

High Oleic Soybean Oil

The Business and Agronomic Case To Meet Growing Demand

Objective:

Address the management challenges of high oleic soybean production 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 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 high oleic soybeans represent an opportunity for farmers to supply a domestic market they have created.

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As we look to the 2023 growing season, rising demand across the supply chain means high oleic soybeans represent a strong value proposition for growers, grain handlers, food processors and retailers as the supply chain coordinates throughout the system. The high oleic 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 high oleic 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.
- The widely available weed control options available to growers.
- On-farm logistics allow more lenient protocols than traditional identity-preserved 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 [Allied Market Research](#) the worldwide cooking oil market was valued at more than \$63 billion in 2020, and that's projected to reach nearly \$105 billion by 2031.

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The [USDA Foreign Ag Service](#) says worldwide vegetable oil production from various oilseeds has grown from 188.50 million metric tons in 2016-17 to a projected 219.21 million MT in the 2022-23 marketing year. Soybean oil currently accounts for nearly 28% of total worldwide vegetable oil production, with U.S. soybean oil holding a 19% share of worldwide soybean oil production¹.

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 heart-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.²

¹ Oilseeds: World Markets and Trade, USDA Foreign Ag Service

² Industry ARC; Soybean Oil Market – Forecast (2021 - 2026)

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 high oleic 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 high oleic soybeans, the fundamental changes necessary for them to begin manufacturing products with high oleic 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 high oleic 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.

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.

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.³

³ [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 high oleic soybean seed at the farm level.

The 2022-2023 season marks the ninth year of general availability of Pioneer® brand Plenish® high oleic soybeans to growers in two main regions with considerable soybean processing capabilities, the Delmarva Peninsula and eastern Corn Belt (Indiana and Ohio). Also, in 2022-2023 high oleic soybeans are expanding into new markets, including Iowa and Illinois.

After adding new varieties every year since the genesis of the product line, farmers will have access to fifteen varieties of high oleic soybeans in 2023, with available maturity groups ranging from 1.9 to 4.8 across all regions within the existing market.

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.

To meet expected demand for the heart-healthy oil, farmers will have the seed and resources to plant 1 million acres as large domestic and multinational food manufacturers advance their high oleic 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.

With comparable yields, achievable agronomic practices, IP protocols with easy compliance, and a premium opportunity, farmers can gain \$2 more per bushel or more when evaluated against conventional soybeans.

ON-FARM PROFIT POTENTIAL

The High Oleic Profit Calculator Tool is available on the UnitedSoybean.org portal to help farmers make economic decisions on how high oleic soybeans fit into their farming operation using their own farm and field data. Farmers can project high oleic 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 high oleic 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 high oleic soybeans showed in-field performance on par with conventional varieties. High oleic 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.

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 high oleic soybeans take less time to integrate into traitled platforms.

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Source: Pioneer Corteva AgriScience

2. **WEED CONTROL** is an important consideration for any crop production decision and there are options with high oleic soybeans. In fact, it is a major area where high oleic 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.⁴

The combination of high-performance output traits and these crop performance attributes make high oleic 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 high oleic soybeans moving into the 2022 growing season and beyond.

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As for potential drift, farmers growing high oleic 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 2023. Currently, three processors purchase high oleic soybeans from growers at a range of premiums based on how growers produce, market and store the crop throughout the Midwest.

⁴ [Dicamba Alternatives to Control Weeds in Soybeans](#), Ligenfelter, D. Penn State University

2023 PARTICIPATING COMPANIES AND PREMIUM OPTIONS*

Company	States for Delivery	On-Farm Storage Premium	Harvest Delivery Premium	Moisture Specifications
ADM	Indiana & Ohio	\$2.00/bu. premium. Additional \$.200/bu. premium if contracted by October 31, 2022.		15% max moisture
Bunge	Indiana, Ohio and Michigan	\$2.05/bu.	\$1.95/bu.	14.5% max moisture
Perdue	Delaware, Maryland, New Jersey, New York, Pennsylvania, and Virginia	\$1.15/bu.	\$1.00/bu.	14% max moisture
AGP—Manning, Iowa	Iowa	\$1.10/bu. contracted before 12/31/2022	\$1.05/bu. contracted after 12/31/2022	13% max moisture
AGP—Hastings, Neb.	Nebraska	\$1.00/bushel harvest delivery \$1.10/bushel preferred buyer's call Contracts before 12/31/2022	\$0.95/bushel harvest delivery \$1.05/bushel preferred buyer's call Contracts after 12/31/2022	13% max moisture
CSC	Pennsylvania, Ohio	\$2.05/bu. buyers call	\$1.95/bushel harvest delivery	No specifications
Cargill	Iowa, Illinois. Ohio		\$1.85/bu.	14.5% max moisture

*Consult your nearest participating elevator for specific premium, delivery locations, delivery timeframe, and contract specifications.
Source: Pioneer.com 2023 Plenish Contracting Options

4. **TRANSPORTATION AND STORAGE COSTS** exist regardless of the crop, so high oleic soybeans cost no more than any other production. Storage capacity in high oleic 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 \$0.06-\$0.10/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 \$0.03 in and \$0.03 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.

Based on internal research conducted by the United Soybean Board in 2020, heading into the 2021 growing season, 33% of elevator and terminal managers in the two primary high oleic soybean growing areas said in a survey they have the capacity to store from 100,000 to over 1 million bushels, while 67% said they lacked the storage capacity and grain segregation capacity to maintain the necessary identity preservation.

As grower interest increases, so too will storage capacity. In the same survey, 47% said they had been asked about storing high oleic soybeans. Storage capacity is expected to grow to accommodate acreage expansion to around 1 million acres in 2022. Current and expected future premium structures incentivizing year-round grain movement outside traditional harvest delivery will contribute to the IP program and supply sustainability and flexibility moving forward.

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, high oleic 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 high oleic soybeans, which is why the low-linolenic content is desirable. That is all in the genetics.⁵

⁵ [Staying Ahead of the High Oleic Soybean Curve](#) Feed&Grain Webinar, March 17, 2021

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 high oleic soybean varieties.
- b. Mark fields where planting high oleic soybean varieties begins and ends.
- c. Run out a combine prior to and after harvesting high oleic soybeans.
- d. Clean bins, trucks, and wagons prior to handling high oleic soybeans 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 high oleic 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 high oleic 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 domestic high oleic soybean 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, high oleic soybean production is a true win for U.S. soybean farmers.

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