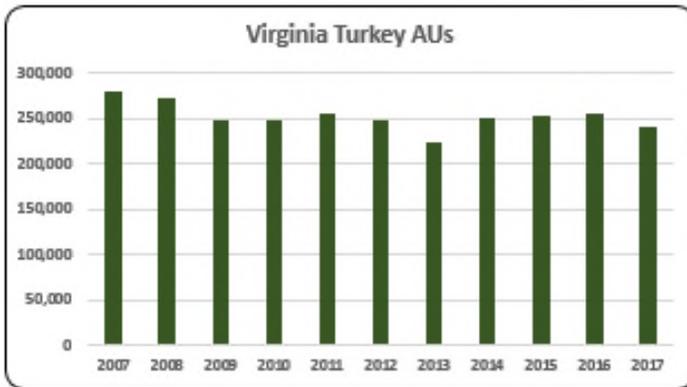
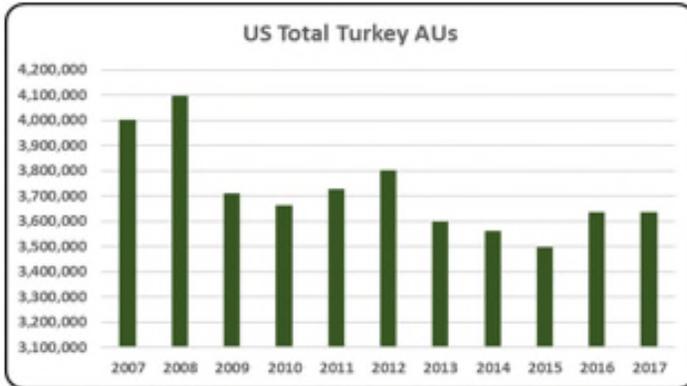
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.



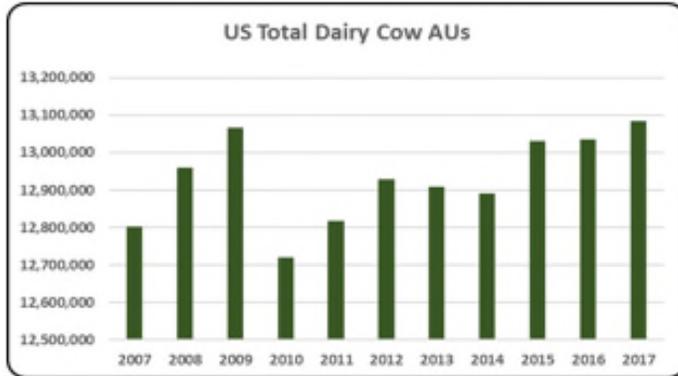
- Virginia animal unit numbers in 2017 were 1.8 million AUs, a 5% decrease from a decade earlier.



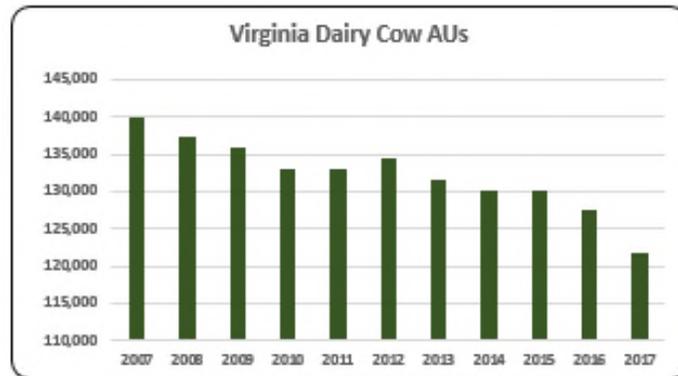
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broilers were the largest animal sector in Virginia. In 2017, 45.96% (833,720 broiler AUs) of all AUs were concentrated in broiler production. Broiler AUs in 2017 were the highest of the decade, increasing 13% since 2007.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (1,917,400 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Less than 0.6% (10,008 laying hen AUs) of all AUs in Virginia were in laying hens in 2017. Laying hen AUs in 2017 dropped 21% relative to 2007 (12,652 laying hen AUs).



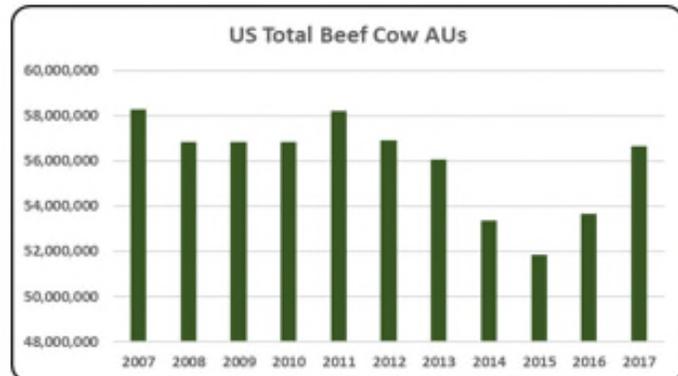
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- There were 252,384 turkey AUs, on average, between 2007 and 2017. 2017 turkey AUs (240,398 turkey AUs) shrank 14% compared to 2007 (279,336 turkey AUs).
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs decreased 36% between 2007 (77,550 hog AUs) and 2017 (49,305 hog AUs).



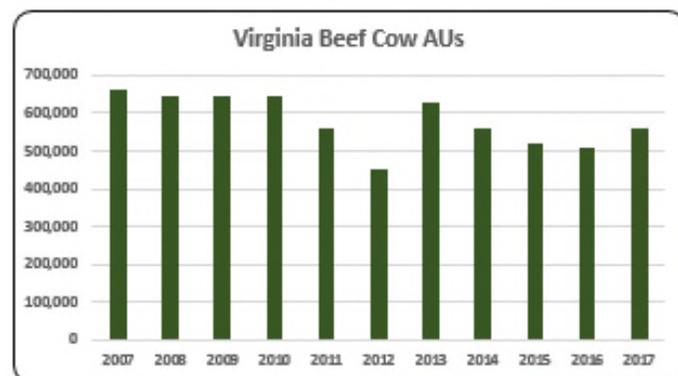
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- There were 121,800 dairy cow AUs, on average, from 2007 to 2017. Dairy cow AUs dropped 13% during that decade.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cow numbers in Virginia fell between 2007 and 2017. In Virginia 30% of all AUs were concentrated in beef cows in 2017 (558,900 beef cow 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:

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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 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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Animal Units (AUs)	Beef Cattle AUs	661,350	644,400	644,400	644,400	561,000	451,200	625,950	559,200	518,475	506,475	558,900
	Hog and Pig AUs	77,550	78,300	71,250	79,500	57,300	54,450	48,900	47,775	48,525	50,775	49,305
	Broiler AUs	735,854	738,032	708,532	736,879	732,504	727,400	751,713	787,450	789,866	808,834	833,720
	Turkey AUs	279,336	271,748	249,104	248,687	255,619	248,332	224,485	250,293	252,777	255,446	240,398
	Egg Layer AUs	12,652	11,832	11,428	11,804	12,088	11,346	11,595	11,785	11,870	10,662	10,008
	Dairy AUs	140,000	137,200	135,800	133,000	133,000	134,400	131,600	130,200	130,200	127,400	121,800
	Total Animal Units	1,906,741	1,881,512	1,820,514	1,854,270	1,751,511	1,627,128	1,794,242	1,786,702	1,751,713	1,759,593	1,814,132
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 405,442	\$ 340,907	\$ 343,919	\$ 364,945	\$ 432,521	\$ 515,665	\$ 483,683	\$ 669,635	\$ 668,815	\$ 435,616	\$ 435,286
	Hogs and Pigs (\$1,000)	\$ 58,155	\$ 57,464	\$ 48,814	\$ 60,325	\$ 48,919	\$ 40,495	\$ 44,822	\$ 42,272	\$ 47,778	\$ 44,585	\$ 46,842
	Broilers (\$1,000)	\$ 559,430	\$ 575,690	\$ 550,228	\$ 622,792	\$ 593,074	\$ 653,400	\$ 819,754	\$ 917,917	\$ 791,775	\$ 733,204	\$ 875,242
	Turkeys (\$1,000)	\$ 251,082	\$ 261,043	\$ 192,854	\$ 251,715	\$ 299,305	\$ 306,910	\$ 257,557	\$ 328,063	\$ 375,240	\$ 385,342	\$ 292,396
	Eggs (\$1,000)	\$ 78,991	\$ 77,103	\$ 66,223	\$ 77,640	\$ 88,362	\$ 91,531	\$ 99,390	\$ 114,471	\$ 122,443	\$ 96,909	\$ 89,995
	Milk (\$1,000)	\$ 373,389	\$ 372,816	\$ 265,608	\$ 333,486	\$ 397,089	\$ 359,216	\$ 398,918	\$ 480,330	\$ 343,574	\$ 310,140	\$ 336,784
	Other	\$ 48,771	\$ 51,196	\$ 53,699	\$ 56,165	\$ 58,656	\$ 60,531	\$ 62,339	\$ 64,546	\$ 66,068	\$ 68,042	\$ 13,357
	Sheep and Lambs (\$1,000)	\$ 4,152	\$ 4,737	\$ 5,400	\$ 6,027	\$ 6,678	\$ 6,713	\$ 6,681	\$ 7,048	\$ 6,730	\$ 6,864	\$ 7,335
	Aquaculture (\$1,000)	\$ 44,619	\$ 46,459	\$ 48,299	\$ 50,138	\$ 51,978	\$ 53,818	\$ 55,658	\$ 57,498	\$ 59,338	\$ 61,178	\$ 6,022
	Total (\$1,000)	\$ 1,775,260	\$ 1,736,219	\$ 1,521,344	\$ 1,767,068	\$ 1,917,926	\$ 2,027,747	\$ 2,166,463	\$ 2,617,234	\$ 2,415,693	\$ 2,073,838	\$ 2,089,902

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	20,369	20,967	20,923	18,149
	Cattle feedlots (112112)	788	1,618	778	373
	Dairy cattle and milk production (11212)	1,152	1,109	934	691
	Hog and pig farming (1122)	254	202	375	323
	Poultry and egg production (1123)	1,252	1,392	1,798	1,668
	Sheep and goat farming (1124)	588	912	1,512	1,564
	Animal aquaculture and other animal production (1125,1129)	2,513	5,391	5,973	6,217
Value of Sales (\$1,000)	Cattle and Calves	412,012	471,703	574,506	707,976
	Hogs and Pigs	78,077	72,213	56,960	67,702
	Poultry and Eggs	761,380	750,035	971,851	1,161,564
	Milk and Other Dairy Products	277,119	275,402	330,344	347,204
	Aquaculture	24,629	19,945	53,032	54,665
	Other (calculated)	n/a	6,782	61,194	22,023
	Total	1,553,217	1,596,080	2,047,887	2,361,134
Input Purchases	Livestock and poultry purchased	(Farms) 12,700	13,434	11,487	13,722
	\$1,000	208,871	277,272	323,214	424,722
	Breeding livestock purchased	(Farms) n/a	6,974	6,167	7,395
	\$1,000	n/a	27,806	38,777	57,220
	Other livestock and poultry purchased	(Farms) n/a	8,182	6,815	8,369
	\$1,000	n/a	249,466	284,437	367,502
	Feed purchased	(Farms) 23,331	31,374	29,233	32,768
\$1,000	649,741	507,692	727,195	1,067,299	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 706,948	\$ 136,114	3,110	\$ 32,089
	Hogs, Pigs, and Other	\$ 89,943	\$ 20,347	457	\$ 4,797
	Poultry and Eggs	\$ 2,745,287	\$ 572,600	12,521	\$ 134,991
	Dairy	\$ 606,178	\$ 134,006	3,205	\$ 31,592
	Total	\$ 4,148,356	\$ 863,068	19,293	\$ 203,468

Change from 2007 to 2017	Cattle and Calves	\$ (65,923)	\$ (12,693)	(290)	\$ (2,992)
	Hogs, Pigs, and Other	\$ (97,568)	\$ (22,072)	(495)	\$ (5,204)
	Poultry and Eggs	\$ 466,275	\$ 97,254	2,127	\$ 22,928
	Dairy	\$ (182,638)	\$ (40,375)	(966)	\$ (9,518)
	Total	\$ 120,146	\$ 22,113	376	\$ 5,213

	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

Tax Rates	Federal effective income tax rate	13.5%
	Federal Social Security tax rate	6.2%
	State Effective Rate	3.9%
	Total	23.6%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$4.5 billion in economic output
- 22,778 jobs
- \$997.0 million in earnings
- \$196.4 million in income taxes paid at local, state, and federal levels
- \$175.1 million in the form of property taxes

Washington's animal agriculture consumed almost 236.5 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Egg-Laying Hens (71.4 thousand tons)
- Dairy Cows (70.6 thousand tons)
- Broilers (62.0 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 2017, Washington's animal agriculture contributed the following to the economy:

- About \$4.5 billion in economic output
- \$997.0 million in household earnings
- 22,778 jobs
- \$196.4 million in income taxes

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

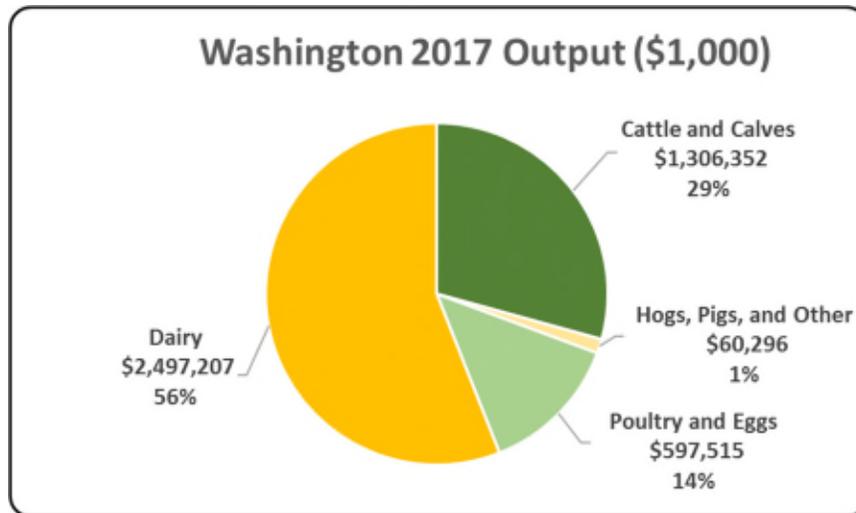
- Decreased economic output by \$338.1 million
- Reduced household earnings by \$78.5 million
- Shrunk by 1,798 jobs
- Paid \$15.5 million less in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 4,461,368	\$ (338,085)	-7.04%
Earnings (\$1,000)	\$ 996,980	\$ (78,500)	-7.30%
Employment (Jobs)	22,778	(1,798)	-7.32%
Income Taxes Paid (\$1,000)	\$ 196,405	\$ (15,465)	-7.30%
Property Taxes Paid in 2012 (\$1,000)	\$ 175,113		

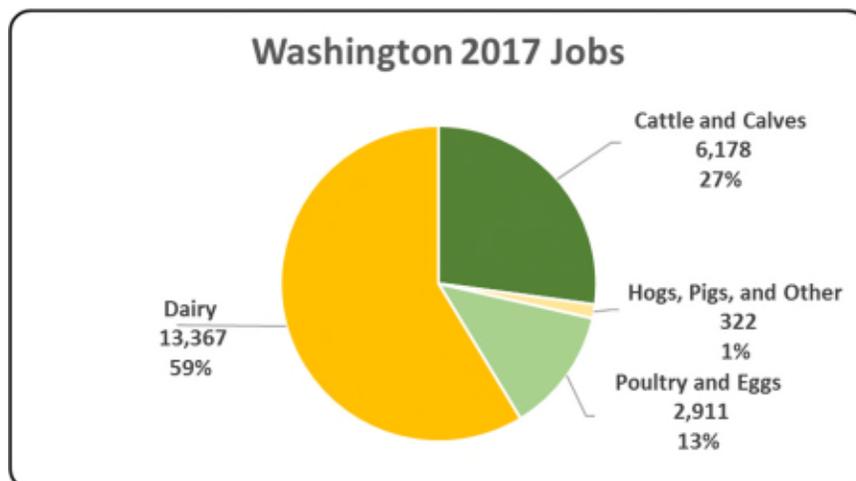
Washington Output

“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 \$4.5 billion.



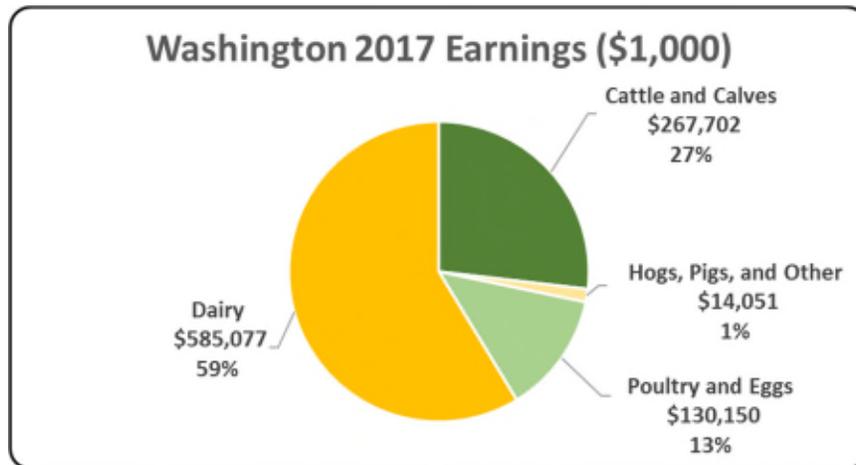
Washington Jobs

“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 22,778 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 \$997.0 million to household earnings in 2017.



Washington Taxes Paid by Animal Agriculture

Washington’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$196.4 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$175.1 million in property taxes paid by all of Washington agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



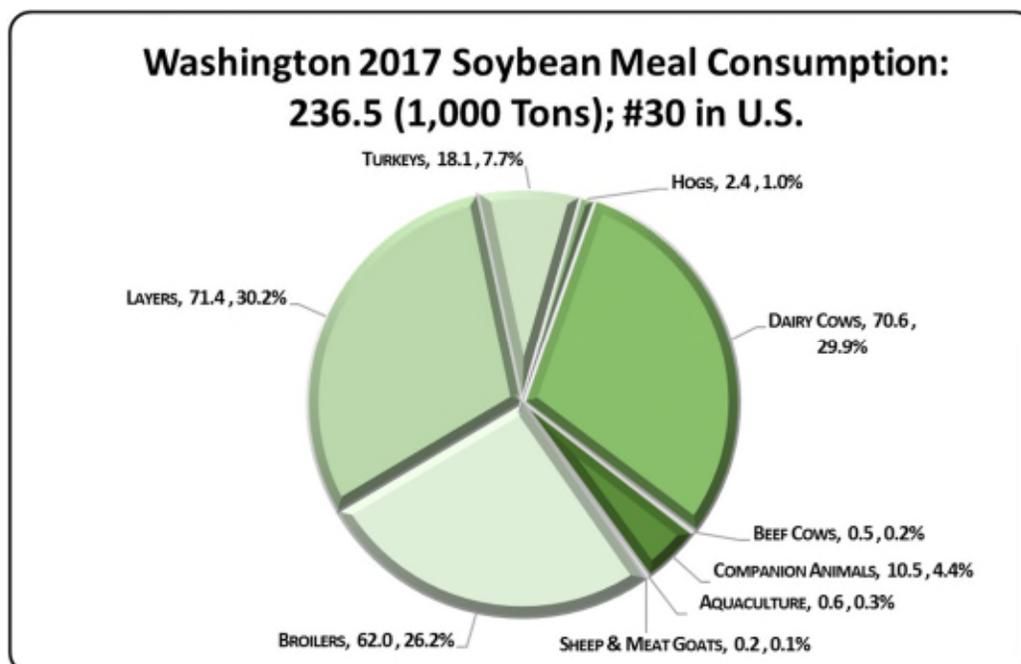
Washington Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Washington's animal agriculture consumed almost 236.5 thousand tons of soybean meal in 2017, placing the state as #30 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Washington consumed 14,643 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Egg-Laying Hens (71.4 thousand tons)
- Dairy Cows (70.6 thousand tons)
- Broilers (62.0 thousand tons)

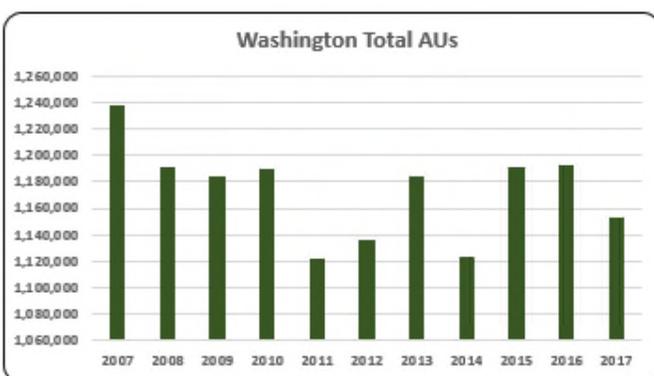
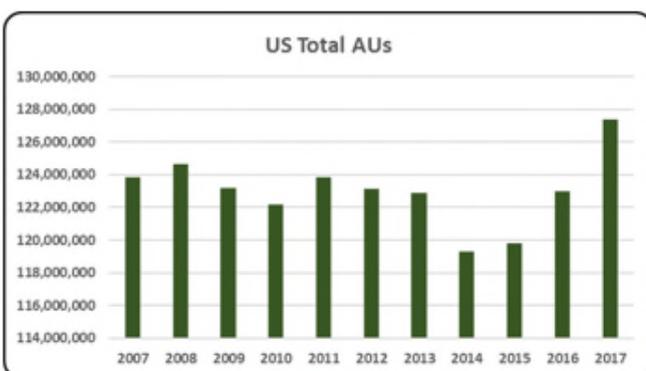


Washington Animal Unit (AU) Trends

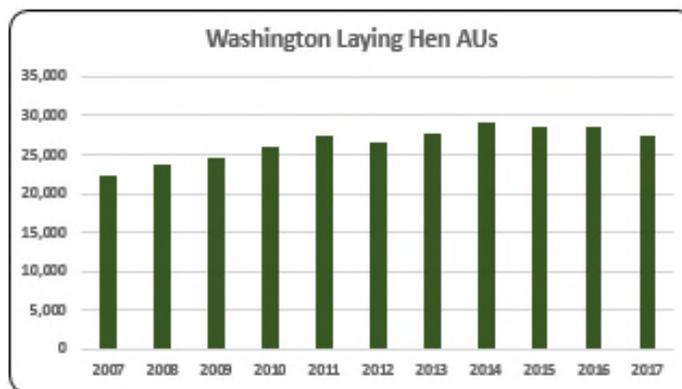
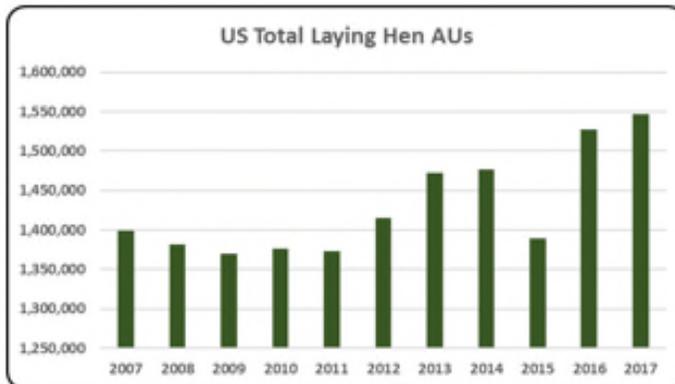
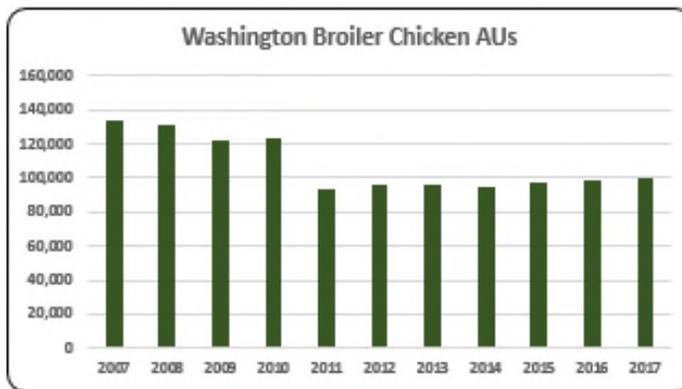
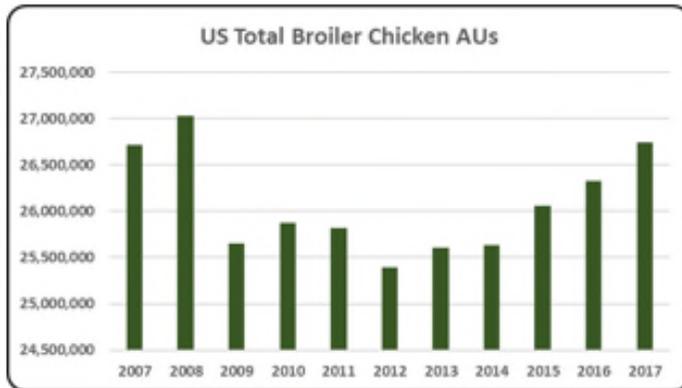
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Washington. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

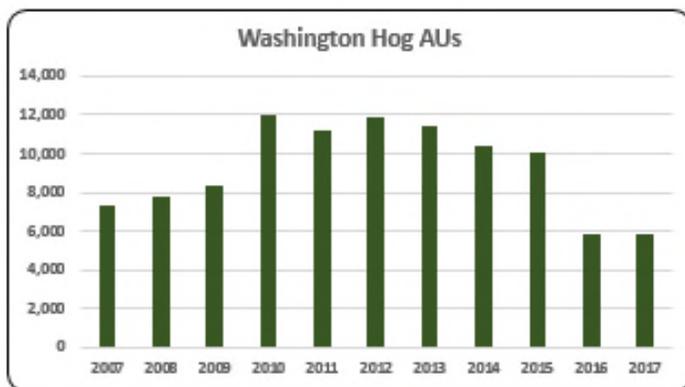
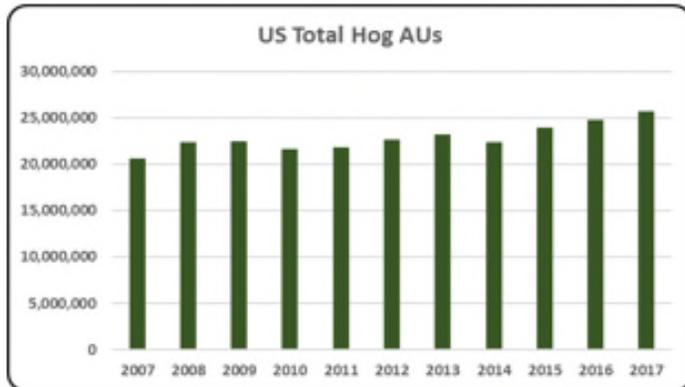
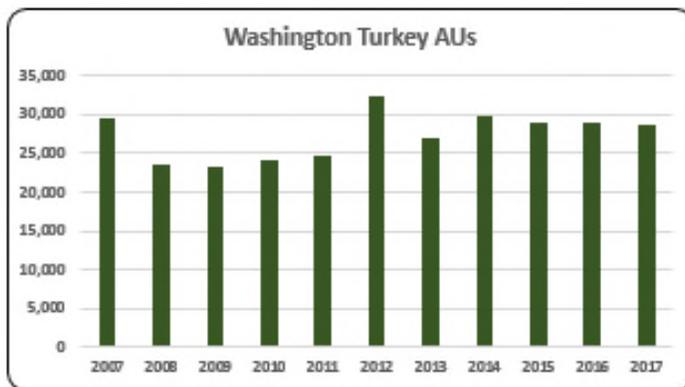
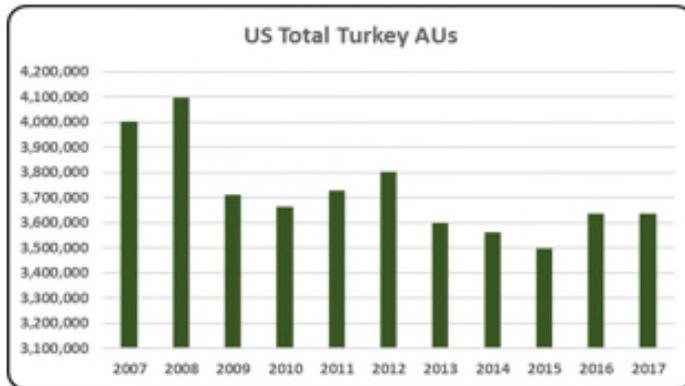
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Washington, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (605,850 AUs), Dairy Cows (385,000 AUs), and Broiler Chickens (99,858 AUs). Total animal units in Washington during 2017 were 1.2 million AUs.



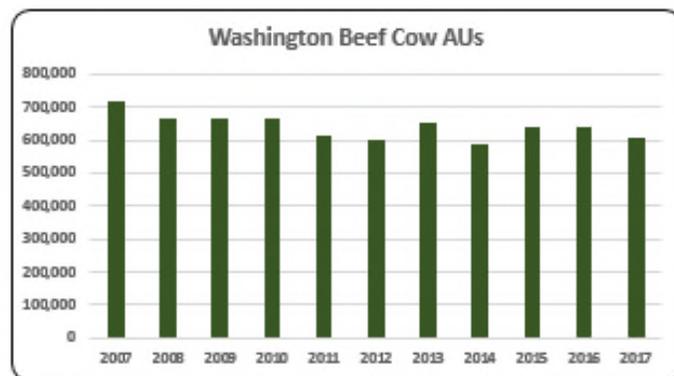
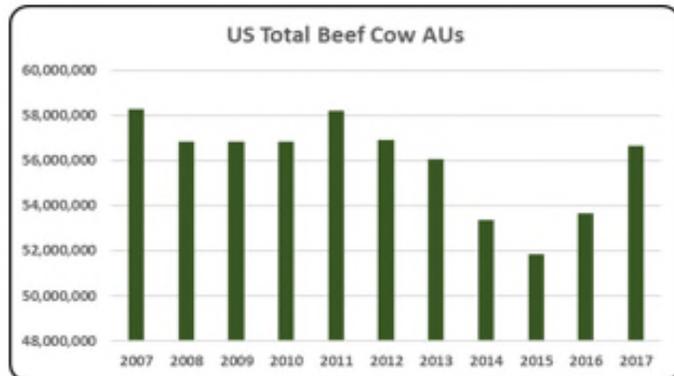
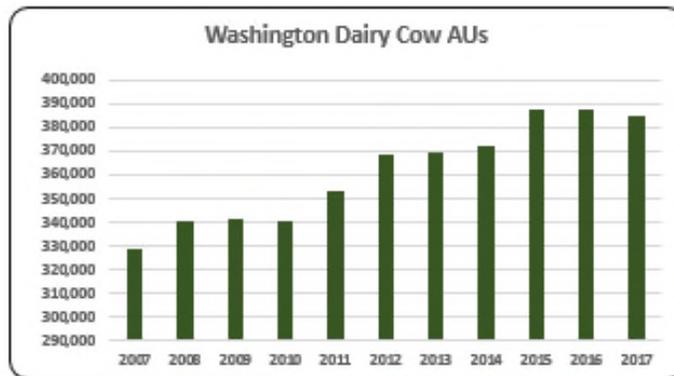
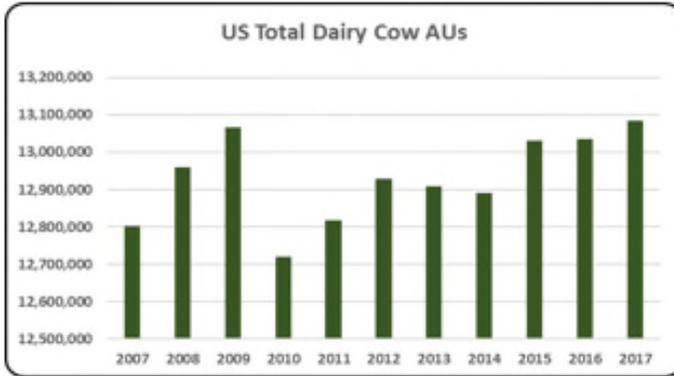
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- The state of Washington held less than 1.0% (1.15 million) of all AUs in the country. This is below the decade average of 1.17 million AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- Broiler numbers in 2017 (99,858 broiler AUs) went 25% below 2007 AU levels (133,717 broiler AUs).
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (1,480,826 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Washington’s laying hen numbers in 2017 were 27,240 layer AUs, expanding 24% compared to the layer AUs in 2007 (22,240 layer AUs).



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- Turkey AUs made up only 2.5% (28,817 turkey AUs) of the Washington total in 2017. There have been, on average, 27,374 during the last decade.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Less than 1.0% (5,850 hog AUs) of animal units were from hogs in Washington in 2017. Hog AUs in 2017 were 19.6% lower than in 2007 (7,275 hog AUs).



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- Dairy cows represented the second largest species based on animal units in Washington during the last decade. There were 385,000 dairy cow AUs in 2017 representing about 33% of all AUs in Washington.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- In terms of animal units, beef is the largest animal sector in the state of Washington from 2007 to 2017. In 2017, 53% (605,850) of all AUs were concentrated in beef cows.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	716,250	663,900	663,900	663,900	612,300	601,200	653,100	586,950	637,950	642,750	605,850
	Hog and Pig AUs	7,275	7,770	8,325	12,021	11,170	11,837	11,374	10,353	10,045	5,869	5,850
	Broiler AUs	133,717	131,632	122,387	124,033	93,460	96,138	95,802	95,258	97,717	98,453	99,858
	Turkey AUs	29,610	23,668	23,183	24,148	24,579	32,303	26,946	29,748	29,105	29,007	28,817
	Egg Layer AUs	22,240	23,728	24,692	25,972	27,312	26,591	27,658	29,095	28,631	28,544	27,572
	Dairy AUs	329,000	340,200	341,600	340,200	352,800	368,200	369,600	372,400	387,800	387,800	385,000
	Total Animal Units	1,238,092	1,190,898	1,184,087	1,190,274	1,121,620	1,136,268	1,184,480	1,123,803	1,191,248	1,192,423	1,152,948
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 574,073	\$ 494,443	\$ 467,592	\$ 566,958	\$ 587,179	\$ 658,787	\$ 715,458	\$ 805,951	\$ 848,509	\$ 704,488	\$ 664,438
	Hogs and Pigs (\$1,000)	\$ 5,329	\$ 4,526	\$ 4,377	\$ 10,645	\$ 13,390	\$ 14,777	\$ 13,526	\$ 14,073	\$ 10,586	\$ 5,805	\$ 5,910
	Broilers (\$1,000)	\$ 103,195	\$ 105,428	\$ 90,962	\$ 95,058	\$ 83,223	\$ 95,793	\$ 116,722	\$ 122,450	\$ 106,827	\$ 94,983	\$ 111,533
	Turkeys (\$1,000)	\$ 22,637	\$ 27,622	\$ 26,178	\$ 49,607	\$ 39,006	\$ 41,941	\$ 30,401	\$ 20,112	\$ 27,244	\$ 30,808	\$ 20,859
	Eggs (\$1,000)	\$ 105,372	\$ 136,448	\$ 106,499	\$ 120,732	\$ 140,429	\$ 137,149	\$ 147,396	\$ 177,074	\$ 331,830	\$ 117,086	\$ 141,321
	Milk (\$1,000)	\$ 1,061,952	\$ 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
	Other	\$ 132,613	\$ 149,880	\$ 167,907	\$ 186,840	\$ 204,901	\$ 224,703	\$ 240,048	\$ 257,976	\$ 276,451	\$ 293,259	\$ 31,399
	Sheep and Lambs (\$1,000)	\$ 4,469	\$ 4,266	\$ 4,822	\$ 6,285	\$ 6,876	\$ 9,208	\$ 7,082	\$ 7,540	\$ 8,544	\$ 7,882	\$ 7,361
	Aquaculture (\$1,000)	\$ 128,144	\$ 145,614	\$ 163,085	\$ 180,555	\$ 198,025	\$ 215,496	\$ 232,966	\$ 250,436	\$ 267,907	\$ 285,377	\$ 24,039
	Total (\$1,000)	\$ 2,005,171	\$ 1,920,843	\$ 1,547,518	\$ 1,980,062	\$ 2,345,112	\$ 2,332,674	\$ 2,562,431	\$ 3,021,909	\$ 2,737,679	\$ 2,343,680	\$ 2,163,192

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	7,436	7,393	8,200	9,008	
	Cattle feedlots (112112)	656	1,004	498	116	
	Dairy cattle and milk production (11212)	893	845	626	471	
	Hog and pig farming (1122)	299	348	567	485	
	Poultry and egg production (1123)	287	455	1,231	1,016	
	Sheep and goat farming (1124)	588	1,060	1,556	1,407	
	Animal aquaculture and other animal production (1125,1129)	3,233	6,421	8,211	5,698	
Value of Sales (\$1,000)	Cattle and Calves	654,124	709,585	716,720	994,835	
	Hogs and Pigs	8,215	6,803	5,921	4,542	
	Poultry and Eggs	170,965	143,962	228,825	261,992	
	Milk and Other Dairy Products	624,839	634,908	873,365	1,136,856	
	Aquaculture	n/a	215,130	162,867	187,222	
	Other (calculated)	86,219	37,534	50,260	25,363	
	Total	1,544,362	1,747,922	2,037,958	2,610,810	
Input Purchases	Livestock and poultry purchased	(Farms) 6,743	7,365	8,589	9,641	
		\$1,000	353,157	394,109	326,256	424,941
	Breeding livestock purchased	(Farms) n/a	3,765	4,247	4,250	
		\$1,000	n/a	26,454	37,873	36,085
	Other livestock and poultry purchased	(Farms) n/a	4,690	5,553	6,686	
		\$1,000	n/a	367,655	288,383	388,856
	Feed purchased	(Farms) 13,102	18,421	19,927	20,375	
	\$1,000	495,975	471,553	663,387	1,106,416	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,306,352	\$ 267,702	6,178	\$ 52,737
	Hogs, Pigs, and Other	\$ 60,296	\$ 14,051	322	\$ 2,768
	Poultry and Eggs	\$ 597,515	\$ 130,150	2,911	\$ 25,640
	Dairy	\$ 2,497,207	\$ 585,077	13,367	\$ 115,260
	Total	\$ 4,461,368	\$ 996,980	22,778	\$ 196,405
Change from 2007 to 2017	Cattle and Calves	\$ (18,411)	\$ (3,773)	(87)	\$ (743)
	Hogs, Pigs, and Other	\$ (201,360)	\$ (46,923)	(1,075)	\$ (9,244)
	Poultry and Eggs	\$ 5,114	\$ 1,114	25	\$ 219
	Dairy	\$ (123,427)	\$ (28,918)	(661)	\$ (5,697)
	Total	\$ (338,085)	\$ (78,500)	(1,798)	\$ (15,465)
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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			0.0%	
	Total			19.7%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 driver 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 2017 animal agriculture contributed:

- \$848.3 million in economic output
- 3,714 jobs
- \$167.1 million in earnings
- \$40.9 million in income taxes paid at local, state, and federal levels
\$21.0 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in West Virginia has increased economic output by over \$102.6 million, boosted household earnings by \$18.6 million, contributed 406 additional jobs and paid \$4.5 million in additional tax revenues.

West Virginia's animal agriculture consumed almost 190.1 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Broilers (136.0 thousand tons)
- Turkeys (32.9 thousand tons)
- Egg-Laying Hens (14.1 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 minor 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 part of West Virginia's economy. In 2017, West Virginia's animal agriculture contributed the following to the economy:

- About \$848.3 million in economic output
- \$167.1 million in household earnings
- 3,714 jobs
- \$40.9 million in income taxes

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

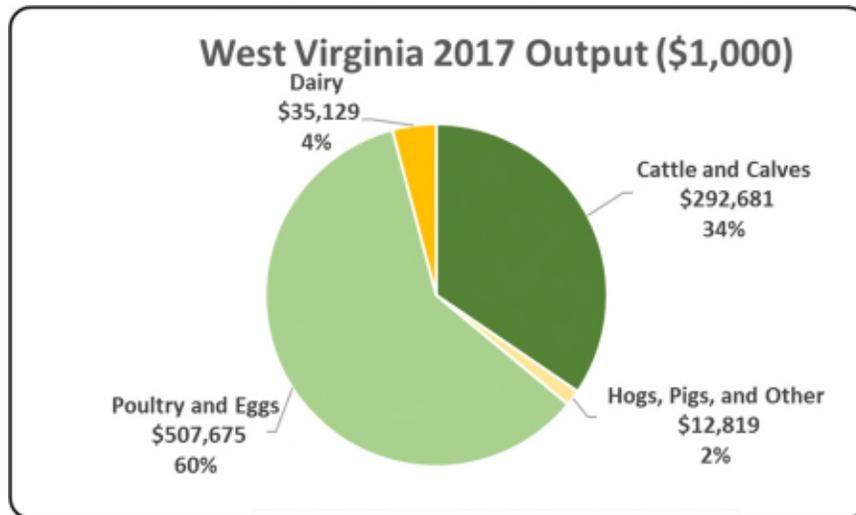
- Increased economic output by \$102.6 million
- Boosted household earnings by \$18.6 million
- Added 406 jobs
- Paid an additional \$4.5 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 848,305	\$ 102,576	13.76%
Earnings (\$1,000)	\$ 167,103	\$ 18,597	12.52%
Employment (Jobs)	3,714	406	12.26%
Income Taxes Paid (\$1,000)	\$ 40,857	\$ 4,547	12.52%
Property Taxes Paid in 2012 (\$1,000)	\$ 21,036		

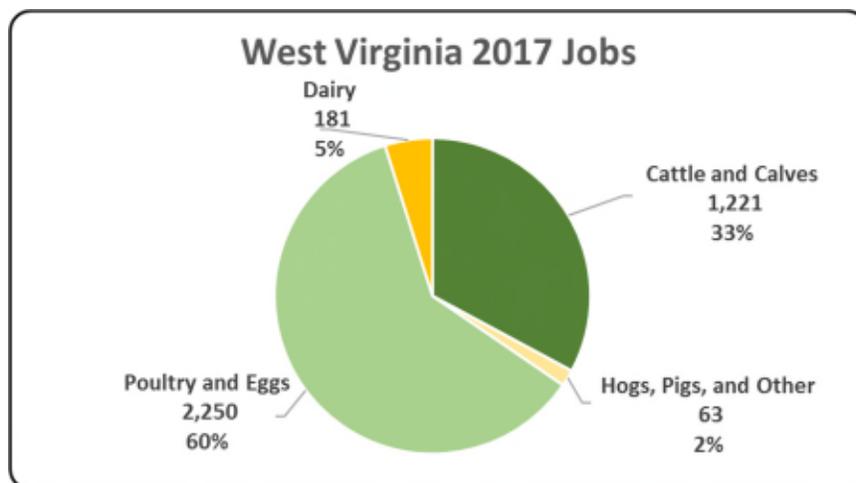
West Virginia Output

“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 West Virginia economy. Animal agriculture’s impact on West Virginia total economic output is about \$848.3 million.



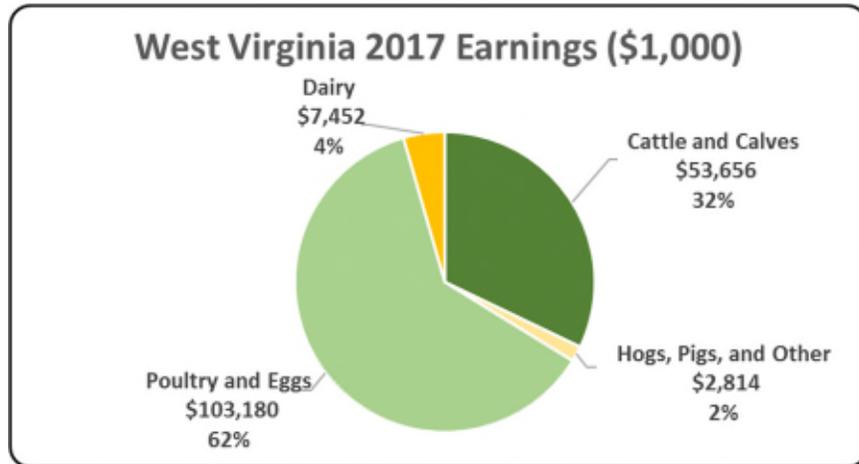
West Virginia Jobs

“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 3,714 jobs within and outside of animal agriculture.



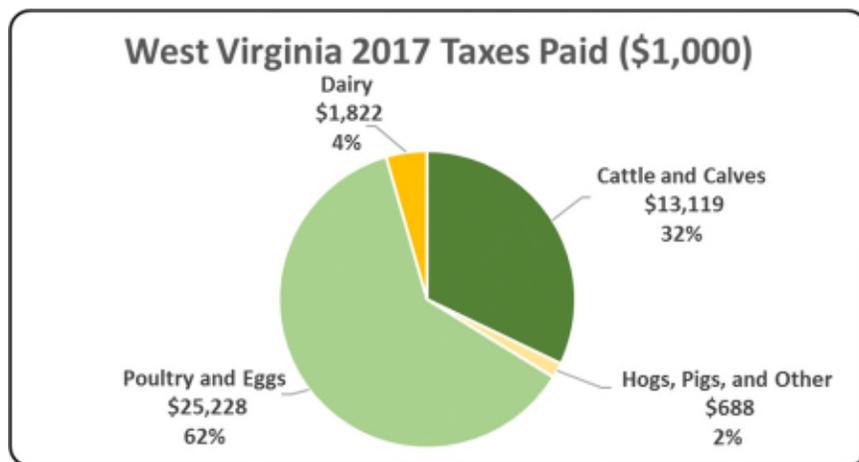
West Virginia Earnings

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 West Virginia economy in terms of earnings. West Virginia’s animal agriculture contributed about \$167.1 million to household earnings in 2017.



West Virginia Taxes Paid by Animal Agriculture

West Virginia’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$40.9 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$21.0 million in property taxes paid by all of West Virginia agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



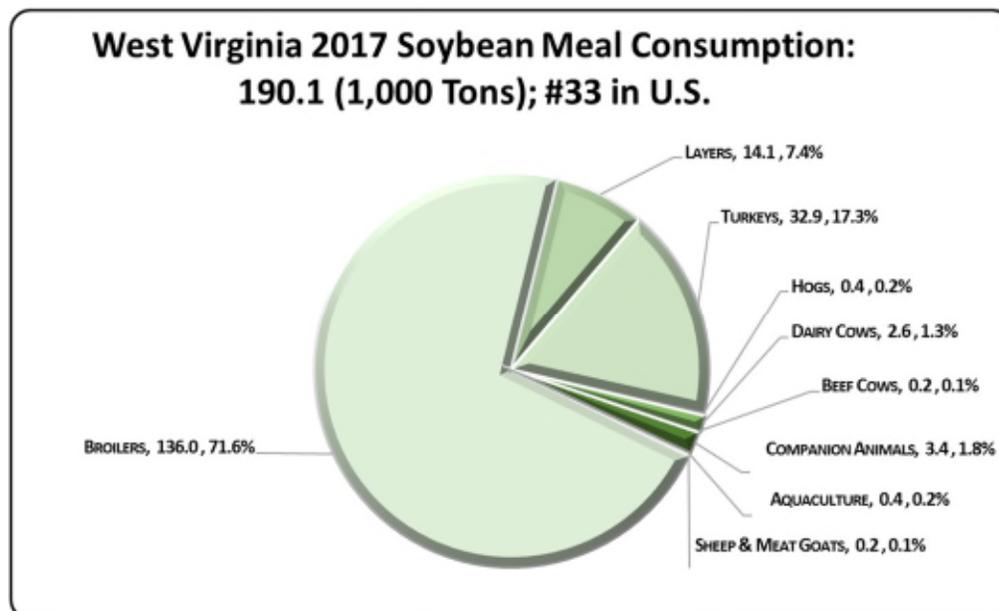
West Virginia Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

West Virginia's animal agriculture consumed almost 190.1 thousand tons of soybean meal in 2017, placing the state as #33 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in West Virginia consumed 3,299 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Broilers (136.0 thousand tons)
- Turkeys (32.9 thousand tons)
- Egg-Laying Hens (14.1 thousand tons)

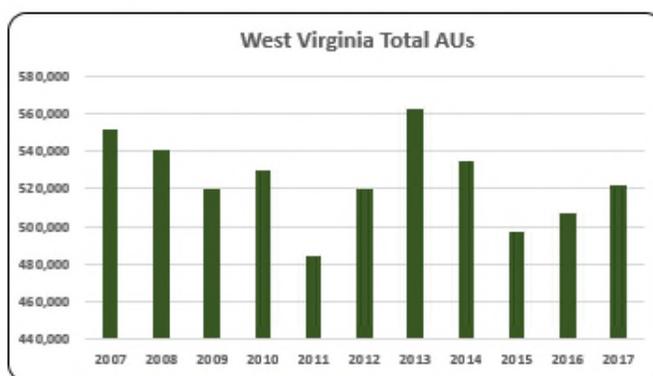
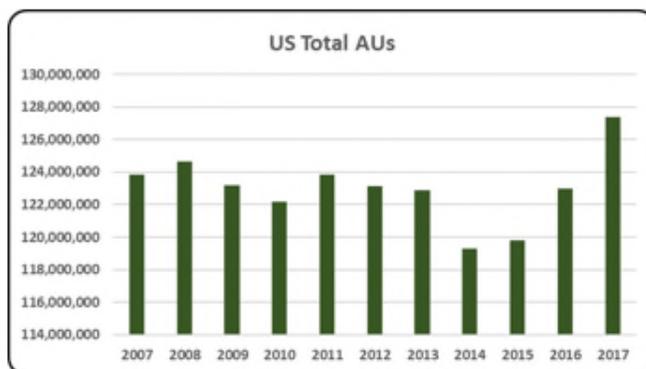


West Virginia Animal Unit (AU) Trends

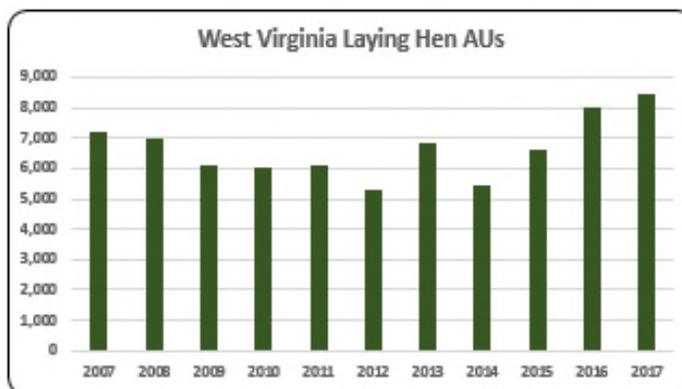
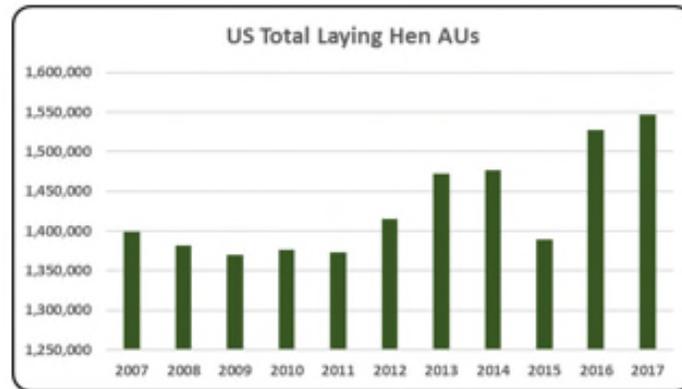
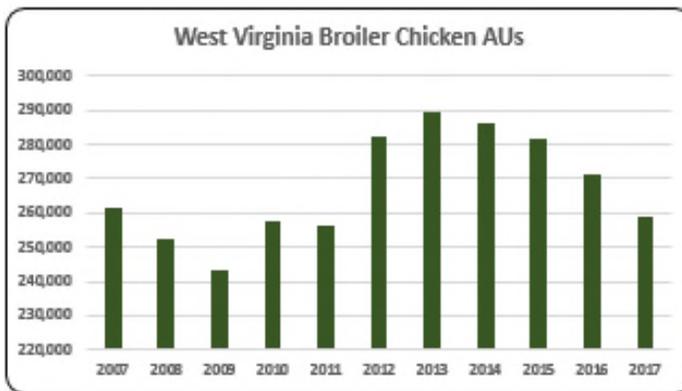
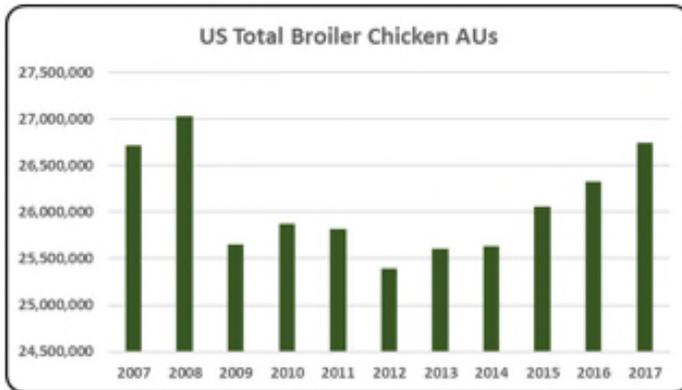
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of West Virginia. Due to this reality, using a single year as a measure of the presence and strength of a sector 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.

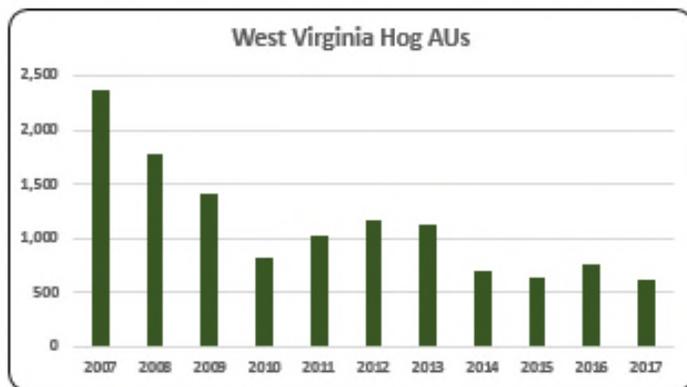
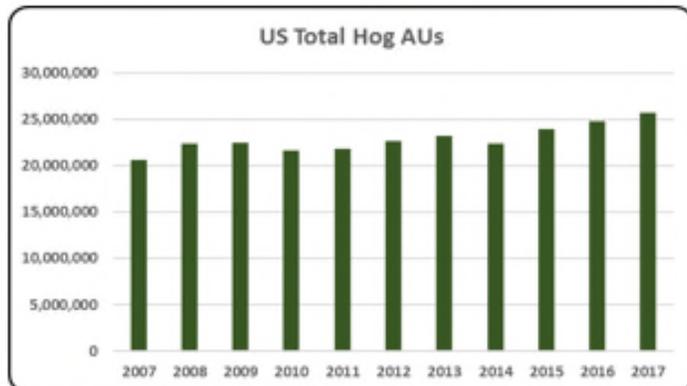
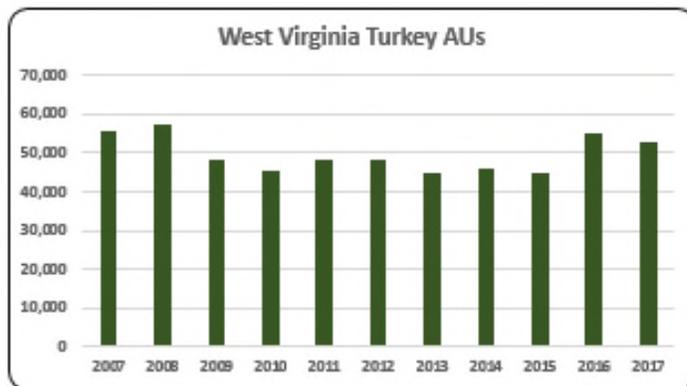
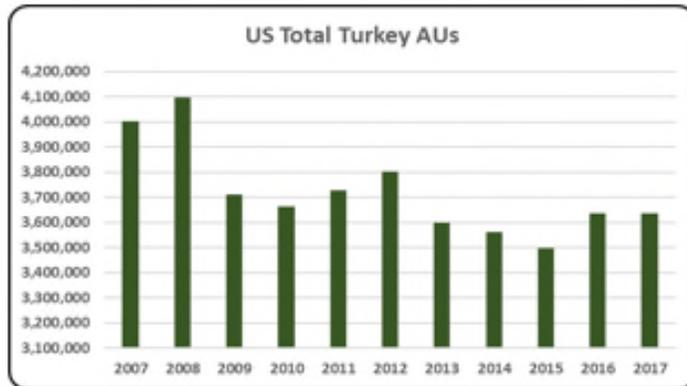
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In West Virginia, the largest three segments of animal agriculture in terms of AUs during 2017 were: Broiler Chickens (258,772 AUs), Beef Cows (190,275 AUs), and Turkeys (52,945 AUs). Total animal units in West Virginia during 2017 were 522,230 AUs.



- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 522,230 AUs in West Virginia in 2017 representing only 0.4% of the U.S. total, and 2,000 units below the decade average.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- On average, there were 267,463 broiler AUs from 2007 to 2017. Broiler production fell 1% in 2017 compared to 2007.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hen animal units increased 17% from 7,183 laying hen AUs in 2007 to 8,423 laying hen AUs in 2017.

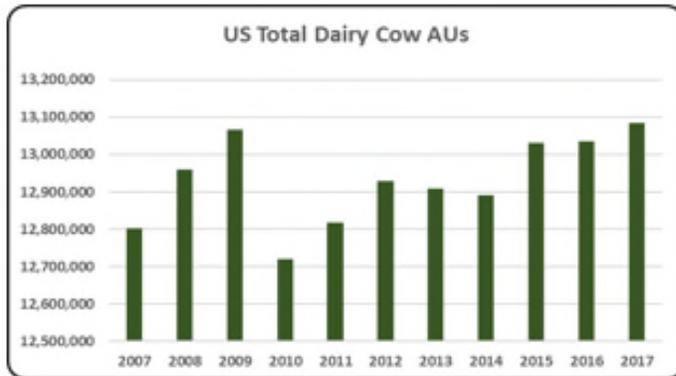


- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.

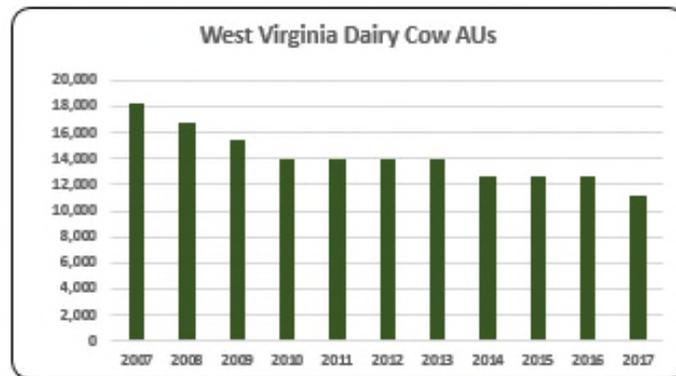
- Turkey AUs in West Virginia shrank by 5% over the last decade to 52,945 in 2017. Turkeys make up 10% of all of the AUs in the state.

- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.

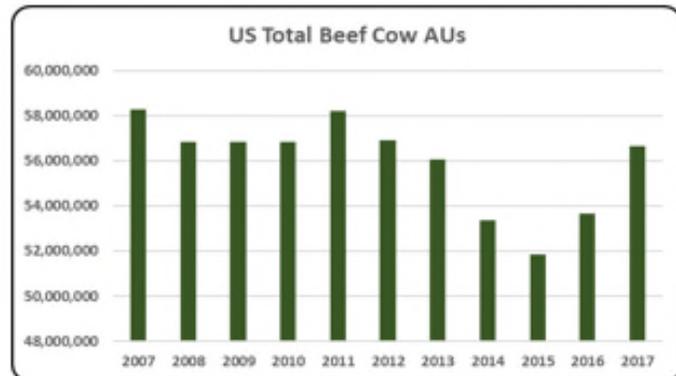
- Hog AUs declined 74% from the high level at the beginning of the decade (2,370 hog AUs) to the one of the lowest levels of the decade in 2017 (615 hog AUs).



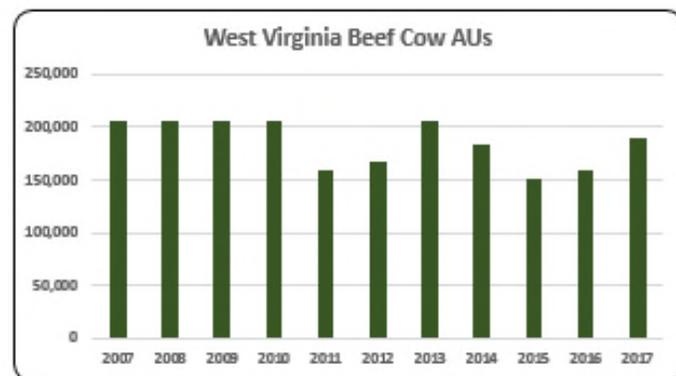
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- There were 11,200 dairy cow AUs in West Virginia in 2017. Dairy cow AUs in 2017 were 38% below 2007 (18,200 dairy cow AUs).



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- 36% (190,275) of all 2017 AUs in West Virginia were concentrated in beef cows. Beef cow AUs decreased 8% from 2007 to 2017.

West Virginia Additional Information and Methodology

Animal agriculture is an important 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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	206,700	205,350	205,350	205,350	158,850	168,330	206,385	183,750	151,125	159,525	190,275
	Hog and Pig AUs	2,370	1,785	1,410	825	1,020	1,170	1,125	705	630	765	615
	Broiler AUs	261,460	252,694	243,337	257,790	256,587	282,544	289,444	286,427	281,623	271,415	258,772
	Turkey AUs	55,867	57,369	48,356	45,349	48,202	48,206	44,897	46,185	44,608	54,951	52,945
	Egg Layer AUs	7,183	6,978	6,104	6,063	6,099	5,300	6,862	5,468	6,579	7,991	8,423
	Dairy AUs	18,200	16,800	15,400	14,000	14,000	14,000	14,000	12,600	12,600	12,600	11,200
	Total Animal Units	551,781	540,977	519,956	529,377	484,758	519,550	562,713	535,135	497,165	507,247	522,230
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 97,904	\$ 103,023	\$ 100,171	\$ 106,340	\$ 141,611	\$ 170,343	\$ 170,384	\$ 217,215	\$ 220,334	\$ 172,920	\$ 175,922
	Hogs and Pigs (\$1,000)	\$ 1,630	\$ 1,193	\$ 1,117	\$ 699	\$ 1,298	\$ 1,497	\$ 1,184	\$ 939	\$ 756	\$ 812	\$ 651
	Broilers (\$1,000)	\$ 160,020	\$ 161,644	\$ 151,176	\$ 166,772	\$ 156,794	\$ 188,000	\$ 233,816	\$ 236,773	\$ 191,582	\$ 168,352	\$ 182,675
	Turkeys (\$1,000)	\$ 50,216	\$ 55,109	\$ 41,548	\$ 47,617	\$ 60,089	\$ 61,868	\$ 51,511	\$ 60,535	\$ 73,794	\$ 91,426	\$ 70,766
	Eggs (\$1,000)	\$ 32,723	\$ 30,275	\$ 28,183	\$ 38,911	\$ 39,398	\$ 40,760	\$ 46,209	\$ 55,887	\$ 54,603	\$ 55,890	\$ 50,120
	Milk (\$1,000)	\$ 38,610	\$ 34,028	\$ 20,898	\$ 26,533	\$ 32,656	\$ 29,260	\$ 30,856	\$ 34,160	\$ 24,675	\$ 21,574	\$ 22,860
	Other	\$ 3,449	\$ 3,361	\$ 3,227	\$ 4,099	\$ 4,239	\$ 5,152	\$ 4,470	\$ 4,670	\$ 5,323	\$ 5,472	\$ 8,904
	Sheep and Lambs (\$1,000)	\$ 2,189	\$ 2,044	\$ 1,852	\$ 2,667	\$ 2,750	\$ 3,605	\$ 2,866	\$ 3,008	\$ 3,604	\$ 3,696	\$ 3,530
	Aquaculture (\$1,000)	\$ 1,260	\$ 1,317	\$ 1,375	\$ 1,432	\$ 1,489	\$ 1,547	\$ 1,604	\$ 1,661	\$ 1,719	\$ 1,776	\$ 5,374
	Total (\$1,000)	\$ 384,552	\$ 388,633	\$ 346,320	\$ 390,971	\$ 436,085	\$ 496,879	\$ 538,431	\$ 610,179	\$ 571,067	\$ 516,447	\$ 511,897

Ag Census Data Category	Animal Type	1997	2002	2007	2012
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	10,276	9,878	10,481	9,430
	Cattle feedlots (112112)	467	379	297	153
	Dairy cattle and milk production (11212)	249	278	165	155
	Hog and pig farming (1122)	124	217	335	170
	Poultry and egg production (1123)	428	520	1,113	680
	Sheep and goat farming (1124)	364	631	968	693
	Animal aquaculture and other animal production (1125,1129)	1,036	2,328	2,635	1,848
Value of Sales (\$1,000)	Cattle and Calves	117,505	117,967	164,962	217,411
	Hogs and Pigs	2,719	1,992	2,089	withheld
	Poultry and Eggs	226,607	250,922	301,708	401,439
	Milk and Other Dairy Products	35,534	32,202	31,386	32,654
	Aquaculture	n/a	2,712	3,478	withheld
	Other (calculated)	8,058	7,326	9,734	6,410
	Total	390,423	413,121	513,357	657,914
Input Purchases	Livestock and poultry purchased	(Farms) 5,481	5,911	5,845	6,198
		\$1,000 63,068	63,817	96,910	128,271
	Breeding livestock purchased	(Farms) n/a	3,255	2,800	3,343
		\$1,000 n/a	8,075	8,821	22,374
	Other livestock and poultry purchased	(Farms) n/a	3,393	3,814	3,820
		\$1,000 n/a	55,742	88,089	105,897
Feed purchased	(Farms) 10,508	14,291	14,027	15,066	
	\$1,000 154,556	130,696	177,847	327,286	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 292,681	\$ 53,656	1,221	\$ 13,119
	Hogs, Pigs, and Other	\$ 12,819	\$ 2,814	63	\$ 688
	Poultry and Eggs	\$ 507,675	\$ 103,180	2,250	\$ 25,228
	Dairy	\$ 35,129	\$ 7,452	181	\$ 1,822
	Total	\$ 848,305	\$ 167,103	3,714	\$ 40,857
Change from 2007 to 2017	Cattle and Calves	\$ 101,502	\$ 18,608	423	\$ 4,550
	Hogs, Pigs, and Other	\$ 4,822	\$ 1,058	24	\$ 259
	Poultry and Eggs	\$ 30,763	\$ 6,252	136	\$ 1,529
	Dairy	\$ (34,510)	\$ (7,321)	(178)	\$ (1,790)
	Total	\$ 102,576	\$ 18,597	406	\$ 4,547
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				13.5%
	Federal Social Security tax rate				6.2%
	State Effective Rate				4.8%
	Total				24.5%

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 2017 animal agriculture contributed:

- \$17.6 billion in economic output
- 106,251 jobs
- \$4.0 billion in earnings
- \$1.0 billion in income taxes paid at local, state, and federal levels
- \$311.2 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Wisconsin has increased economic output by almost \$1.8 billion, boosted household earnings by \$363.3 million, contributed 9,539 additional jobs and paid \$92.7 million in additional tax revenues.

Wisconsin's animal agriculture consumed almost 607.4 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Dairy Cows (383.7 thousand tons)
- Broilers (99.5 thousand tons)
- Egg-Laying Hens (40.8 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 2017, Wisconsin's animal agriculture contributed the following to the economy:

- About \$17.6 billion in economic output
- \$4.0 billion in household earnings
- 106,251 jobs
- \$1.0 billion in income taxes

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

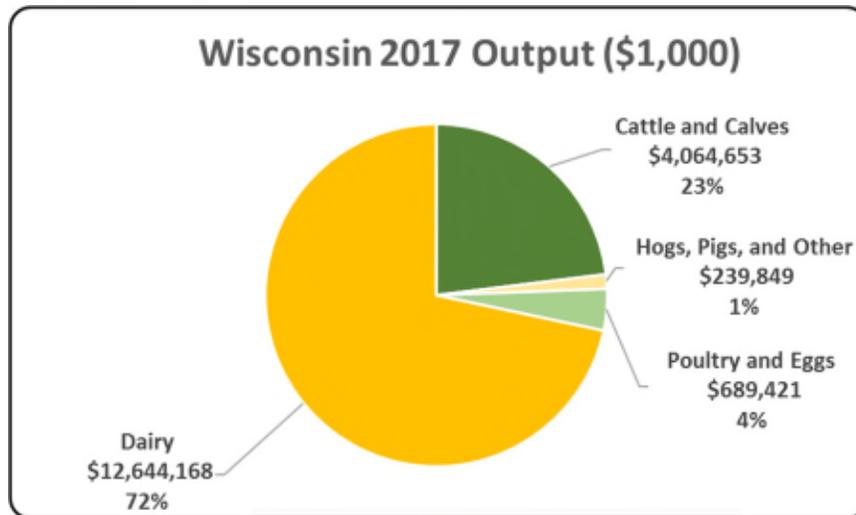
- Increased economic output by \$1.8 billion
- Boosted household earnings by \$363.3 million
- Added 9,539 jobs
- Paid an additional \$92.7 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 17,638,090	\$ 1,750,466	11.02%
Earnings (\$1,000)	\$ 3,974,085	\$ 363,305	10.06%
Employment (Jobs)	106,251	9,539	9.86%
Income Taxes Paid (\$1,000)	\$ 1,014,385	\$ 92,734	10.06%
Property Taxes Paid in 2012 (\$1,000)	\$ 311,228		

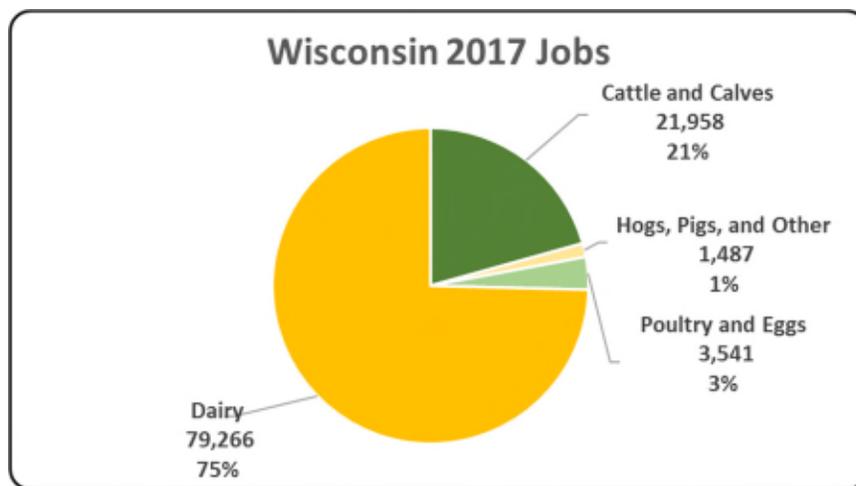
Wisconsin Output

“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 \$17.6 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 106,251 jobs within and outside of animal agriculture.



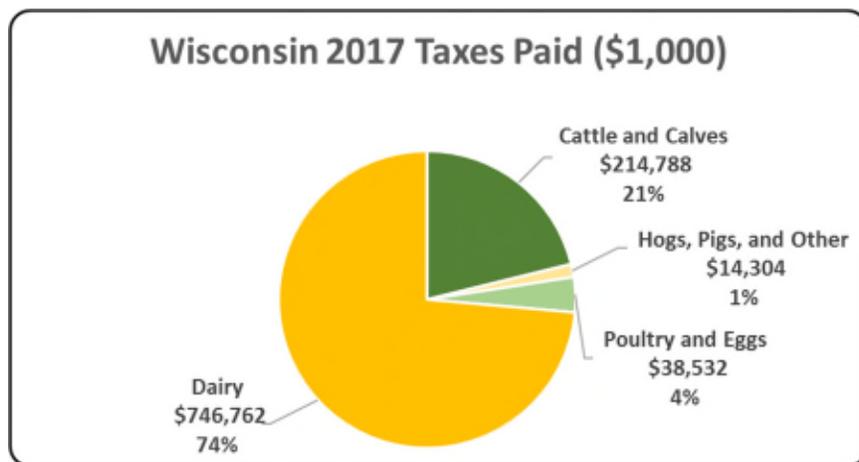
Wisconsin Earnings

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 \$4.0 billion to household earnings in 2017.



Wisconsin Taxes Paid by Animal Agriculture

Wisconsin’s animal agriculture is also a significant source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$1.0 billion in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$311.2 million in property taxes paid by all of Wisconsin agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



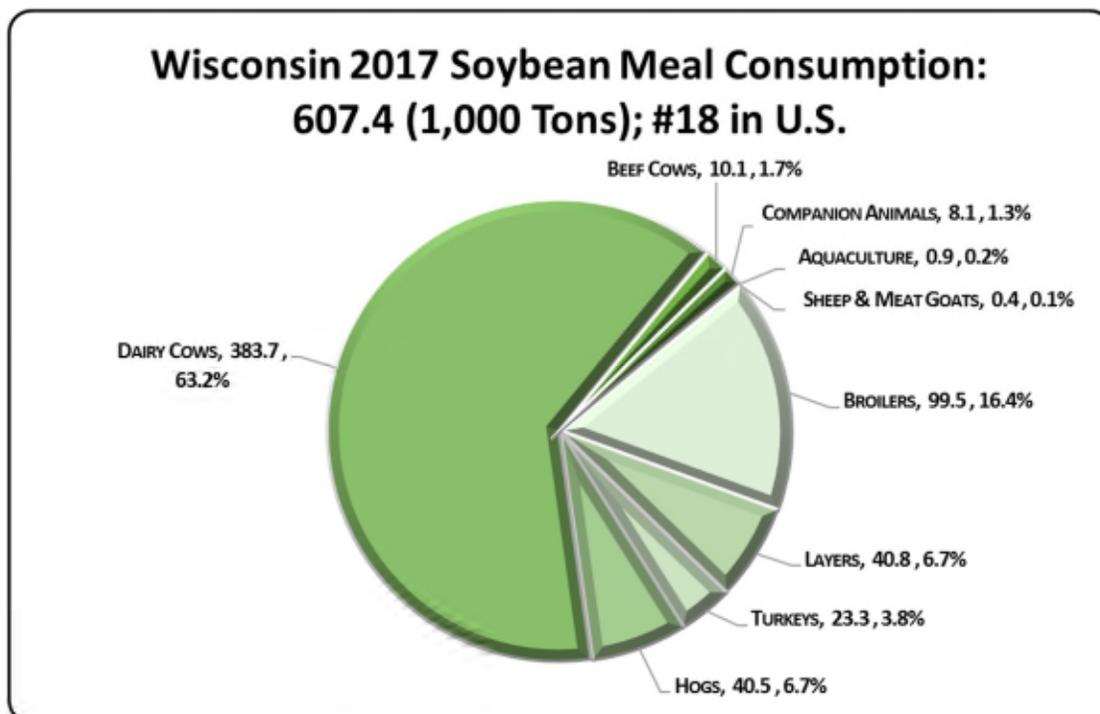
Wisconsin Animal Agriculture Soybean Meal Consumption

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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Wisconsin's animal agriculture consumed almost 607.4 thousand tons of soybean meal in 2017, placing the state as #18 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Wisconsin consumed 369,650 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Dairy Cows (383.7 thousand tons)
- Broilers (99.5 thousand tons)
- Egg-Laying Hens (40.8 thousand tons)

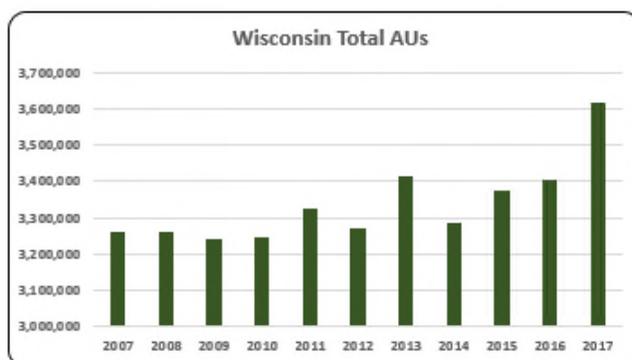
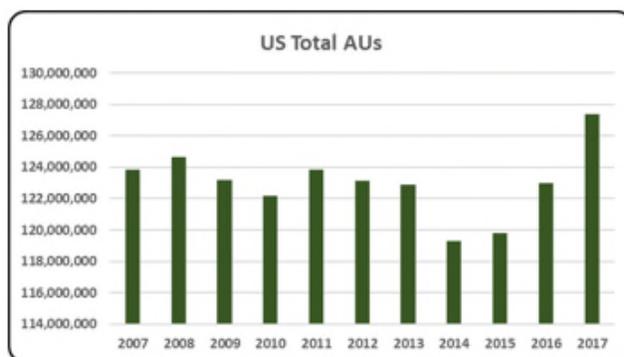


Wisconsin Animal Unit (AU) Trends

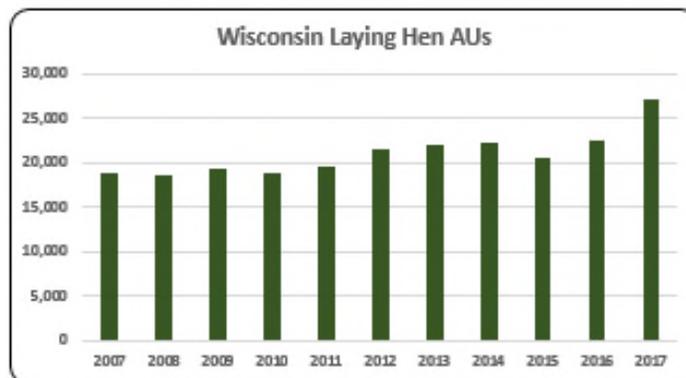
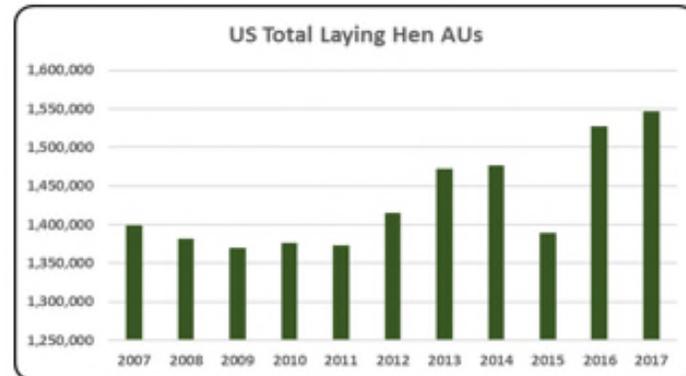
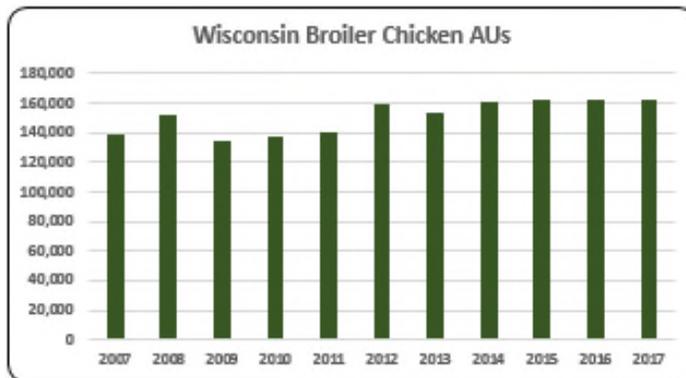
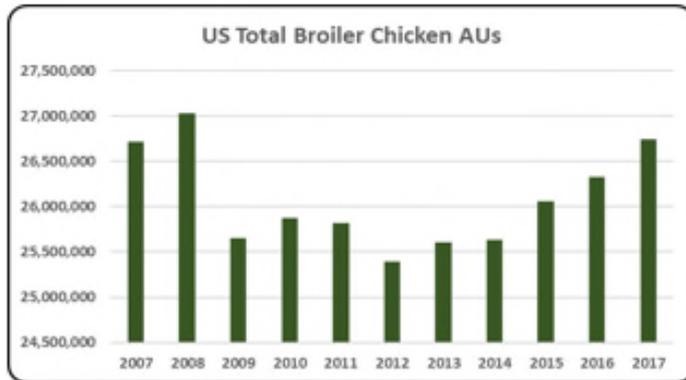
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Wisconsin. Due to this reality, using a single year as a measure of the presence and strength of a sector can 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.

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.

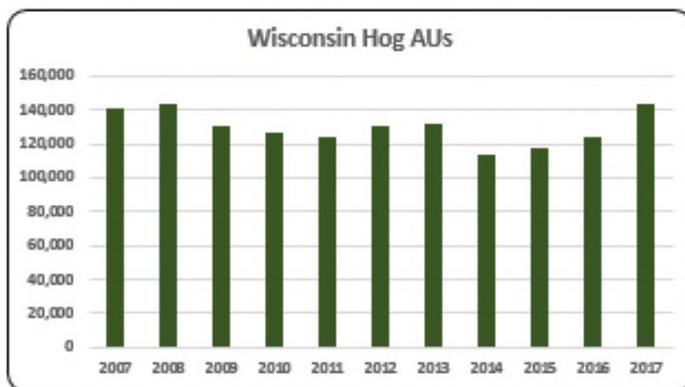
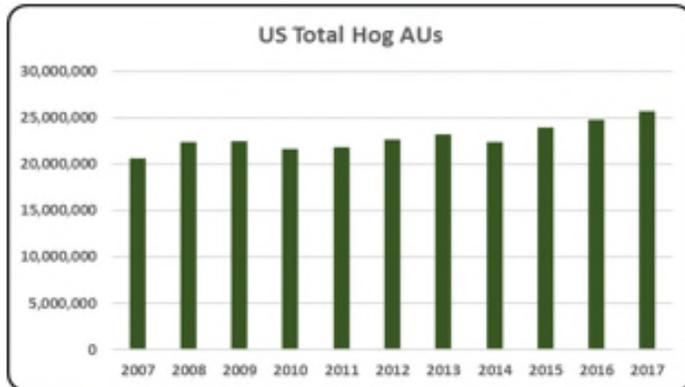
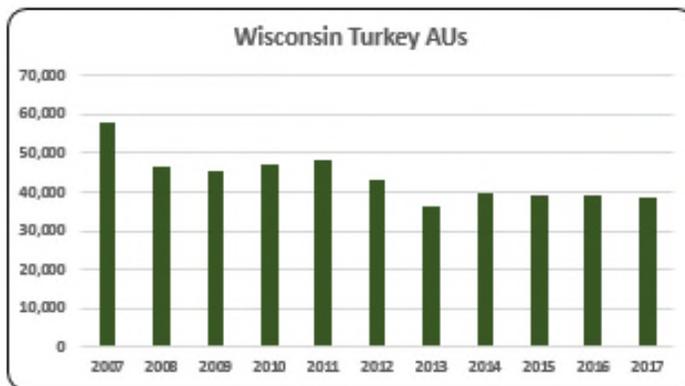
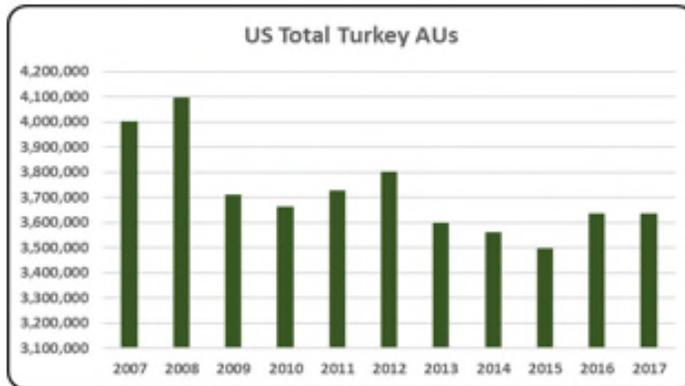
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Wisconsin, the largest three segments of animal agriculture in terms of AUs during 2017 were: Dairy Cows (1.8 million AUs), Beef Cows (1.5 million AUs), and Broiler Chickens (161,695 AUs). Total animal units in Wisconsin during 2017 were 3.6 million AUs.



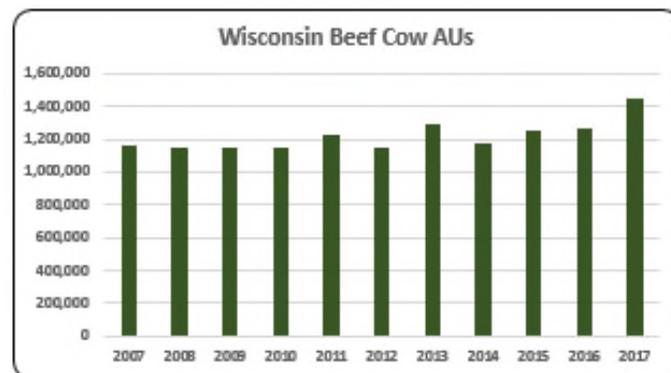
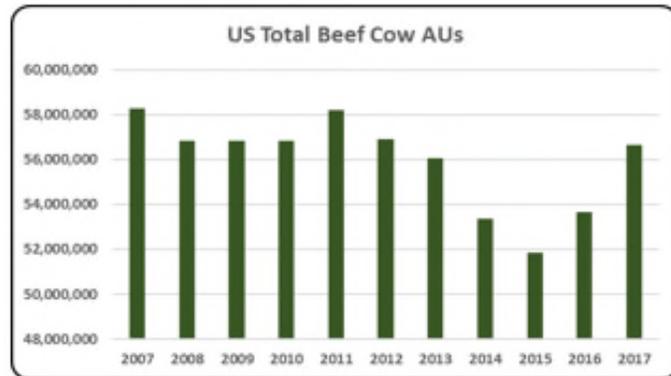
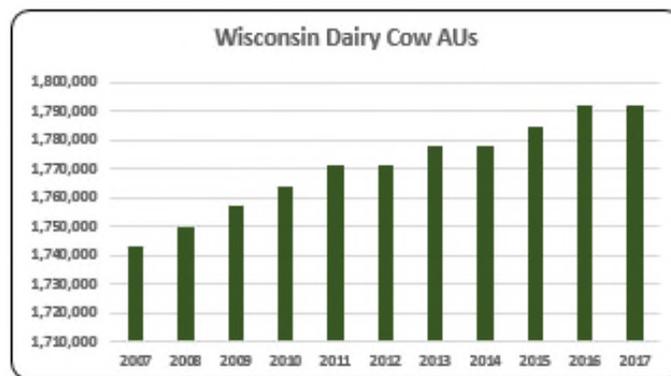
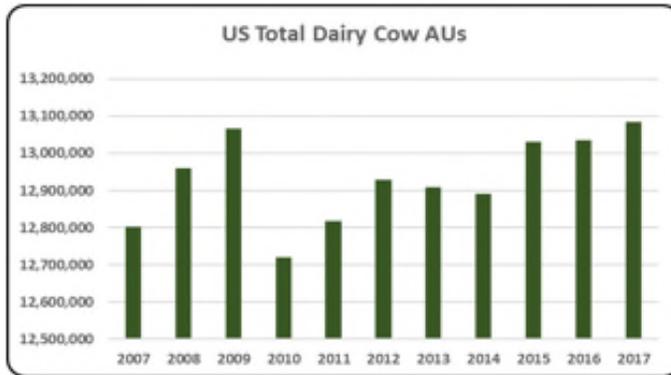
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 3.6 million AUs in Wisconsin in 2017 representing about 2.8% of all AUs in the U.S. AUs increased 10.8% in 2017 relative to 2007's 3.3 million AUs.



- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- On average, there were 151,169 broiler AUs in Wisconsin from 2007 to 2017. Broiler AUs in 2017 (161,695 broiler AUs) rose 16% compared to 2007 (139,112 broiler AUs).
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (19,174 AUs). Growth slowed slightly 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 during last decade with only 0.8% (27,160 layer AUs) of the total animal units in 2017.



- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- There were 43,747 turkey AUs on average during the last decade. 2017 turkey AUs (38,681) declined 33% from 2007 turkey AUs.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- In 2017, Wisconsin was home to 144,075 hog AUs. The average number of hog AUs throughout the decade was 129,890.



- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.
- With the second largest dairy cow numbers in the country, Wisconsin accounted for 13.7% (1.79 million dairy AUs) of all dairy cows in the U.S. in 2017. This is 50% of the state's AUs.
- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.
- Beef cow AUs made up 40% (1.45 million) of all AUs in Wisconsin in 2017. Beef cow AUs, in 2017, rose 25% compared to 2007.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,162,350	1,152,000	1,152,000	1,152,000	1,225,185	1,144,635	1,292,595	1,169,790	1,248,540	1,266,540	1,451,835
	Hog and Pig AUs	141,510	143,700	130,845	126,165	124,050	130,350	132,150	114,300	118,050	123,600	144,075
	Broiler AUs	139,112	152,442	134,762	136,841	139,710	159,006	154,190	160,495	162,001	162,608	161,695
	Turkey AUs	57,966	46,334	45,385	47,274	48,117	43,359	36,170	39,930	39,068	38,936	38,681
	Egg Layer AUs	18,780	18,728	19,444	18,880	19,512	21,629	21,971	22,263	20,546	22,601	27,160
	Dairy AUs	1,743,000	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
	Total Animal Units	3,262,718	3,263,204	3,239,437	3,245,160	3,327,575	3,269,980	3,415,075	3,284,778	3,373,204	3,406,285	3,615,446
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 819,104	\$ 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
	Hogs and Pigs (\$1,000)	\$ 108,595	\$ 107,923	\$ 90,766	\$ 110,277	\$ 135,219	\$ 122,921	\$ 128,999	\$ 122,464	\$ 106,577	\$ 98,594	\$ 123,294
	Broilers (\$1,000)	\$ 91,530	\$ 99,866	\$ 87,927	\$ 95,243	\$ 89,643	\$ 111,100	\$ 130,809	\$ 142,879	\$ 121,803	\$ 108,602	\$ 122,944
	Turkeys (\$1,000)	\$ 58,118	\$ 70,916	\$ 67,209	\$ 97,114	\$ 76,362	\$ 82,106	\$ 59,515	\$ 39,373	\$ 36,569	\$ 41,353	\$ 27,999
	Eggs (\$1,000)	\$ 89,263	\$ 102,910	\$ 78,301	\$ 78,316	\$ 85,397	\$ 101,214	\$ 115,879	\$ 129,992	\$ 187,719	\$ 79,083	\$ 103,278
	Milk (\$1,000)	\$ 4,647,440	\$ 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
	Other	\$ 12,248	\$ 11,634	\$ 12,012	\$ 14,129	\$ 13,502	\$ 13,316	\$ 11,285	\$ 11,842	\$ 12,709	\$ 11,472	\$ 16,486
	Sheep and Lambs (\$1,000)	\$ 5,653	\$ 5,255	\$ 5,848	\$ 8,180	\$ 7,769	\$ 7,798	\$ 5,982	\$ 6,754	\$ 7,836	\$ 6,814	\$ 6,874
	Aquaculture (\$1,000)	\$ 6,595	\$ 6,379	\$ 6,164	\$ 5,949	\$ 5,734	\$ 5,518	\$ 5,303	\$ 5,088	\$ 4,873	\$ 4,657	\$ 9,612
	Total (\$1,000)	\$ 5,826,298	\$ 5,796,711	\$ 4,350,727	\$ 5,447,376	\$ 6,854,216	\$ 7,004,156	\$ 7,487,598	\$ 9,167,028	\$ 7,717,275	\$ 7,006,297	\$ 7,569,269

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	9,469	9,852	11,593	10,241	
	Cattle feedlots (112112)	2,540	3,749	2,485	892	
	Dairy cattle and milk production (11212)	20,958	16,096	13,081	10,401	
	Hog and pig farming (1122)	1,179	759	989	475	
	Poultry and egg production (1123)	466	910	2,297	1,591	
	Sheep and goat farming (1124)	805	1,117	1,501	1,555	
	Animal aquaculture and other animal production (1125,1129)	2,864	6,347	5,816	4,814	
Value of Sales (\$1,000)	Cattle and Calves	702,854	834,895	1,014,553	1,416,881	
	Hogs and Pigs	156,106	79,836	100,309	90,589	
	Poultry and Eggs	242,238	224,968	375,284	465,717	
	Milk and Other Dairy Products	2,800,298	2,651,018	4,573,294	4,952,039	
	Aquaculture	5,226	14,262	14,182	13,847	
	Other (calculated)	132,891	128,225	220,410	192,404	
	Total	4,039,613	3,933,204	6,298,032	7,131,477	
Input Purchases	Livestock and poultry purchased	(Farms) 22,888	21,117	19,948	19,759	
		\$1,000	306,830	294,121	356,954	454,402
	Breeding livestock purchased	(Farms) <i>n/a</i>	12,329	10,799	10,907	
		\$1,000	<i>n/a</i>	108,518	139,475	186,105
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	11,343	11,816	11,748	
		\$1,000	<i>n/a</i>	185,603	217,479	268,297
Feed purchased	(Farms)	39,355	43,074	38,826	39,784	
	\$1,000	847,206	785,165	1,091,862	2,066,721	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 4,064,653	\$ 841,480	21,958	\$ 214,788
	Hogs, Pigs, and Other	\$ 239,849	\$ 56,038	1,487	\$ 14,304
	Poultry and Eggs	\$ 689,421	\$ 150,956	3,541	\$ 38,532
	Dairy	\$ 12,644,168	\$ 2,925,610	79,266	\$ 746,762
	Total	\$ 17,638,090	\$ 3,974,085	106,251	\$ 1,014,385
Change from 2007 to 2017	Cattle and Calves	\$ 1,748,734	\$ 362,030	9,447	\$ 92,408
	Hogs, Pigs, and Other	\$ (3,527)	\$ (824)	(22)	\$ (210)
	Poultry and Eggs	\$ (71,038)	\$ (15,554)	(365)	\$ (3,970)
	Dairy	\$ 76,296	\$ 17,653	478	\$ 4,506
	Total	\$ 1,750,466	\$ 363,305	9,539	\$ 92,734
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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			5.8%	
	Total			25.5%	

Sources: 1997, 2002, 2007 and 2012 Census of Agriculture, USDA/NASS Survey Data, RIMS II Multipliers (U.S. Bureau of Economic Analysis), Tax-Rates.org & The Motley Fool.

2007-2017 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 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 2017 animal agriculture contributed:

- \$1.6 billion in economic output
- 10,575 jobs
- \$323.6 million in earnings
- \$63.8 million in income taxes paid at local, state, and federal levels
- \$41.6 million in the form of property taxes

Plus, from 2007-2017 animal agriculture in Wyoming has increased economic output by over \$403.1 million, boosted household earnings by \$78.8 million, contributed 2,584 additional jobs and paid \$15.5 million in additional tax revenues.

Wyoming's animal agriculture consumed almost 42.4 thousand tons of soybean meal in 2017. This soybean meal was fed primarily to:

- Hogs (15.9 thousand tons)
- Broilers (10.6 thousand tons)
- Egg-Laying Hens (5.9 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 2017, Wyoming's animal agriculture contributed the following to the economy:

- About \$1.6 billion in economic output
- \$323.6 million in household earnings
- 10,575 jobs
- \$63.8 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:

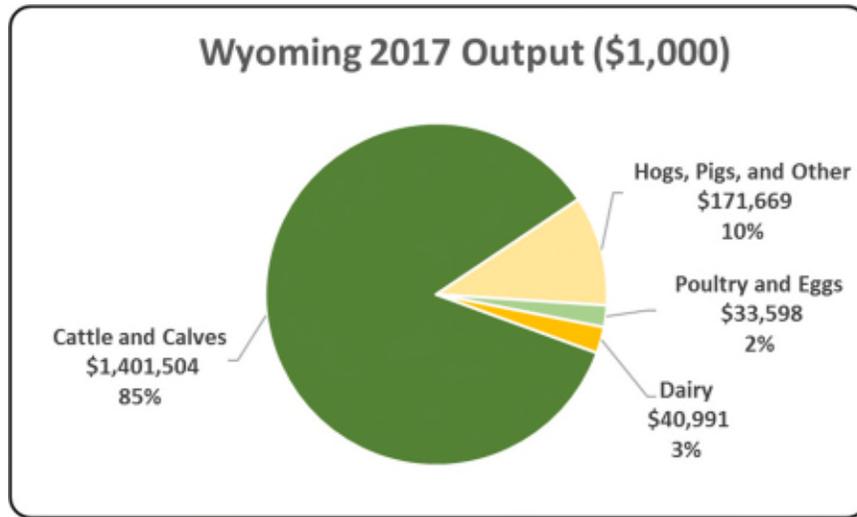
- Increased economic output by \$403.1 million
- Boosted household earnings by \$78.8 million
- Added 2,584 jobs
- Paid an additional \$15.5 million in income taxes

Below is a table which demonstrates this decade of change.

Measure	2017	Change 2007-2017	% Change 2007-2017
Output (\$1,000)	\$ 1,647,763	\$ 403,104	32.39%
Earnings (\$1,000)	\$ 323,637	\$ 78,811	32.19%
Employment (Jobs)	10,575	2,584	32.34%
Income Taxes Paid (\$1,000)	\$ 63,756	\$ 15,526	32.19%
Property Taxes Paid in 2012 (\$1,000)	\$ 41,580		

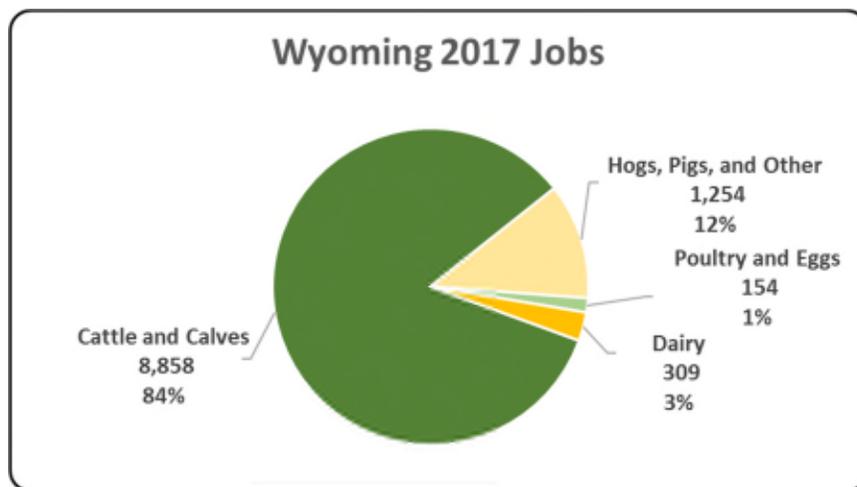
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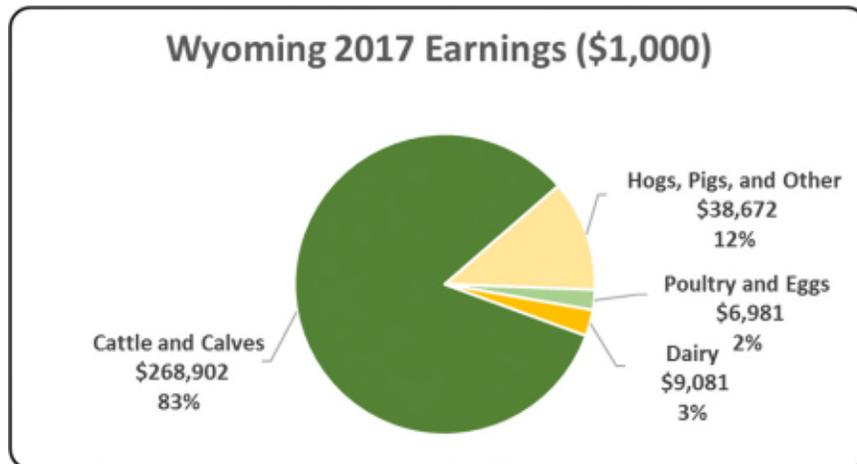
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“Jobs” represents an estimate of the number of full or part-time positions (jobs) currently filled in an area and/or industry. The table illustrates the contribution to Wyoming in terms of animal agriculture jobs. As shown, animal agriculture contributes 10,575 jobs within and outside of animal agriculture.



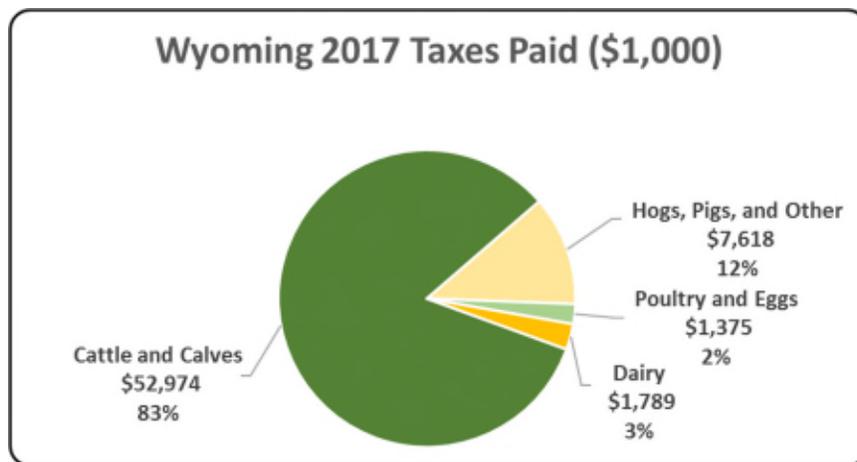
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Wyoming Taxes Paid by Animal Agriculture

Wyoming’s animal agriculture is also a source of tax revenue. In 2017, the state’s animal agriculture industry paid about \$63.8 million in income taxes at local, state, and federal levels. Plus the 2012 Census of Agriculture estimated \$41.6 million in property taxes paid by all of Wyoming agriculture during 2012. Estimates of income taxes paid by animal agriculture are shown in the following chart.



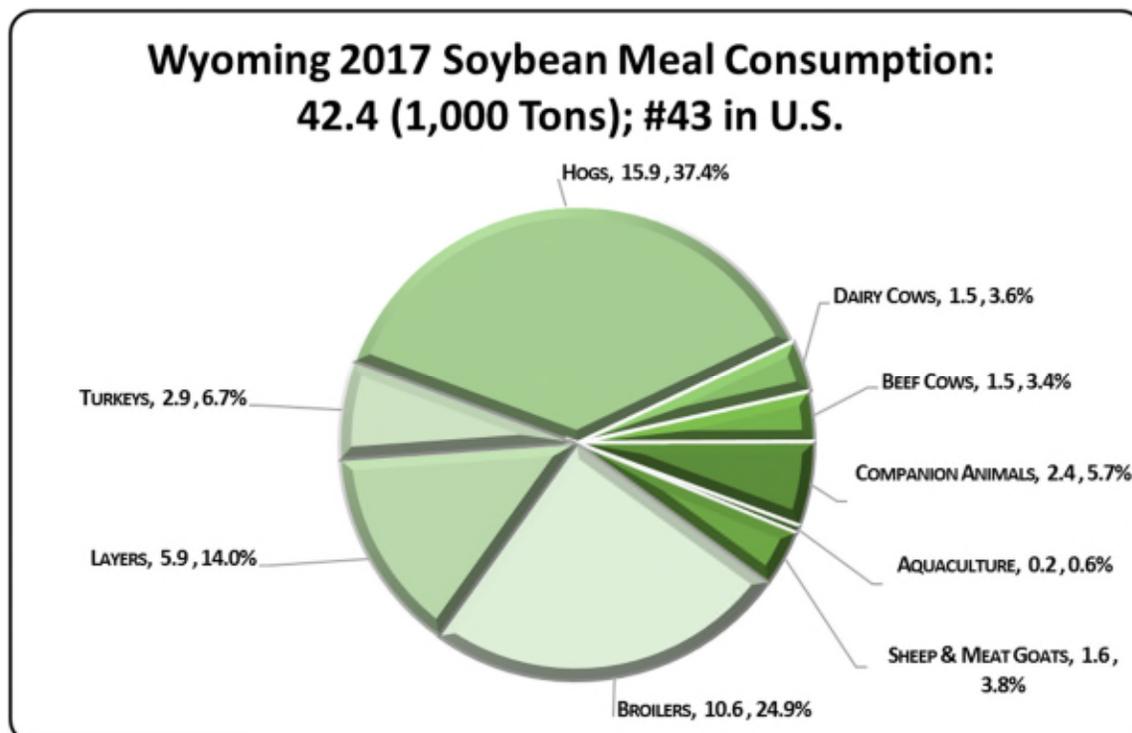
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The choice to use soybean meal in animal agriculture is highly dependent upon nutritional requirements of animals (which would encompass varying life stages within an animal species), accessibility to various feed ingredients capable of competing with 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 2016-17 soybean marketing year by up to sixteen specific animal species has been estimated.

Wyoming's animal agriculture consumed almost 42.4 thousand tons of soybean meal in 2017, placing the state as #43 in the nation in terms of soybean meal consumption (see figure below). Additionally, animal agriculture in Wyoming consumed 7,608 tons in soy hulls. The three segments of animal agriculture that led the state in estimated soybean meal consumption are:

- Hogs (15.9 thousand tons)
- Broilers (10.6 thousand tons)
- Egg-Laying Hens (5.9 thousand tons)

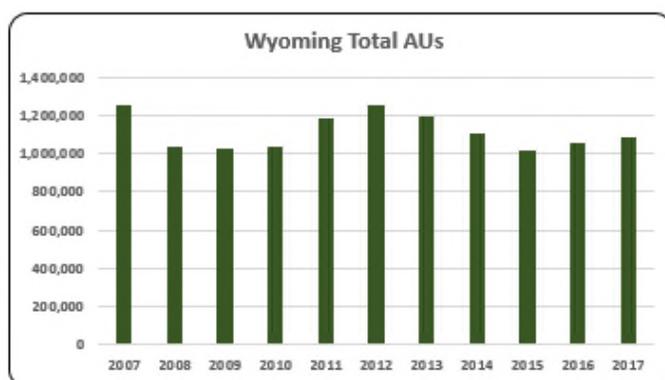
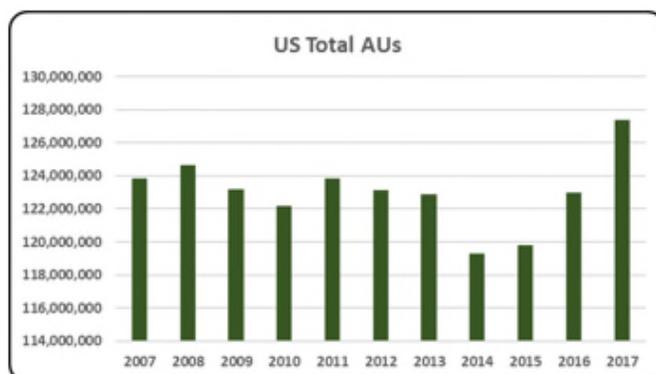


Wyoming Animal Unit (AU) Trends

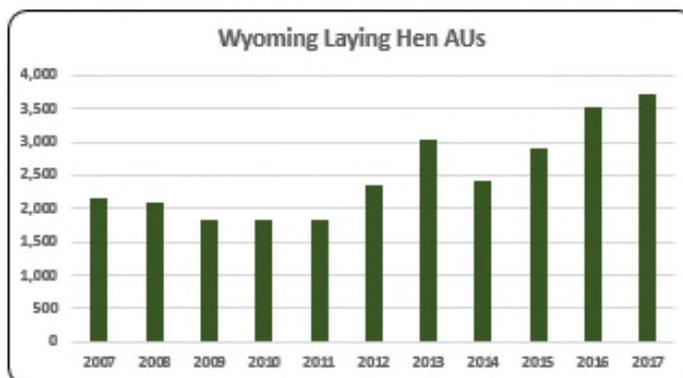
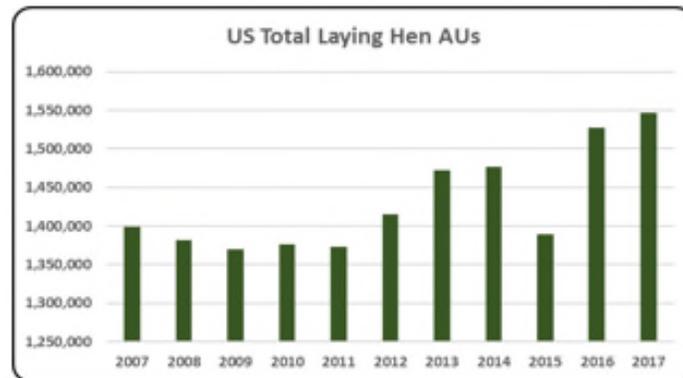
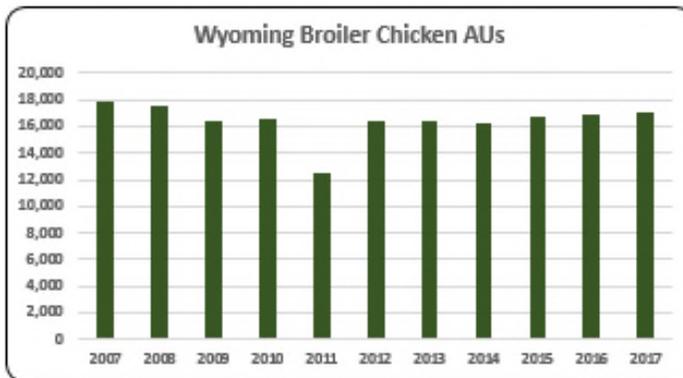
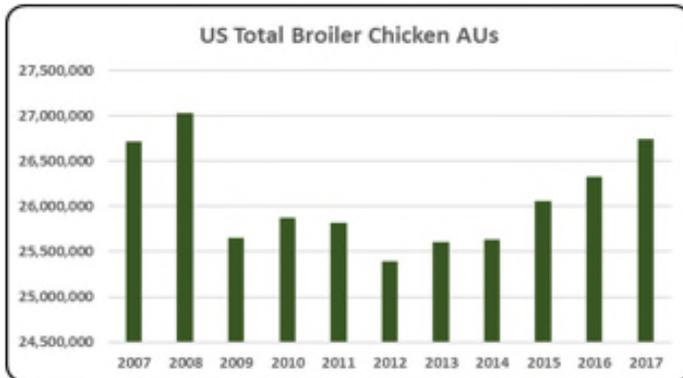
Over time, prices of feed, meat, eggs and milk, as well as levels of demand for these products in the United States and abroad have an impact on the size of animal agriculture in the State of Wyoming. Due to this reality, using a single year as a measure of the presence and strength of a sector can be 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.

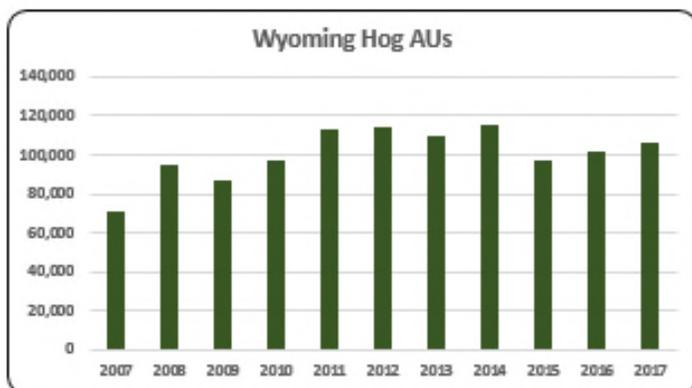
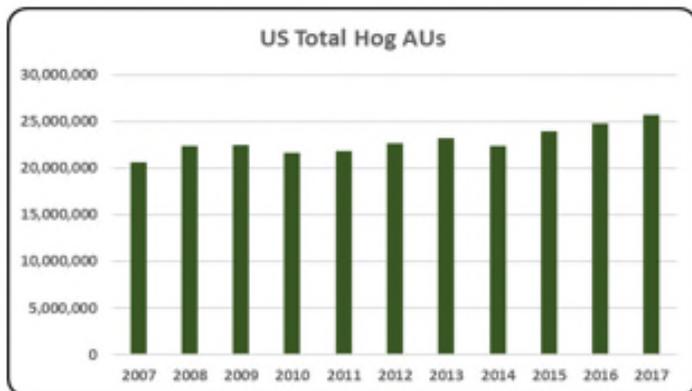
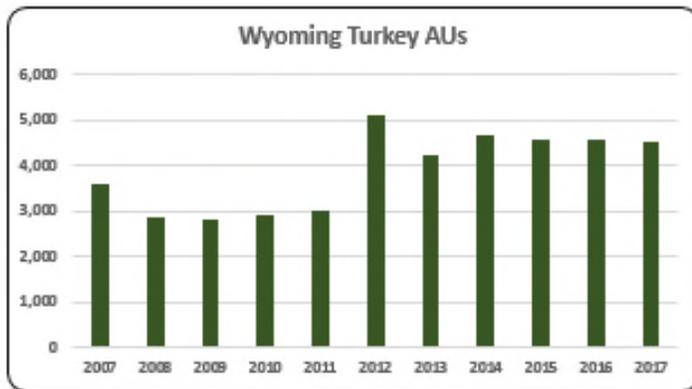
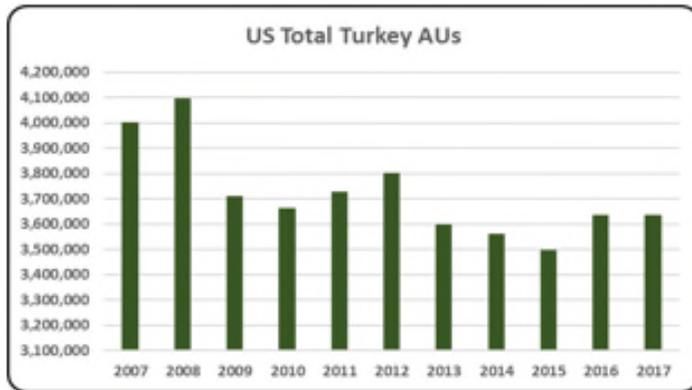
As shown in the accompanying charts and written commentary, certain components of animal agriculture are more present, and therefore more dominant than others. This is due primarily to geography (i.e., weather patterns and access to certain transportation hubs), proximity to high quality, relevant feed ingredients, and the local animal agriculture regulatory framework. In Wyoming, the largest three segments of animal agriculture in terms of AUs during 2017 were: Beef Cows (945,375 AUs), Hogs (106,500 AUs), and Broiler Chickens (17,054 AUs). Total animal units in Wyoming during 2017 were 1.1 million AUs.



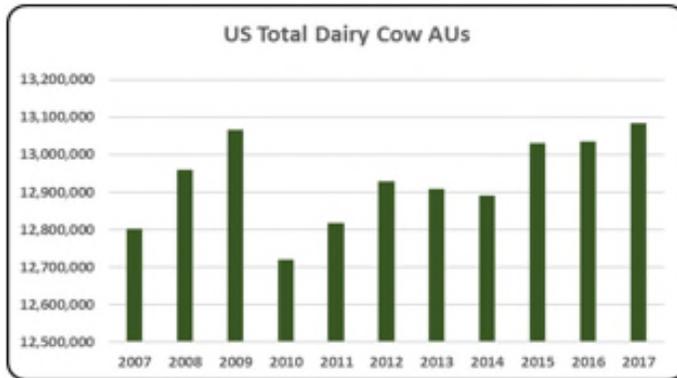
- In 2017 U.S. total AUs hit a decade high at 127 million in total. In 2014 and 2015 AUs were at all-time lows. Starting in 2016 this low period began upward movement. Beef cows, laying hens and broiler chickens were the most significant contributors to the growth between 2016 and 2017.
- There were 1.1 million AUs in Wyoming in 2017 representing 0.85% of all AUs in the U.S. Additionally, animal units in Wyoming decreased 13% from 2007 to 2017.



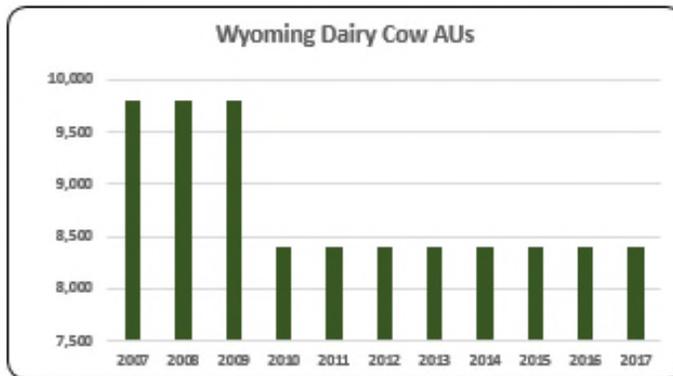
- U.S. broiler production is focused in the southern states, with Georgia being the largest producer. On average, from 2007 to 2017, broiler chicken AUs were 26.7 million across the US. Between 2016 and 2017 there was a 1.6% increase in broiler chicken AUs (408,900).
- The average number of broiler AUs in Wyoming was 16,403 during last decade. Broiler AUs fell 4.5% in 2017 (17,054 broiler AUs) from 2007.
- On average, the layer AUs during 2007-2017 were 1.4 million. In 2017, layer AUs were 1.5 million, a 1% increase from the year before (1,917,4 AUs). Growth slowed slightly in comparison to the large increase from 2015 to 2016 when the industry was recovering from avian influenza.
- Laying hens represented 0.34% (3,728 layer AUs) of all animal units in the state in 2017.



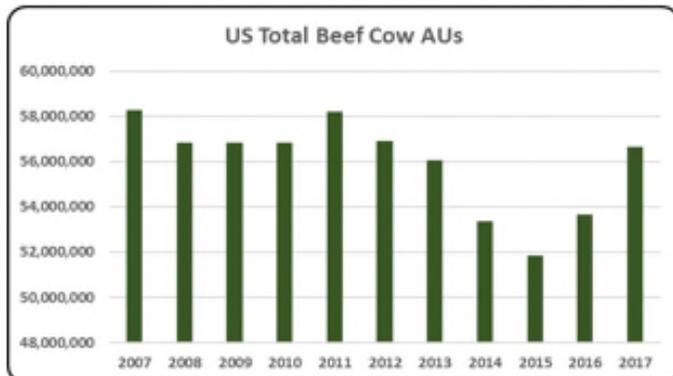
- In 2017 turkey AUs were at 3.6 million, with no significant change from the previous year. Minnesota had the most turkey AUs during 2017 with nearly 25% of the total U.S. turkey AUs. Although growth has not occurred, turkey AUs have maintained increased numbers since the avian influenza outbreak.
- There were 4,545 turkey AUs in 2017. Turkey AUs increased 26% in since 2007.
- On average from 2007 to 2017, hog AUs increased 25%, more than 5 million AUs. Hogs make up 20% of all animal units within the United States.
- Hog AUs average was 100,871 during the 2007-2017 decade. 2017 hog numbers (106,500 hog AUs) were 50% above 2007 (70,560 hog AUs).



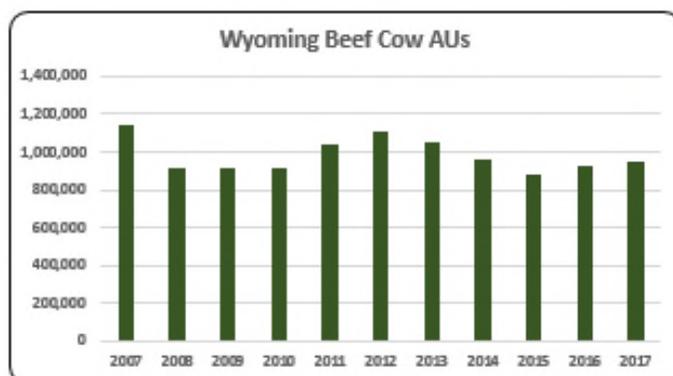
- From 2007 to 2017, dairy cow AUs averaged 12.9 million. In 2017, dairy cow AUs increased only 50,000 AUs from 2016.



- Wyoming 2017 dairy cow AUs were the same as 2016 at 8,400.



- From 2007 to 2017, beef cow AUs averaged 56 million. 2017 beef cow AUs saw a 5.6% (3 million AU) growth as drought recovery continues to take place.



- Beef cows accounted for 87% (945,375 beef cow AUs) of all AUs in Wyoming in 2017, but beef cow AUs in 2017 were down 18% relative to 2007.

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:

- Economic impact of animal agriculture to local (state) economies during the 2007-2017 time period
- Soybean meal usage by animal species during the 2016/17 soybean marketing year
- Animal Unit (AU) trends from 2007-2017

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 2007-2017 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 2016-17 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 515.257.6077.

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

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Animal Units (AUs)	Beef Cattle AUs	1,147,050	912,600	912,600	912,600	1,045,200	1,110,600	1,053,225	956,325	882,225	920,625	945,375	
	Hog and Pig AUs	70,560	95,220	87,450	97,500	113,550	114,750	109,800	114,900	97,650	101,700	106,500	
	Broiler AUs	17,858	17,580	16,345	16,565	12,482	16,418	16,361	16,268	16,688	16,814	17,054	
	Turkey AUs	3,603	2,880	2,821	2,939	2,991	5,095	4,250	4,692	4,590	4,575	4,545	
	Egg Layer AUs	2,161	2,099	1,836	1,824	1,834	2,346	3,038	2,421	2,912	3,538	3,728	
	Dairy AUs	9,800	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	1,251,032	1,040,179	1,030,852	1,039,827	1,184,457	1,257,609	1,195,074	1,103,005	1,012,466	1,055,651	1,085,602	
Value of Production (\$1,000)	Cattle and Calves (\$1,000)	\$ 436,790	\$ 462,933	\$ 404,132	\$ 495,666	\$ 603,619	\$ 618,850	\$ 698,529	\$ 928,182	\$ 860,466	\$ 690,498	\$ 689,140	
	Hogs and Pigs (\$1,000)	\$ 40,614	\$ 60,704	\$ 50,231	\$ 71,259	\$ 118,416	\$ 103,837	\$ 76,255	\$ 86,817	\$ 57,648	\$ 62,127	\$ 68,905	
	Broilers (\$1,000)	\$ 13,782	\$ 14,080	\$ 12,148	\$ 12,695	\$ 11,114	\$ 16,359	\$ 19,934	\$ 20,912	\$ 18,244	\$ 16,221	\$ 19,047	
	Turkeys (\$1,000)	\$ 4,014	\$ 4,897	\$ 4,641	\$ 6,037	\$ 4,747	\$ 5,104	\$ 3,700	\$ 2,448	\$ 4,297	\$ 4,859	\$ 3,290	
	Eggs (\$1,000)	\$ 242	\$ 193	\$ 134	\$ 167	\$ 175	\$ 190	\$ 176	\$ 176	\$ 176	\$ 176	\$ 176	
	Milk (\$1,000)	\$ 24,735	\$ 23,612	\$ 14,449	\$ 19,866	\$ 24,128	\$ 23,417	\$ 25,768	\$ 30,303	\$ 24,778	\$ 23,347	\$ 24,738	
	Other	\$ 32,103	\$ 31,376	\$ 32,136	\$ 34,184	\$ 37,871	\$ 52,252	\$ 40,739	\$ 38,323	\$ 43,785	\$ 44,694	\$ 50,859	
	Sheep and Lambs (\$1,000)	\$ 31,896	\$ 31,170	\$ 31,931	\$ 33,981	\$ 37,669	\$ 52,051	\$ 40,539	\$ 38,124	\$ 43,587	\$ 44,497	\$ 46,002	
	Aquaculture (\$1,000)	\$ 207	\$ 206	\$ 205	\$ 203	\$ 202	\$ 201	\$ 200	\$ 199	\$ 198	\$ 197	\$ 4,857	
	Total (\$1,000)	\$ 552,279	\$ 597,795	\$ 517,871	\$ 639,874	\$ 800,071	\$ 820,010	\$ 865,100	\$ 1,107,161	\$ 1,009,394	\$ 841,922	\$ 856,155	

Ag Census Data Category	Animal Type	1997	2002	2007	2012	
Number of Farms by NAICS	Beef cattle ranching and farming (112111)	5,236	4,290	3,910	4,365	
	Cattle feedlots (112112)	158	269	108	69	
	Dairy cattle and milk production (11212)	59	51	26	36	
	Hog and pig farming (1122)	74	61	133	96	
	Poultry and egg production (1123)	32	41	83	112	
	Sheep and goat farming (1124)	494	387	382	293	
	Animal aquaculture and other animal production (1125,1129)	942	1,891	3,264	3,140	
Value of Sales (\$1,000)	Cattle and Calves	604,793	643,123	801,833	1,101,195	
	Hogs and Pigs	24,088	23,057	41,923	35,101	
	Poultry and Eggs	238	663	997	602	
	Milk and Other Dairy Products	9,882	7,473	22,331	22,904	
	Aquaculture	317	3,213	7,157	5,586	
	Other (calculated)	84,231	48,582	69,487	67,202	
	Total	723,549	726,111	943,728	1,232,590	
Input Purchases	Livestock and poultry purchased	(Farms) 4,279	3,673	3,493	4,349	
		\$1,000	180,847	199,326	215,888	316,034
	Breeding livestock purchased	(Farms) <i>n/a</i>	2,565	2,354	2,837	
		\$1,000	<i>n/a</i>	21,091	38,436	55,056
	Other livestock and poultry purchased	(Farms) <i>n/a</i>	1,747	1,803	2,260	
		\$1,000	<i>n/a</i>	178,035	177,453	260,977
Feed purchased	(Farms)	6,125	6,761	6,398	8,484	
	\$1,000	110,332	137,943	150,962	320,457	

	Animal Type	Output (\$1,000)	Earnings (\$1,000)	Employment (Jobs)	Taxes Paid (\$1,000)
2017 Animal Agriculture	Cattle and Calves	\$ 1,401,504	\$ 268,902	8,858	\$ 52,974
	Hogs, Pigs, and Other	\$ 171,669	\$ 38,672	1,254	\$ 7,618
	Poultry and Eggs	\$ 33,598	\$ 6,981	154	\$ 1,375
	Dairy	\$ 40,991	\$ 9,081	309	\$ 1,789
	Total	\$ 1,647,763	\$ 323,637	10,575	\$ 63,756
Change from 2007 to 2017	Cattle and Calves	\$ 358,886	\$ 68,858	2,268	\$ 13,565
	Hogs, Pigs, and Other	\$ 49,330	\$ 11,112	360	\$ 2,189
	Poultry and Eggs	\$ 2,003	\$ 416	9	\$ 82
	Dairy	\$ (7,115)	\$ (1,576)	(54)	\$ (311)
	Total	\$ 403,104	\$ 78,811	2,584	\$ 15,526
RIMS II Multipliers	Animal Type	Output(\$)	Earnings (\$)	Employment (Jobs)	
	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			13.5%	
	Federal Social Security tax rate			6.2%	
	State Effective Rate			0.0%	
	Total			19.7%	

Sources: 1997, 2002, 2007 and 2012 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 19 and Table 20. 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 SBM, corn, DDGS, canola meal, and cottonseed meal. We then applied the same methodology described in the estimation of the own and cross-price price elasticities of SBM demand.

Table 19, 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 20, 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 21, 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 nineteen 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, 5.5 lbs, 7 lbs and 8.75 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 2016 and 2017 broiler production data to 2016/17 soybean marketing year.
4. Worked with Justin Fowler (University of Georgia) to determine four regional diets (see Figure 62). 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 2017 was approximately 6.15 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.

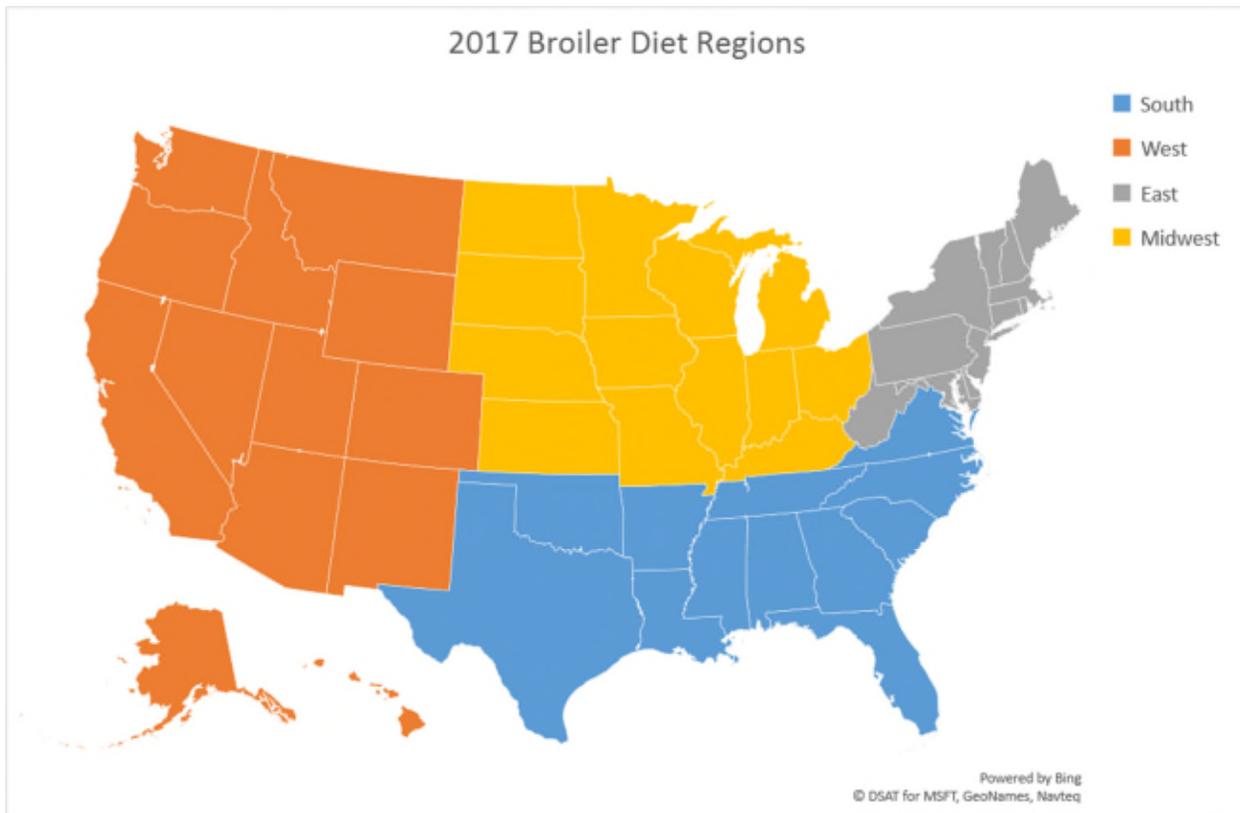


Figure 62, Broiler Ration Regions

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 2016 and 2017 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 63). 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 63, Layer Ration Regions

Turkeys

The following methodology was adopted to estimate soybean meal usage for turkeys:

1. Obtained 2017 turkey production from USDA's "Poultry – Production and Value, 2017 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 64). 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.

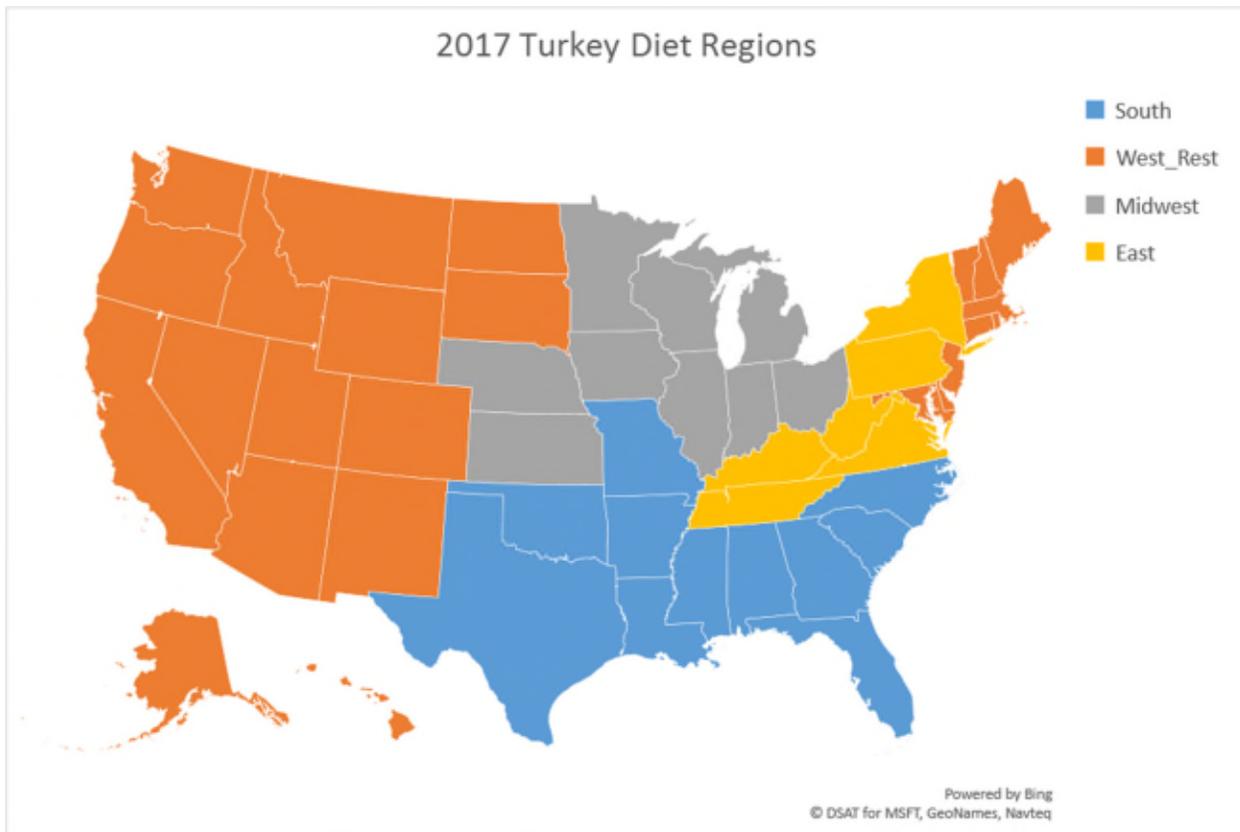


Figure 64, Turkey Ration Regions

Hogs

The following methodology was adopted to estimate soybean meal usage for hogs:

1. Obtained 2016 and 2017 marketings data from the USDA's "Meat Animal Production, Disposition, and Income 2017 Summary" report.
2. Converted 2016 and 2017 marketings data to 2016/17 soybean marketing year.
3. Worked with Nick Shelton (NutriQuest) to determine three (see Figure 65) 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 Nick Shelton.
5. Summarized soybean meal and other ration ingredient quantities.



Figure 65, Hog Ration Regions

Dairy Cows

The following methodology was adopted to estimate soybean meal usage for dairy cows:

1. Obtained monthly 2016 and 2017 inventory data by state from the USDA/NASS.
2. Calculated average inventory by state for months making up the 2016/17 soybean marketing year.
3. Worked with primarily Mike Hutjens (University of Illinois) to determine appropriate regional rations for lactating dairy cattle (see Figure 66). 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.

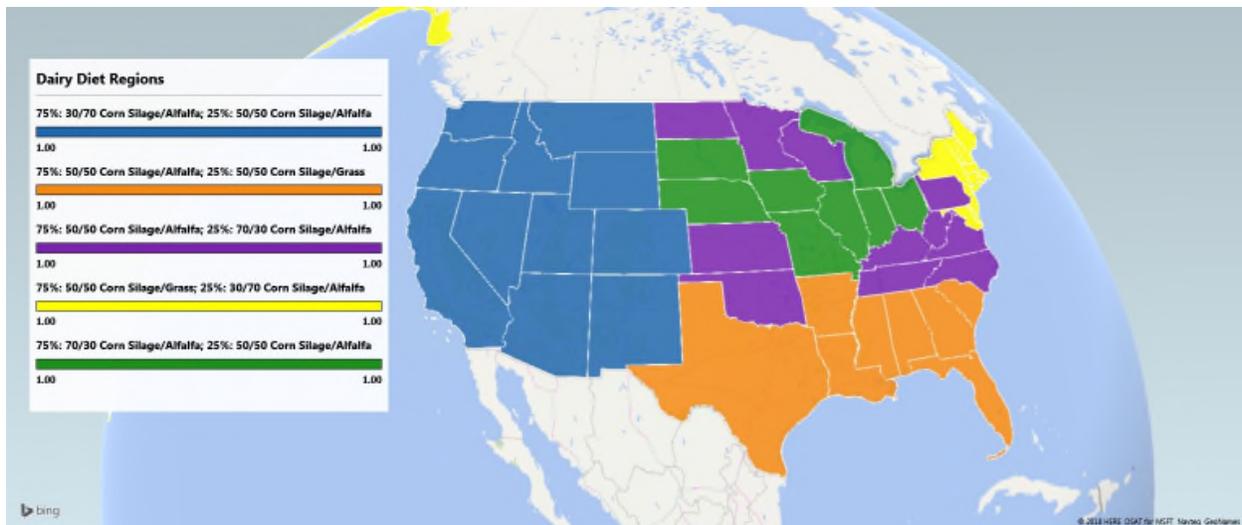


Figure 66, Dairy Ration Regions

Beef Cows

The following methodology was adopted to estimate soybean meal usage for beef cows:

1. Obtained 2016 and 2017 marketings data from the USDA's "Meat Animal Production, Disposition, and Income 2017 Summary" report.
2. Converted 2016 and 2017 marketings data to 2016/17 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 65) 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.

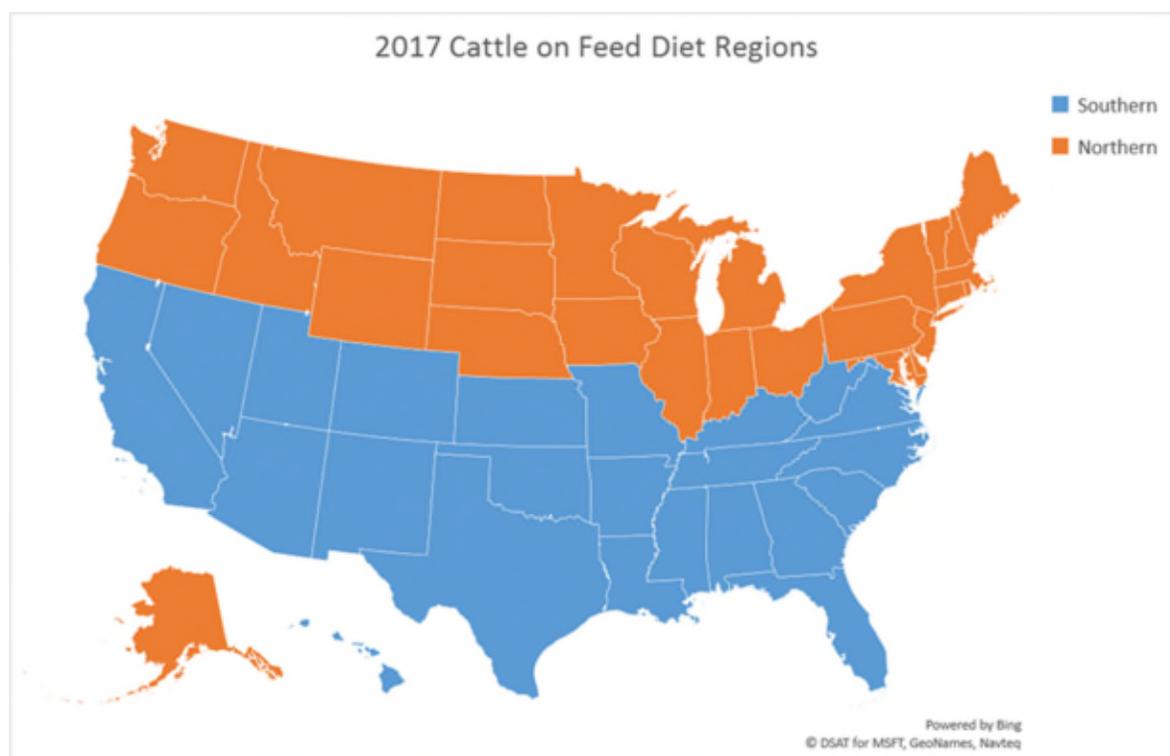


Figure 67, Cattle on Feed Ration Regions

Aquaculture

The 2012 USDA Census of Agriculture provides information on the number of aquaculture operations by species within each state. This information was used to produce the USDA 2013 Census of Aquaculture (2013 Census). The 2013 Census provides sales information by sales dollars, head count and live weight for species of fish and crustacean's raised for food and/or distribution in the US.

Five major food fish were included in previous studies. They are; catfish, trout, tilapia, hybrid striped bass and yellow perch. Saltwater shrimp and freshwater prawns are included in the shrimp category. Baitfish were added for this study.

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 2017. 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, 2017 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 2017 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 2017 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 2017 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 2017 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 2017 cat populations by state.

Animal Unit Trends

Animal units (AUs) allow equal standards for all animal based on size and manure produced. The AUs in the Figures are 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 450 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. Overall AUs have varied during the 2007 to 2017 time period, as different factors such as the weather, the economy, international trade, regulations and animal diseases, among others, impacted animal production. In 2017 AUs were higher than in 2016. Recent severe weather on cattle production in some part of country and animal diseases have challenged AU levels in recent years.

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 22:

- 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 22, 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, 2017 State by Species Soybean Meal Usage

State	State Abbrev	Broilers	Turkeys	Layers	Hogs, MEAL	Hogs, HULLS	Hogs, TOTAL	Dairy Cows, MEAL	Dairy Cows, HULLS
Alabama	AL	1,826,799	5,173	25,901	13,559	-	13,559	2,264	954
Alaska	AK	2,707	1,459	688	226	7	233	113	-
Arizona	AZ	10,710	2,857	11,729	13,524	416	13,940	51,638	8,453
Arkansas	AR	1,795,058	234,597	45,447	28,452	-	28,452	2,045	862
California	CA	49,549	105,631	124,635	8,938	98	9,036	451,646	73,930
Colorado	CO	34,698	11,546	40,730	137,372	3,796	141,168	40,413	6,615
Connecticut	CT	17,657	-	5,027	228	29	257	7,137	-
Delaware	DE	375,251	365	4,315	782	98	880	1,851	-
Florida	FL	108,458	7,410	63,528	1,723	-	1,723	36,811	15,514
Georgia	GA	2,293,396	4,526	98,021	24,877	-	24,877	24,078	10,148
Hawaii	HI	2,589	-	2,500	566	24	590	846	-
Idaho	ID	23,774	7,962	14,426	1,266	-	1,266	154,312	25,259
Illinois	IL	46,093	10,477	35,318	547,999	6,550	554,549	35,853	39,242
Indiana	IN	78,057	175,338	241,764	419,303	3,244	422,547	71,577	78,343
Iowa	IA	81,531	104,980	412,243	2,192,035	12,273	2,204,308	83,228	91,096
Kansas	KS	30,457	5,002	13,819	198,892	2,005	200,897	45,113	38,026
Kentucky	KY	536,425	8,611	26,388	50,330	-	50,330	18,048	15,213
Louisiana	LA	33,114	2,529	9,101	689	-	689	3,944	1,662
Maine	ME	38,151	14,344	9,915	469	49	518	11,269	-
Maryland	MD	445,618	7,111	30,502	3,116	245	3,361	18,304	-
Massachusetts	MA	18,664	8,752	8,397	1,055	73	1,128	4,506	-
Michigan	MI	130,172	45,978	108,102	116,618	1,408	118,026	163,760	179,240
Minnesota	MN	103,252	382,101	79,342	865,357	6,886	872,243	137,914	116,249
Mississippi	MS	1,244,543	2,175	21,830	54,168	-	54,168	3,210	1,353
Missouri	MO	538,419	168,330	59,995	371,945	5,432	377,377	33,042	36,165
Montana	MT	11,136	4,133	10,032	24,074	612	24,686	3,516	576
Nebraska	NE	42,559	5,826	70,437	377,201	5,126	382,327	21,150	23,149
Nevada	NV	5,061	3,100	3,575	193	2	195	7,223	1,182
New Hampshire	NH	21,317	-	6,193	328	34	362	5,165	-
New Jersey	NJ	11,985	4,376	6,370	1,010	73	1,084	2,581	-
New Mexico	NM	6,355	3,014	8,434	276	12	288	84,046	13,757
New York	NY	83,621	25,287	53,322	5,343	294	5,637	239,542	-
North Carolina	NC	1,389,485	292,531	71,947	868,180	-	868,180	13,462	11,347
North Dakota	ND	10,117	1,924	3,283	31,807	428	32,235	4,754	4,007
Ohio	OH	167,079	56,568	251,837	215,419	2,280	217,700	101,074	110,628
Oklahoma	OK	355,094	5,103	28,115	383,200	11,082	394,282	11,466	9,665
Oregon	OR	57,317	16,532	23,743	776	37	813	31,935	5,228
Pennsylvania	PA	288,226	65,993	243,607	120,580	5,203	125,784	157,619	132,859
Rhode Island	RI	5,215	2,553	1,546	168	15	183	328	-
South Carolina	SC	409,447	12,878	25,689	14,719	-	14,719	4,461	1,880
South Dakota	SD	18,024	37,676	21,613	219,352	2,540	221,893	44,968	49,219
Tennessee	TN	297,414	6,401	26,649	30,644	-	30,644	13,011	10,967
Texas	TX	1,113,682	22,474	159,549	120,278	3,184	123,462	150,620	63,479
Utah	UT	8,592	46,359	52,886	63,174	1,929	65,103	24,059	3,938
Vermont	VT	38,700	13,371	8,059	420	49	469	49,719	-
Virginia	VA	446,279	150,733	12,080	17,584	-	17,584	26,232	22,112
Washington	WA	62,025	18,112	71,448	2,416	-	2,416	70,631	11,562
West Virginia	WV	136,047	32,850	14,061	373	49	422	2,559	2,157
Wisconsin	WI	99,477	23,283	40,811	40,539	551	41,090	383,683	323,411
Wyoming	WY	10,550	2,857	5,950	15,852	784	16,636	1,507	247
U.S. Total (Short Tons)		14,959,947	2,171,188	2,714,897	7,607,394	76,919	7,684,314	2,858,232	1,539,694

State	State Abbrev	Beef Cows, MEAL	Beef Cows, HULLS	Beef Cows, TOTAL	Sheep	Meat Goats	Cats	Dogs	Horses	Companion Animals
Alabama	AL	1,844	6,964	8,808	69	4	562	3,982	4,102	8,645
Alaska	AK	2	6	8	4	-	70	455	338	863
Arizona	AZ	1,051	4,764	5,815	171	2	656	5,771	7,030	13,457
Arkansas	AR	2,443	9,227	11,670	80	3	354	3,369	1,821	5,544
California	CA	1,907	17,290	19,198	1,423	7	2,796	18,357	20,900	42,053
Colorado	CO	4,185	18,968	23,152	1,448	2	550	4,051	6,010	10,611
Connecticut	CT	9	52	60	27	-	332	1,356	2,855	4,543
Delaware	DE	4	23	27	6	-	84	432	11,505	12,021
Florida	FL	451	2,043	2,493	86	4	2,006	12,972	12,283	27,261
Georgia	GA	817	3,293	4,110	68	6	991	7,541	6,200	14,732
Hawaii	HI	12	37	50	21	1	100	653	639	1,392
Idaho	ID	2,216	6,697	8,914	1,155	1	162	1,049	2,228	3,439
Illinois	IL	7,176	22,957	30,133	333	1	1,018	6,429	5,112	12,559
Indiana	IN	5,195	16,619	21,814	323	3	845	4,808	4,923	10,576
Iowa	IA	39,493	126,352	165,845	891	3	317	1,709	3,607	5,633
Kansas	KS	24,965	150,870	175,835	324	4	312	2,319	3,576	6,207
Kentucky	KY	995	6,015	7,011	272	5	588	4,465	5,592	10,645
Louisiana	LA	473	1,787	2,260	48	1	361	2,991	2,638	5,990
Maine	ME	15	88	103	53	-	217	857	651	1,726
Maryland	MD	42	254	296	70	1	791	2,554	2,079	5,423
Massachusetts	MA	7	43	50	47	-	676	2,427	2,163	5,266
Michigan	MI	2,885	10,896	13,780	351	2	1,065	5,759	5,005	11,829
Minnesota	MN	12,077	54,740	66,818	688	2	562	2,649	5,044	8,254
Mississippi	MS	915	3,457	4,372	48	2	290	2,333	3,123	5,747
Missouri	MO	9,034	40,948	49,982	559	6	698	5,868	6,560	13,125
Montana	MT	2,816	12,764	15,580	1,428	1	121	829	2,991	3,941
Nebraska	NE	65,009	294,650	359,658	524	2	208	1,009	2,973	4,190
Nevada	NV	386	1,167	1,554	194	1	289	1,805	2,151	4,245
New Hampshire	NH	5	28	33	35	-	140	651	548	1,339
New Jersey	NJ	4	24	28	101	1	628	3,919	2,681	7,228
New Mexico	NM	1,476	6,689	8,165	249	2	242	2,227	2,486	4,956
New York	NY	422	1,911	2,333	427	1	1,867	9,021	7,056	17,943
North Carolina	NC	843	3,822	4,665	122	4	1,001	7,441	3,891	12,333
North Dakota	ND	8,216	37,238	45,453	374	0	54	389	1,719	2,162
Ohio	OH	3,444	13,009	16,453	692	3	1,723	7,887	6,535	16,145
Oklahoma	OK	10,979	33,175	44,154	244	8	437	3,981	4,771	9,190
Oregon	OR	513	3,100	3,613	852	2	521	2,770	3,513	6,804
Pennsylvania	PA	731	3,314	4,046	497	3	1,594	7,114	6,292	15,000
Rhode Island	RI	1	5	6	8	-	91	494	299	883
South Carolina	SC	372	1,499	1,871	41	3	449	3,462	2,744	6,655
South Dakota	SD	8,755	26,456	35,211	1,479	1	120	624	2,319	3,063
Tennessee	TN	972	5,875	6,847	270	9	800	6,671	5,528	12,999
Texas	TX	27,220	82,249	109,469	2,155	65	2,447	21,190	15,037	38,675
Utah	UT	781	2,359	3,140	1,708	1	192	1,164	3,020	4,377
Vermont	VT	34	206	240	53	-	111	427	683	1,221
Virginia	VA	355	2,148	2,503	448	4	816	4,819	6,066	11,702
Washington	WA	510	3,081	3,591	223	2	774	4,858	4,891	10,524
West Virginia	WV	241	1,094	1,335	204	2	271	1,768	1,316	3,355
Wisconsin	WI	10,080	45,688	55,768	434	2	690	3,346	4,105	8,140
Wyoming	WY	1,451	6,578	8,029	1,627	0	57	344	2,008	2,408
U.S. Total (Short Tons)		263,830	1,092,519	1,356,348	22,955	175	32,045	203,368	221,609	457,022

State	State Abbrev	Catfish	Trout	Tilapia	Hybrid Striped	Yellow Perch	Shrimp	Baitfish	Aquaculture	State Total, MEAL	State Total, HULLS	State GRAND Total
Alabama	AL	43,050	66	417	112	-	196	1	####	1,928,099	7,919	1,936,018
Alaska	AK	-	23	-	-	-	-	-	23	6,085	13	6,098
Arizona	AZ	-	134	302	71	-	-	-	507	105,646	13,633	119,279
Arkansas	AR	8,518	47	113	142	1	-	544	9,365	2,123,033	10,089	2,133,122
California	CA	1,275	653	340	142	-	-	5	2,415	788,204	91,318	879,522
Colorado	CO	512	332	38	107	1	-	5	995	282,001	29,379	311,379
Connecticut	CT	-	90	-	-	-	-	-	90	34,718	81	34,799
Delaware	DE	-	-	38	36	-	-	-	73	394,668	121	394,790
Florida	FL	301	12	1,701	94	-	196	1	2,304	248,035	17,557	265,592
Georgia	GA	1,015	191	113	-	-	43	4	1,367	2,461,889	13,441	2,475,330
Hawaii	HI	536	-	606	-	-	158	-	1,299	9,226	62	9,288
Idaho	ID	16	5,488	151	-	-	-	-	5,655	214,207	31,957	246,163
Illinois	IL	968	30	189	45	-	22	5	1,259	697,068	68,748	765,816
Indiana	IN	252	59	113	-	-	43	3	469	1,002,604	98,207	1,100,811
Iowa	IA	326	53	76	36	2	43	8	544	2,920,581	229,721	3,150,301
Kansas	KS	979	-	38	36	-	-	1	1,053	325,835	190,901	516,737
Kentucky	KY	175	28	189	36	-	18	-	446	652,164	21,228	673,392
Louisiana	LA	111	-	-	-	-	194	16	321	56,209	3,449	59,659
Maine	MN	-	128	-	-	-	-	3	131	76,073	137	76,210
Maryland	MD	16	23	76	-	-	22	-	137	510,325	499	510,825
Massachusetts	MA	-	178	76	-	-	22	3	278	46,971	117	47,088
Michigan	MI	86	276	76	-	1	-	3	441	580,138	191,544	771,682
Minnesota	MN	-	128	113	-	7	22	71	341	1,589,328	177,876	1,767,204
Mississippi	MS	83,829	-	38	36	-	5	5	####	1,416,550	4,810	1,421,360
Missouri	MO	1,778	352	76	-	2	0	28	2,236	1,196,693	82,545	1,279,238
Montana	MT	-	245	-	-	-	-	-	245	61,323	13,952	75,274
Nebraska	NE	312	187	-	-	6	-	5	511	587,408	322,925	910,332
Nevada	NV	-	117	-	-	-	-	-	117	24,095	2,352	26,447
New Hampshire	NH	-	155	-	-	-	2	3	159	34,541	62	34,603
New Jersey	NJ	37	48	-	-	-	-	3	87	33,744	97	33,841
New Mexico	NM	-	141	38	-	-	-	-	178	108,986	20,459	129,445
New York	NY	20	279	189	36	2	-	2	528	426,437	2,205	428,642
North Carolina	NC	877	764	302	718	1	4	5	2,671	2,651,577	15,169	2,666,746
North Dakota	ND	-	12	-	-	-	-	-	12	62,648	41,673	104,321
Ohio	OH	761	120	264	107	5	2	50	1,308	813,570	125,917	939,487
Oklahoma	OK	74	12	38	-	-	-	3	126	803,525	53,921	857,446
Oregon	OR	503	526	76	-	-	-	-	1,105	139,580	8,364	147,944
Pennsylvania	PA	771	807	38	107	6	-	8	1,736	893,993	141,377	1,035,370
Rhode Island	RI	-	59	-	-	-	-	-	59	10,761	19	10,780
South Carolina	SC	0	28	76	107	-	65	3	278	474,544	3,379	477,923
South Dakota	SD	-	84	38	-	1	-	5	128	355,059	78,215	433,275
Tennessee	TN	92	168	76	-	-	-	3	338	388,708	16,842	405,551
Texas	TX	5,840	42	341	2,039	-	199	24	8,484	1,643,202	148,912	1,792,114
Utah	UT	-	232	-	-	-	-	-	232	202,169	8,226	210,395
Vermont	VT	-	150	-	-	-	-	-	150	111,727	255	111,982
Virginia	VA	296	246	76	2	-	22	3	645	666,062	24,260	690,321
Washington	WA	-	581	-	-	-	43	-	624	236,514	14,643	251,157
West Virginia	WV	100	157	38	71	-	-	2	368	190,059	3,299	193,359
Wisconsin	WI	296	225	341	-	5	-	46	913	607,363	369,650	977,013
Wyoming	WY	-	196	38	-	-	-	0	233	42,436	7,608	50,045
U.S. Total (Short Tons)		153,723	13,870	6,840	4,075	44	1,319	870	####	31,236,380	2,709,132	33,945,512

Appendix B, Subject Matter Experts

Full Name	Subject Matter	Company Name
Andy Tauer	Aquaculture	Indiana Soybean Alliance
Craig Browdy Ph.D.	Aquaculture	Zeigler Feed
D Allen Davis Ph.D.	Aquaculture	Auburn University
Dale Blasi Ph.D.	Beef	Kansas State University
Eric Bailey Ph.D.	Beef	University of Missouri
James Drouillard Ph.D.	Beef	Kansas State University
James Lattimer Ph.D.	Eqine	Kansas State University
Jaymelynn Farney Ph.D.	Beef	Kansas State University
Jenny Jennings Ph.D.	Beef	Texas A&M University
Justin Fowler Ph.D.	Broilers & Layers	University of Georgia
Justin Waggoner Ph.D.	Beef	Kansas State University
Karla Jenkins Ph.D.	Beef	University of Nebraska - Lincoln
Kevin Fitzsimmons Ph.D.	Aquaculture	The University of Arizona
Meghan Schwartz Ph.D.	Turkeys	Schwartz Consulting Services, Inc
Menghe Li Ph.D.	Aquaculture	Mississippi State University
Michael Brouk Ph.D.	Dairy	Kansas State University
Michael Hutjens Ph.D.	Dairy	University of Illinois
Nick Shelton Ph.D.	Swine	NutriQuest
Steven Hart Ph.D.	Aquaculture	Global Aquaculture Alliance
Terry Hanson Ph.D.	Aquaculture	Auburn University
Wendy Sealey Ph.D.	Aquaculture	U.S. Fish and Wildlife Service