

High Oleic Soybean Oil

The Business and Agronomic Case To Meet Growing Demand

Objective:

Address the management challenges and provide insight for farmers to manage this high-value crop. This is the business case that will allow the United States soybean industry to feed a rapidly expanding domestic market.



INTRODUCTION

When soybeans became a staple rotational row crop for U.S. farmers in the 1940s and 1950s, it kicked off a decades-long effort by plant breeders to develop varieties with high-demand traits.

Since then, soybean oil has become a similar staple in consumer, commercial and industrial kitchens, and food processing facilities. Today it's a key ingredient in many high-demand food products, especially since partially hydrogenated soybean oil became popular in food manufacturing in the 1970s. While the aggregate demand for soybean oil has grown over the years, consumer appetites and attitudes toward "unhealthy fats" have changed, and that has opened doors for high oleic (HO) soybeans. Today, there are premium market opportunities for American farmers to deliver soybeans to local elevators, resulting in a strong domestic market. U.S. farmers have a huge opportunity, and responsibility to feed this growing demand.

Quantity was the biggest demand-driver in the soybean oil market, but in recent years, that's begun to shift to quality. Today's High oleic soybeans — those with higher oleic acid content that eliminates the need for hydrogenation, thus making them an excellent alternative to conventional soybeans when processed for vegetable oil — fill the supply needs, with the required attributes. The identity-preserved varieties available to farmers today meet consumer demand for cooking oil with desirable fat profiles while offering competitive agronomic performance and a premium farm price. In short, today's HOSoy represents an opportunity for farmers to supply a domestic market they have created.

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As we enter the 2021 growing season, rising demand across the supply chain means HOSoy soybeans represent a strong value proposition for growers, grain handlers, food processors and retailers as the supply chain coordinates throughout the system. The HOSoy value chain is built, now the chain needs a solid hook at the farm level with soybean growers consistently providing the supply food processors need to meet this demand.

There are challenges for producers, however. Some are real. Some are merely perception, but they all must be overcome to keep this developed market a reality. Previously, as the market developed, myriad challenges persisted that limited growers' ability and desire to accept this opportunity. Through the efforts of farmers, grain handlers, and other participants in the HO Soybean value chain, these challenges have been addressed.

This paper explores the rising value of the quality-based market for growers, including:

- Existing and growing demand means this is a long-term premium opportunity worthy of farmer consideration.
- The reality that these seed varieties hold as much or greater yield potential than conventional soybeans.
- There are widely available weed control options available for growers.

- On-farm logistics, allow for more lenient protocols than traditional identity preservation grain handling procedures that require meeting only a minimum oleic content when delivered to the elevator.
- Food processors and distributors are committed to this market, see the long-term market potential, and just need U.S. farmers to provide the products.

SUSTAINED DEMAND GROWTH

Soybean oil has long been a major component of the consumer, industrial and commercial vegetable oil complex, but as end-user preferences have shifted, a market for an oil with a desirable fatty acid composition has developed. Previously, that market relied mostly on canola or cottonseed oil, but preferences are changing. After years of research and field testing funded by the U.S. Soybean Checkoff, food companies are poised to increase demand with high oleic soybeans.

The global cooking oil market, of which soybean oil is a major component, is expected to continue the demand surge that's been underway for years. According to [Zion Market Research](#) the worldwide cooking oil market was valued at more than \$85 billion in 2017, and that's expected to exceed \$130 billion by 2024, with annual growth of more than 6%.

There is a market in the United States for homegrown soybeans that provides an opportunity for U.S. soybean farmers to build and maintain a premium market.

The [USDA Foreign Ag Service](#) says worldwide vegetable oil production from various oilseeds has grown from 188.41 million metric tons in 2016-17 to a projected 213.9 million MT in the 2021-22 marketing year. Soybean oil currently accounts for nearly 29% of total worldwide vegetable oil production, with U.S. soybean oil holding a 6% share of the world market. When whole soybean exports destined for overseas crush facilities are factored in however, that total jumps to nearly 11% of the worldwide total vegetable oil market from United States-produced soybeans.

That share can continue escalating and it is poised for growth here at home. There is a market in the United States for homegrown soybeans that provides a great opportunity for U.S. soybean farmers to build and maintain a premium market. There is domestic demand, it's growing, and it promises to grow in the future.

Asia Pacific dominated the Soybean Oil market in 2019 with a share of more than 44.12%, followed by North America owing to the increasing demand for Soybean oil for cooking purposes in a household. Increasing urbanization and the rise in the number of health-conscious consumers is increasing the growth of the soybean oil market in this region.

However, North America is estimated to grow at a higher CAGR during the forecast period 2020-2025 owing to the rising disposable income and an increase in the fermentation and drilling process. Increasing demand for soybean oil in the preparation of sauces, dressing, non-dairy creamers, whipped toppings and increasing usage of soybean oil in fighting against conditions such as obesity, high

cholesterol and cardiovascular disease is increasing the growth of the soybean oil market in this region.

Source: Industry ARC; Soybean Oil Market – Forecast (2021 - 2026)

Consumers prefer the flavor and health benefits with minimal trans-fatty acids (TFA) and saturated fat. Normally, the two are mutually exclusive; whenever hydrogenating a cooking oil source, TFAs decline but saturated fat and oxidative instability rise, as do adverse health effects of consuming partially hydrogenated oil, like increased risk of heart disease, stroke, and type-2 diabetes.¹

This is where the real opportunity is for U.S. soybean farmers with high oleic soybean production to build, maintain, and grow a market with specifically desirable traits food processors, chefs and consumers prefer.

At the same time, cooking oil made from HO soybeans with low linolenic acid levels perform on par with conventional cooking oils from a shelf-stability standpoint, while low linolenic acid contents contribute to improve shelf stability and long-term viability of the finished oil product.

U.S. producers have an opportunity to supply a stable and growing domestic market at U.S.-based crush facilities. This means the localized market is less susceptible to from foreign competition and potential international trade disputes because the market is U.S based.

Once food companies discovered the value of HO soybeans, the fundamental changes necessary for them to begin manufacturing products with HO soybean oil didn't happen immediately. That transition — one that's taken five to seven years for many food manufacturers to adjust procedures, equipment and other components of the entire process — is nearing its end.

Companies that eliminate TFAs in products are ready to begin using HO soybean oil. The marketplace is poised to connect growers and processors to these end-users and their consumers. And now, the production side of the supply chain is almost a decade into developing the infrastructure and systems to deliver.

With a growing market base in the United States, there is added benefit to American soybean farmers. U.S. producers have an opportunity to supply a stable and growing domestic market at U.S.-based crush facilities. This means this localized market is less susceptible to from foreign competition and potential international trade disputes because the market is U.S. based and relies on U.S. produced crops. The soybeans are grown, processed, and sold to consumers right here at home.

High oleic soybeans now represent the impetus for vegetable oil that's the best of both worlds for the consumer. With limited seed supply in 2021, acreage increases are required to meet demand in 2022 and beyond.²

¹ Industry ARC; Soybean Oil Market – Forecast (2021 - 2026)

² [Staying Ahead of the High Oleic Soybean Curve](#) Feed&Grain Webinar, March 17, 2021

MEETING MARKET DEMAND

High Oleic Soybean demand is strong and ever strengthening, which puts an added emphasis on the seed input channel. Through a renewed focus on genetic development, seed breeding and production, it is poised to catch up with the food supply chain demand from food processors, retailers, restaurateurs and consumers in the near future.

With this growth, the industry is rapidly laying the groundwork to meet that demand, ultimately forging necessary coordination from the farm to the consumer that will help growers increase farm revenues. That starts with adequate supplies of the right HO soybean seed at the farm level. The 2021 season marked the seventh year of general availability of high oleic soybeans under the Pioneer® brand Plenish® labeled to growers in two main regions with considerable soybean processing capabilities, the Delmarva Peninsula and eastern Corn Belt (Indiana and Ohio).

Farmers will have the seed and resources to plant 1 million acres as large domestic and multinational food manufacturers advance their HO soybean processing capabilities and continue to purchase the oil from processors.

After adding new varieties every year since the genesis of the product line, farmers had access to eight varieties of HO soybeans in 2021, with available maturity groups ranging from 2.1 to 4.8 in the two regions with the existing market.

To meet expected demand for the heart-healthy oil in 2022, farmers will have the seed and resources to plant 1 million acres as large domestic and multinational food manufacturers advance their HO soybean processing capabilities and continue to purchase the oil from processors. By 2024, the market is expected to sustain production from more than 1 million acres throughout the United States.

ON-FARM PROFIT POTENTIAL

The High Oleic Profit Calculator Tool is available to help farmers make informed economic decisions on how High Oleic soybeans fit into their farming operation using their own farm and field data. Farmers can project HO Soybean production on individual fields to conventional soybeans, corn, wheat, or other crops. Examining scenarios based on management, costs, and variables that are important to each farm and puts the initial decision step decision in the hands of the farmer.

While this tool does address the initial step to show the true opportunity, the concerns over years of farmers seeing premium programs for identity-preserved grain falling short of promises is still real. Challenges for many farmers that have been addressed are:

1. Competitive Yields
2. Weed Control Options
3. Transportation and Storage Costs
4. A Soft IP Program
5. Longevity of Market Potential

- 1. COMPETITIVE YIELDS ARE A REALITY** and HO soybean varieties consistently perform as good or better than conventional numbers. With seven years of commercial trait development and a mature seed pipeline in place, growers have access to the varieties they need to raise trend yields with the added financial incentive of premiums up to 75 cents/bushel.

In field trials from 2018 to 2020, Pioneer® Plenish HO soybeans showed in-field performance on

Maryland farms trials from 2018-2020 showed yield ranges from 76.2 to 103.2 bu./acre, with trials in Pennsylvania yielding between 81.4 and 91.3 bu./acre.

par with conventional varieties. High oil soybean varieties in Maryland trials showed a yield range between 76.2 and 103.2 bushels/acre, with trials in Pennsylvania yielding between 81.4 and 91.3 bushels/acre. Double-crop yield trials in Delaware showed a yield of 68.3 bushels/acre. Average soybean yields for those three states ranged between 46 and 57 bushels/acre in 2020, according to USDA-NASS data ([Delaware](#), [Maryland](#), [Pennsylvania](#)).

High oleic soybean varieties have the same germplasm as conventional soybean varieties, which means they offer the same agronomic attributes. At the field level, that means the same input traits are in the seed, they are just applied to different output traits. That genetic foundation—combined with a relatively small number of available varieties—means HO soybeans take less time to integrate into traited platforms.

In fact, Corteva has advanced **2** new varieties for the 2022 growing season. As the market evolves and grows, HO soybeans will contain common herbicide resistance and other key input traits available in today’s conventional soybean varieties.



Source: Pioneer Corteva AgriScience

2. **WEED CONTROL** is an important consideration for any crop production decision and there are options with HO Soybeans. In fact, it is a major area where high oleic soybeans programs have improved the most in the last seven years.

Leading up to the 2021 growing season, soybean specialists in the Delmarva Peninsula estimated around one third of all soybean farmers apply an effective pre-emergence herbicide, and many of those use lower-cost options that typically lack residual efficacy. Agronomists recommend not only applying a pre-emergence product, but also rotating products to mix up the modes of action and prevent development of herbicide resistance.³

The combination of high-performance output traits and these crop performance attributes make HO soybeans competitive with conventional varieties from a yield potential standpoint, and with maturities ranging from 2.1 to 4.8, can accommodate growers in key growth geographies for HO soybeans moving into the 2022 growing season and beyond.

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As for potential drift, farmers growing HO Soybean varieties are encouraged to talk to their neighbors and local applicators about their plans to produce varieties that may be damaged by certain herbicides.

Farmers can also register their non-herbicide resistant fields at www.driftwatch.org to help local applicators identify potential hazards of applying chemicals in certain conditions. From the Driftwatch.org web site:

This DriftWatch registry tool is meant to help pesticide applicators and specialty crop growers communicate more effectively to promote awareness and stewardship activities to help prevent and manage drift effects. Our data set is overseen by state-appointed stewards who verify each area submitted to the registry. The boundaries on the map are not property lines, but user-submitted specialty site designations.

3. **MARKETING AND LOGISTICS** options exist throughout the trade area for 2021. Currently, three processors purchase HO soybeans from growers at a range of premiums based on how growers produce, market and store the crop throughout Indiana and Ohio, and the Delmarva/Pennsylvania region.

³ [Dicamba Alternatives to Control Weeds in Soybeans](#), Ligenfelter, D. Penn State University

2021-22 PARTICIPATING COMPANIES AND PREMIUM OPTIONS*

Company	States for Delivery	On-Farm Storage Premium	Harvest Delivery Premium	Moisture Specifications
ADM	Indiana & Ohio	Premium is set by the producer between August 13, 2021 and August 31, 2022 and is 10% of Nov. 2022 futures price. It is set only once and must be set before contracting bushels.		15% max moisture
Bunge	Indiana, Ohio and Michigan	\$1.25/bu.	\$1.15/bu.	14.5% max moisture
Perdue	Delaware, Maryland, New Jersey, New York, Pennsylvania, and Virginia	\$0.80/bu. \$0.10 additional for 100% planted to Plenish soybeans	\$0.55/bu. \$0.10 additional for 100% planted to Plenish soybeans	14% max moisture

*Consult your nearest participating elevator for specific premium, delivery locations, delivery timeframe, and contract specifications. Source: Pioneer.com 2021 Plenish Contracting Options

With a processing facility in Salisbury, Maryland, and partnering with 17 grain elevators in Pennsylvania, Virginia, Delaware, Maryland and New York, Perdue is the HO soybean processor and grower partner for farmers in the Delmarva Peninsula. The HO soybeans are accepted at up to 14% crop moisture, with a discount schedule beyond that level for delivery to four of its locations.

Perdue offers premiums starting at 55 cents/bushel. If farmers store their HO soybeans on-farm and make them available for delivery at high-demand times, that premium increases to 80 cents/bushel. If Plenish soybeans are planted on 100% of a grower’s acres devoted to the crop, the premium rises to 90 cents/bushel.

Currently with 16 grain elevator partners in Indiana and Ohio, ADM is the grower partner and processor for farmers in the eastern Corn Belt. Contracts for 2022 include harvest delivery and on-farm storage options, but these are dependent on the delivery location. Farmers should check with the individual elevator to determine their contracting choice. The farmer chooses when the premium price is determined and it will be set at 10% of the November 2022 soybean futures price. The price will only be set one time and it will remain for the entirety of the Plenish production. It must be established before contracting bushels. Requirements are for 15% maximum moisture (14.5% at some locations).

Bunge takes delivery at 26 locations in 2022. Premium options for \$1.25/bushel exist if a farmer is willing to store the crop and participate in a preferred buyer call between December 2022 and August 2023. Farmers who prefer to deliver at harvest will receive a \$1.15/bushel premium. The Bunge contract calls for a 14.5% maximum moisture.

Though the HO soybean market was limited in 2021, it’s expected to expand for 2023 and beyond. Plans are underway for new HO soybean contracts, with acreage expected to double in future years.

4. **TRANSPORTATION AND STORAGE COSTS** exist regardless of the crop, so HO Soybeans cost no more than any other production. Storage capacity in HO soybean production regions is a key piece of the puzzle to sustaining the premium program.

For transportation, estimate what it costs to have someone locally haul grain. There needs to be a charge from the field to on-farm storage if it's available, as well as from the farm to the processing facility. Typically, within 15 miles \$.06-\$.10/bushel will cover the cost from field to storage. From there, it just depends on how far the cost is to the processing facility, who is trucking it, or if it is being picked up will-call on the farm.

The other way to calculate the cost is knowing exactly how much trucking costs you in fuel, maintenance, labor, overhead, depreciation, inflation, appreciation, and repairs annually. Take that number divided by the total bushels hauled on average to arrive at a per bushel cost.

FOR STORAGE AND DRYING, it is also the same as any other crop. If you are storing commercially, simply input the flat fee or the cost to store per month times the number of months stored. If the soybeans are stored on-farm, this number can be a bit trickier. There are four things to consider:

1. Amount of Storage
2. Principal and Interest payments remaining on the storage.
3. Life expectancy of the grain system
4. Will there be upcoming upgrades?

What we need to be careful of is not over-inflating the cost on an annual basis.

Example:

100,000 bushels of storage

\$50,000 of debt

20-year life expectancy

$\$50,000/100,000/20 = \$.025$ or $\$.03/\text{bushel}$ in storage.

If there is significant grain-handling equipment such as grain legs, dryer, etc. a general rule of thumb for handling is \$.03 in and \$.03 out. Every grain handling facility is different in cost, size, and complexity, as well as the frequency of turning the system if the farm doesn't offer 100% storage capacity of the crop.

5. **A SOFT IP PROGRAM** allows some room for error at the farm level. The contracts are based on the commitment from the grower to plant a specific Plenish variety for 2021, so the requirements at delivery are somewhat lenient compared to traditional IP programs. High oleic oil content in soybeans is a genetic trait, meaning there's not the variety of oil output compared to other crop output traits, so meeting the oil requirements is less restrictive.

Conventional soybean oil is composed of approximately 60% polyunsaturated fatty acids, 25% monounsaturated fatty acids and 15% saturated fatty acids, whereas, HO soybean oil is made of around 75% oleic acid, with 20% less saturated fat and 2% to 3% linolenic acid. Eight percent of conventional soybean oil comprises linolenic acid, contributing to relative shelf instability

compared to HO soybeans, which is why the low-linolenic content is desirable. That is all in the genetics.⁴

Strict farm-level grain segregation is not necessary; as long as the soybeans meet the processor's oil requirements at the right crop moisture levels, they're accepted.

As a “soft IP” program, farmers can account for what minimal oil content variance individual loads may show in testing by blending. As long as the grain meets minimum thresholds for oil contents on an aggregate level, it meets the requirements for processing as high oleic soybean oil. Strict farm-level grain segregation is not necessary; as long as the soybeans meet the processor's oil requirements at the right crop moisture levels, they're accepted.

A Simple On-Farm Process:

- a. Clean seed hopper or boxes before planting HOSoy varieties.
- b. Mark fields where planting HOSoy varieties begins and ends.
- c. Run out a combine prior to and after harvesting HOSoy.
- d. Clean bins, trucks, and wagons prior to handling HOSoy to maintain purity.

As an example, Perdue requires 65% oleic acid content with their loads, which should be achievable with normal grain handling procedures. Harvest equipment and storage facilities should be cleaned before storing HO Soybeans for the premium contracts, but the perception that equipment needs to be pristine is not accurate. The test is for minimal oil content based on the production of the approved varieties. If small amounts of unapproved varieties are in the load, it is acceptable if the delivered load contains the minimum required oil content.

Testing typically takes less than 1 minute to complete, and a small number of loads are tested for sampling purposes. Tactically, this typically means farmers delivering HO soybeans to an elevator indicate their cargo via a placard and are directed to bins where the identity-preserved (IP) grain is stored.

CONCLUSION

The market is built and expanding rapidly. Now it just needs to be fed. For U.S. soybean growers, there will be some changes to their production, but due to the nature of a soft IP program, with excellent genetics and traditional agronomic practices, the on-farm disruption is minimal. With the upside promised from a stable domestic market, this is a true win for U.S. soybean farmers.

⁴ [Staying Ahead of the High Oleic Soybean Curve](#) Feed&Grain Webinar, March 17, 2021