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Volume 6 Annual 2022

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- Double Cropping Sunflowers
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2021 was another successful year in all four Nuseed regions, North America, Australia, Europe and South America.

At the same time, global challenges such as the pandemic and climate change have highlighted the need for further, sustainable performance gains in agriculture and beyond.

The genetics of the crops we grow are an important key to ensuring further progress in agricultural sustainability. It's fortunate – and extremely exciting – that at this point in history, new technologies and techniques are enabling us to make unprecedented use of the existing crop breeding knowledge base. With the use of molecular/genomic breeding for all crops to enable marker-assisted selection, never before have we had the potential to achieve such large gains in breeding and at such a fast pace.

We're proud that our Nuseed canola, sorghum, carinata and sunflower hybrids are already helping farmers meet current challenges in the sustainable production of vital food, fuel, feed and fiber. And our new hybrids, as they continue to be launched into the market, will help them do even more.

World population continues to grow and the importance of superior crops with the best yields – as well as traits beyond yield such as improved nutritional benefits – are critical. Nuseed continues to keep our breeding focus on top yield performance along with the development of other traits critical to climate adaptation.

At the same time, we keep a strong focus on very specific, value-added end-use markets. In 2019 and 2020, Nuseed commercialized two new proprietary crops. Nuseed Carinata is currently grown in Argentina, so far, for the production of low-carbon biofuel with best-in-class greenhouse gas reduction certified by the Roundtable on Sustainable Biomaterials (RSB). Nuseed Omega-3 Canola, grown in the U.S., is the first land-based plant source of essential omega-3 fatty acids.

Our past R&D investments at our Nuseed Innovation Centers in West Sacramento, California and Horsham, Australia have advanced our input and output plant traits. Continued new investment, including the opening of our third Nuseed Innovation Center, in Venado Tuerto, Argentina will enable us to push further forward.

2022 will be another year where we at Nuseed work hard to provide our farm customers with new opportunities.

Through our network of local seeds businesses, global reach, world-class R&D and the Nuseed Value Chains, Nuseed continues delivering VALUE BEYOND YIELD®.

Leon Streit
Global R&D Lead
Nuseed



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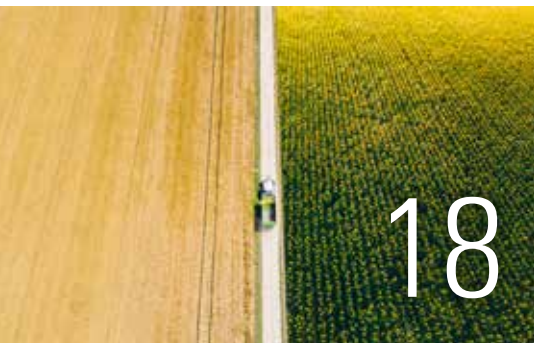
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SUNFLOWER: THE SUPER CROP

Drought tolerance, water/nutrient efficiency
and market opportunity are all reasons to
grow this agronomic superhero.



Superhero films have become reliable cash generators that draw in crowds and usually spur a slew of sequels. As of August 2021, the Marvel Cinematic Universe series was the highest-grossing film franchise with a total worldwide box office revenue of nearly US\$23 billion.

You might say sunflower is to the ag industry what the Marvel movies are to the people who make films in Hollywood, and 2022 shows no signs of the sunflower market slowing down.



Alison Pokrzywinski, Product Development Manager North America for Nuseed

"It's a great time to reintroduce sunflower to your farm. 2021 was a heck of a year for people on a lot of different fronts — the drought, input costs, supply chain challenges, you name it. But despite all that, sunflower performed very, very well," says Alison Pokrzywinski, Product Development Manager North America for Nuseed.

"People who grew sunflower in 2021 are going to be increasing their acres for 2022. The challenges we saw last year really gave this crop a chance to shine."

According to Pokrzywinski, most sunflower growing regions in the northern United States and the Prairie region of Canada faced severe drought in 2021. Sunflower was able to come out on top in many areas.

"Sunflowers need moisture at specific times to be minimally successful, and that's at plant stand establishment. They need more during flowering, or shortly after flowering, because that's when the seed is starting to develop. That's exactly what happened in a lot of the sunflower-growing regions," she says.

"Growers were able to get a decent stand, and even though yields varied, they were still reliable enough for growers to come out ahead."

That means despite drought, return on investment was still very good. In areas impacted more heavily by the drought, she says 1,000-pound per acre yields were very common.

"While that's not by any means spectacular, a lot of growers ended the season thinking, 'Boy, we had such a drought and I still got a decent sunflower yield, especially considering what prices are right now.' That means growers are going to be coming back to this crop in 2022."

In areas that had more rain, the crop did even better, she notes. Some areas produced 2,500-pound per acre yields, and she's even seen some 3,000-pound per acre yields as well.

"That's phenomenal."

"THE COMBINATION OF REALLY GOOD YIELDS WITH THE HIGH-QUALITY OIL CONTENT, AS WELL AS GOOD PRICES, IS REALLY MAKING THAT LIGHT BULB GO OFF IN GROWERS' HEADS AND MAKING THEM LOOK AT INCREASING THEIR ACRES FOR 2022."

- ALISON POKRZYWINSKI

It's all in the Oil

But it's not just yield that makes for a stellar return on investment (ROI) for sunflower crops. The oil content is a big factor as well, and Pokrzywinski is happy to note that this is another area where this superhero crop proved its worth in 2021.

"The combination of really good yields with the high-quality oil content, as well as good prices, is really making that light bulb go off in growers' heads and making them look at increasing their acres for 2022," she says.

"Many of these growers also yielded sunflowers with up to 47 percent oil content,

which is amazing. For sunflower that's being sold into the crush market, growers get a premium for anything over 40 percent oil content. To have 47 percent means you're getting more money per pound. Let's say your base price is \$27 per hundredweight (cwt). At 47 percent oil content, that would mean that your sunflower seed would now be getting \$30.78 per hundredweight (cwt). That's a huge selling feature of this crop."

John Sandbakken, Executive Director for the National Sunflower Association, says the growth in sunflower acres is directly driven by growth in market demand, which is surging.

"We've been experiencing about a 5 percent to 10 percent growth in usage each year, and that continues to move up as consumers are looking for healthier products," he says. "Everybody wants to eat the same amount of food; they just want it to be healthier. With sunflowers, you get very high monounsaturated fat and low saturated fat, and that's what people want."

The "clean eating" trend is a big one and puts an emphasis on whole foods that are less processed — namely, fruits, vegetables, whole grains and healthy oils.

"The 'clean' label is very big in the U.S. and Canada, and sunflower just fits in perfectly with that," Sandbakken says. "It has a very neutral taste, and it doesn't impart any other kinds of flavors into the foods that we eat."

Long-Term Benefits

That high-quality oil content is due in no small part to the plant's ability to grow well even under drought conditions. The agronomics of the sunflower are uniquely suited to this and make it an ideal addition to a long-term crop rotation plan.



John Swanson, Minnesota grower and former Product Manager for Winfield United



Today's sunflower hybrids are better adapted to changing climates.

"Water use efficiency is stellar with this crop. Sunflower has deep roots that are very good at penetrating into the ground, and that helps to make it so that water can move upward and downward a little easier," says John Swanson, a Minnesota grower and former Product Manager for Winfield United.

"In 2021, we had extremely bad drought in our particular area. I have my sunflowers on very sandy ground. We had around 1.7 inches of moisture during the total growing season, and between six and seven inches for the previous whole 12-month period. Yet, they did quite well."

Swanson's experience with sunflower has helped him identify top-quality hybrids by their visual characteristics, he says. These qualities shed even more light on the plant's ability to handle drought.

"This is something I look for in hybrids — the leaves will curl when it gets really hot. In the morning, you can see the leaves are flat and absorbing sunlight. Then in the afternoon, if it gets really hot and windy, they will roll and curl and the stomata (pores) would close and they would actually conserve water," he says.

As hybrids have improved to better handle what the climate throws at them, so have yields. Swanson notes yields have improved as much as 50 percent in recent years, largely due to genetics but also better because of management practices like weed control that have improved soil health.

"It's important to rotate different herbicides, and sunflower gives us the ability to do some rotation of herbicides that normally aren't used in corn, soybean or wheat. There's an advantage there, too. Having more crops in your rotation in general does add to soil health," Swanson says.

Nutrient Efficiency

Another area where sunflower proves its mettle is in nutrient efficiency, which Pokrzywinski says is all the more relevant right now.

"Nitrogen prices are quite high. Coming off of a drought, some growers' fields have excess nitrogen in them. So, let's say that they were fertilizing for corn, or wheat, and their yield wasn't nearly what they thought it was going to be. There should still be nitrogen left in the soil, and since sunflowers are scavengers, they have the potential to root down deeper than other crops would to get that extra nitrogen."

She recommends growers soil test down to 24 inches for stored nitrogen.

"That's something that growers are going to take a hard look at for 2022, because if you have that much nitrogen in your soil, you're probably not going to plant something like soybean, which isn't going to necessarily utilize that nitrogen. You're going to want to plant something that's going to need it and be able to go find it."

With their deep and vast root systems, sunflowers are able to access both water and nutrients at deeper depths.

"Over the years, I took part in research that shows the roots can go down six, nine, even 12 feet. Under the right conditions, they're able to do that," Swanson says.

Market Opportunity

Despite weather being hard on all crops in 2021, the agronomic benefits of sunflower means market opportunities did not take a hit. In fact, the drought could actually have a silver lining in the form of more contract opportunities.

"Even though sunflower is very drought tolerant, the weather in 2021 is going to

affect the amount of production we have. The drought was so severe in places that yields were not up to what our expectations normally are," Sandbakken says.

"With demand growing the way it has been the last few years, we need more acres in 2022. So, my thought is that the industry is going to be very aggressive in starting to contract and in fact they did come out with 2022 contracts in August 2021, which is unheard of. Normally we don't see new crop contracts until November or even December, so that just shows you how eager the industry is to contract acres."

Pokrzywinski agrees.

"That to me speaks volumes about the fact that processors are wanting more acres. They also didn't want growers to start making decisions in the fall of 2021 that would limit them from planting sunflowers in 2022. On the oilseed crush side, it ranges. It's fluctuating between \$26 and \$27.40 USD per hundredweight.*"

The Future

As new high oleic hybrids come to market, Swanson sees the opportunities for sunflower increasing even more.

"The work being done now on sclerotinia and phomopsis is incredible. We may not get total immunity, but some of the new germplasm that's being released has some real good promises of at least reasonable field tolerances," he says.

"We've had years of really good sunflower crops, close to 3,000 pounds average in a year. But then you get those years, like 2021, where we've had less than ideal yields in many places. If we can take out those low yield years by having more resistance in our crop or tolerance to these diseases, I think that will add significant value for the grower. We used to think if we could get one new product to market out of 1,000 we tested, it was a pretty good. Now, I think we're getting a little bit better than that. So, our systems of testing are improving, and our abilities to make the most of genetics is certainly greater with the new techniques that are being used in breeding." 🌻

* Published prices at the time of printing.

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WATCHING THE SKIES

According to a weather expert, sunflower growers can look forward to good moisture in spring, despite some potential for late seeding.



What is La Niña?

La Niña is an oceanic and atmospheric phenomenon that is the colder counterpart of El Niño, as part of the broader El Niño–Southern Oscillation climate pattern. During a La Niña period, the sea surface temperature across the eastern equatorial part of the central Pacific Ocean will be lower than normal by 1-3° C (2-6° F). A La Niña can persist for as little as five months to as long as three years. It has extensive effects on weather across the globe, particularly in the Americas.

Sunflower growers can look to 2022 planting with guarded optimism. After a severe drought that defined the year prior, the upcoming U.S. and Canadian sunflower planting season looks to be quite favorable, says meteorologist David Streit of Commodity Weather Group based in Washington, DC.

“Over the winter months, early 2022, it looks like it’s going to be drier than normal, but precipitation is normally very light. As we get into the spring, we’re expecting to see some weakening of the La Niña we’re in right now. That’s when we will see precipitation activity pick up,” he says.



David Streit of Commodity Weather Group based in Washington, DC.

“There may be some delays to planting because of cool and wet conditions. If you put your seed in the ground too soon, there could be some issues as far as stand viability goes. We will likely continue to see a weakening of the La Niña, meaning we will see an easing

of the wet pattern. There could be some planting issues at the start, but as of right now I don’t think anything too dramatic.”

Streit says the cool, wet weather start to the spring could be a big help to growers who had difficulty in 2021.

“From a soil moisture standpoint, I think growers will definitely have a better situation for going into the early growth period. For anyone worried about dryness, they can take some comfort in what’s coming for 2022.”

Despite decent conditions for spring, Streit says challenges with drought and heat could return in summer, depending on a myriad of factors such as upper air and sea surface temperature pattern evolution during the spring.

“We could go back into a hotter pattern in the northern United States and Canada growing regions, but right now we just don’t have the data to let us see that very clearly.”

Globally, Streit sees a similarly wet spring for the major sunflower growing regions of Europe.

“They’re probably going to be set up to have near- to above-normal rainfall activity for the spring. That moisture will mostly be a good thing, and I don’t foresee big challenges as far as their moisture situation goes, or in getting the crop established.”

He says countries like France and Spain could run into some minor planting delays due to the active shower pattern but doesn’t foresee major delays in seeding there. He does predict some drought for parts of Northern Europe but says it will likely be mainly in the wheat and rapeseed growing areas, as opposed to the more southerly sunflower-growing regions. ☀️



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SUNFLOWERS ON THE UPSWING

After lower acreages in 2021, a big comeback is expected for sunflowers this year.

While 2021 presented some unprecedented and challenging aspects for the sunflower sector across Canada and the U.S., it's looking to industry insiders like 2022 will pick up where 2020 left off.

Going back about 24 months, 2020 was a banner year for sunflowers, with very strong markets and more expansion of acreage. At the start of 2021, the U.S. and Canadian outlooks for the oil and confection markets

were described as never being better. Indeed, a year ago in Nuseed Succeed, John Sandbakken, Executive Director of the National Sunflower Association, said the sunflower industries in Canada and the U.S. had been working together well — and that going into 2021, farmers had been offered “great prices to keep the momentum going.”

However, while U.S. and Canadian sunflower acreage grew as much as 30 percent in 2020,

it fell in 2021 due to historically high corn and soybean prices. “At those price levels,” explains Mark Jackson, General Manager of Nuseed Americas, “those in some of the key sunflower-growing regions took a chance and added more corn and soybean acres, bringing sunflower inventories lower.”

But no one can predict weather patterns, and during 2021, some of the growers who planted more corn and soybeans were faced



with tough times. "With the hot, dry growing season of 2021 in many areas, performance of these crops fell short," Jackson reports. "It's actually under those types of conditions that the benefits of sunflower tend to show. The plant has a root structure that can go deeper in order to access subsoil moisture and nutrients. It's an excellent reason to add sunflower into your crop plan in 2022. The taproot can also do an excellent job to break through hardpan."



John Sandbakken, Executive Director of the National Sunflower Association



Mark Jackson, General Manager of Nuseed Americas

North American sunflower growers have many hybrid options right now, but those in the High Plains region have an additional choice. Nuseed's N4H161 CL is a specially developed hybrid for that region's short growing season and double-crop system (sunflower after winter wheat). N4H161 CL is therefore allowing sunflowers to be planted where growers likely hadn't previously considered sunflower as a fit, due to higher elevations and/or less 'growing degree' days.

Another positive attribute of N4H161 CL is shorter plant height. This allows growers to use a ground rig for mid- and late-season pesticide applications and thus saves them the cost of aerial applications.

Market outlook

Agronomics aside, strong demand is another reason why sunflowers are a smart choice this year. Overall, Jackson states that North American market opportunities are excellent.

"Fundamentally, we continue to see sunflower oil-based products grow at a faster pace than those made from commodity alternatives," he says. "It all revolves around sunflowers non-GM status, healthy oil profile and quality protein. They all come together to make sunflower an easy choice for consumers looking to make healthier food choices."

Indeed, inventories are small and demand is high going into 2022 for all sunflower segments: oilseed crush, dehull or kernel, and birdseed.

Jackson explains that "from all indications so far, sunflower is going to have a great year. The processors have already put out lucrative contracts and this is driving early grower decisions to go with sunflowers. With open contracts from oilseed crush to birdseed, growers have a lot of opportunity right now."

The overall production ratio for oil versus confection has stayed stable over the last few years, but with a small gain by oil types. It's now about 90/10 percent oil/confection and this is expected to stay about the same for the next year.

Healthy Oil Demand

The long-term increased demand from consumers for healthier products is a major driver behind the growing market for sunflower oil. Indeed, due to all of its health benefits, it's now being incorporated into more and more products such as premium mayonnaise.

Before we look at the oil's components, let's take a closer look at some of the accolades now enjoyed by sunflower oil. For some time, it's been listed among the small group of top 'better-for-you' oils currently recommended by the American Heart Association to maintain circulatory system health.

SUNFLOWER MARKETS

It's low in saturated fat and high in two types of healthy fatty acids which the American Heart Association urges us to make the majority of fats in our diet. They're known as polyunsaturated and monounsaturated fatty acids, PUFAs and MUFAs for short. And while they're present in sunflower oil, sunflower seeds contain high amounts of PUFAs as well.

PUFAs encompass omega-3 and omega-6 fatty acids, which have been shown to reduce cholesterol and triglycerides, risk factors in heart disease. MUFAs may also reduce heart disease, and their consumption has been shown to increase HDL (the 'good' type of cholesterol) and to reduce inflammation.

The significant level of vitamin E in sunflower oil also protects human health. This vitamin acts as an antioxidant that can lower inflammation and protect against some types of cancers.

And nowadays, consumers and food product manufacturers can choose from a few types of healthy sunflower oil. There is sunflower oil high in oleic acid (a MUFA), in linoleic acid (a PUFA), and others in between. For several years, the U.S. Food and Drug Administration has supported a food product health claim that oils containing at least 70 percent oleic acid may reduce heart disease.

High-oleic sunflower oil is in particular demand for cooking since it stays stable at higher cooking temperatures. Indeed, it's already a staple in the food industry, year after year displacing more soybean oil in various products. It is also featured in many of the new plant-based food products. This type of oil slows down the oxidation process, extending product shelf life. It also delivers the great taste that's always been a characteristic of sunflower oil.

Jackson reports that current demand for oil from both NuSun® mid-oleic hybrids and high-oleic hybrids is strong, but at the same time, predicts that the current shift towards more high-oleic hybrid acreage will continue.

"While there is a committed customer base for NuSun sunflower oil due to its flavor and performance, as long as there is a grower premium for high-oleic oil, growers will lean

that direction," he says. "It's very exciting that hybrid yield performance has improved across the board, allowing growers to move easily between NuSun and High Oleic."

Confection Sunflowers

The confection sunflower market is also predicted to be strong in 2022. The pandemic found us spending more time at home and snacking more, but we want those snacks to be healthy. Sunflower seeds fit the bill, being heart-healthy and also a great source of protein.

While confection production does involve more focus on managing insect pressures and other potential quality issues, growers are rewarded with strong premiums. This is why first-time sunflower growers usually target the oil market (crushing, kernel processing and birdseed) and then decide in subsequent years if they are ready to grow for the confection market.

Jackson also notes that while confection producers have always been offered contracts with an 'Act of God' clause (a shortfall is given if the yield is not achieved), it has been a few years now that some oil market contracts also contain this clause.

2022 and Beyond

Looking forward, 2022 appears to be a very good year to grow sunflowers.

"With high demand, a range of hybrids and strong agronomic advantages for this crop," says Jackson, "we expect that 2021 will go down as a blip in otherwise steady trends towards higher returns and expanded acreage." 🌻

Bird Feed STILL Flying Off the Shelves

In 2020, as the pandemic ramped up and most people were confined to their homes, watching birds became hugely popular across the U.S. and around the world. Hundreds of thousands, if not millions, of U.S. households were keen to attract birds to their yards — and they mostly did this by putting out birdseed.

Because so many people got hooked on the pastime, birdseed demand in 2020 was extremely strong. This spike actually followed quite a few years of steady decline in demand. Indeed, the market for sunflower seed — the main component of wild birdseed and almost 40 percent of the market for U.S. sunflower growers — perhaps reached its lowest point ever in 2019. Right now, over the winter of 2021/2022, demand for bird feed is strong. Homeowners wanted the same entertainment they had during the winter of 2020/2021, seeing so many birds just outside their windows.

However, supplies are tight. States where sunflowers and other grains and seeds in bird food mixes are predominantly grown were hard hit by the drought of last summer. Many farmers who would have chosen to grow sunflowers in 2021 also decided to plant soybeans or other commodities to take advantage of high prices. As the National Audubon Society (a group that protects birds and their habitats throughout the Americas) recently reported, U.S. farmers planted about one-quarter fewer acres in sunflowers in 2021 compared to 2020. Those that did grow sunflowers however, as explained in the article, are being paid well, perhaps even double the 2020 price.

The outlook for birdseed demand is good going forward. Global research firm Research & Markets reports that from 2021 to 2026, the global bird food market is expected to have a compound annual growth rate of 2.7 percent.

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GLOBAL MARKETS

The Black Sea Region of Europe continues to lead global sunflower production, with new hybrid adoption the main reason for ongoing growth in acreage – and higher yields.

As it has been for many years, global sunflower production is currently led by Russia and Ukraine. "Sunflower is the crop of choice for farmers in these countries," explains Patrick Dieterich, Nuseed General Manager, Europe. "With new hybrids becoming available and strong markets, acreage is growing in both countries by a small percentage each year."

According to recent International Sunflower Association (ISA) reports, Argentina and countries in Europe lead global sunflower production after Russia and Ukraine. In particular, the association describes the growth in acreage over the last decade in the Black Sea region as exponential. Russia now has approximately 8 million hectares of sunflowers, says Dieterich, Ukraine 6 million hectares and in total in the Black Sea Region (which is home to a number of countries), about 3.5 million hectares are now under production.

Oil for human consumption, both traditional oil and high-oleic, is the main market for sunflower growers in Russia, Ukraine, Europe and Argentina, but Dieterich says the inshell confectionary market and the 'conoil' market for the dehull market (using hybrids that have both oil-type and confection parentage) also remain strong. He explains that the largest drivers in the sunflower market right now are commodity pricing and high-oleic premiums. The high-oleic market is cyclical, he notes, and last year demand was down due to lower premiums, so he believes "it's quite possible that the high-oleic market will bounce back this year with higher demand as supply for the crushers last season was reduced."

In terms of global trade, the ISA reports that the vast majority of sunflower seeds are crushed locally, and trade represents less than 10 percent of global production. The EU is the major destination of the Ukrainian



and Argentine exports. Dieterich notes that while there are some opportunities for North American growers to export confectionary sunflower seed to Europe, these opportunities are dependent on macroeconomic conditions such as oil premiums, currency exchange rates and logistic costs. He doesn't believe global demand for European rapeseed oil or North American canola oil will have much current impact on the sunflower market in Europe.

The overall increase in planted acres of sunflowers are a direct result of the availability of new hybrids. "Today, the Nuseed market access for sunflower in the European region (the EU and Ukraine) is approximately 18 million hectares," says Dieterich. "We continue to bring new hybrids to market and increase our shelf space with our distribution partners. Expectations for 2022 are high for all sales teams in Russia, Ukraine and Central Eastern Europe, especially in Romania, Bulgaria and Moldova."

Hybrids most in demand are Express® herbicide-resistant hybrids with genetic Orobanche resistance and advanced downy mildew resistance in both the oil and high-oleic market. "These segments continue to outpace growth in other market segments," says Dieterich, "as farmers look to secure their yield with these crucial agronomic traits." 🌻

What is Orobanche?

Orobanche cumana (sunflower broomrape) is a parasitic plant and substantial threat to sunflower production in countries around the Black Sea and across Europe. Sunflower plants infected with Orobanche are stunted with smaller heads and yield losses are reported to be anywhere from 20 percent to 100 percent.



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A hand is holding a large, clear plastic bottle of sunflower oil with a green cap. The bottle is filled with a golden-yellow liquid. The background shows a grocery store aisle with shelves stocked with various bottles of oil. The lighting is bright, and the focus is on the bottle being held.

CONSUMER PREFERENCE: WHY THEY BUY

Consumers are not just choosing healthier products on grocery store shelves but are actively searching for healthier products. Recent trends show consumers are looking for the health benefits, but also want to know where their crops come from. Now is the time for the sunflower industry to strengthen the *farm to fork* messaging – and growers play an important role.

Around 75 percent of the sunflower seeds grown globally are crushed for their oil. For savvy growers and processors, as well as health-conscious consumers, the nutritional quality of that sunflower oil matters. The proof is in the marketplace. New products are popping up on grocery store shelves and the demand for sunflower oil is growing. According to Research and Markets' recent Sunflower Oil Market Growth, Trends and Forecasts report, the global sunflower oil market is forecasted to witness a compound annual growth rate (CAGR) of 5.67 percent during the forecast period (2020-2025).

The increased demand for sunflower oil is being driven by the fact that it is healthy and a lower cost than other vegetable oils. Fluctuating prices of other vegetable oils, such as palm oil, soybean oil, and others, plays a role. The fluctuating prices often affect the overall sales of the end-user products; therefore, companies are leaning towards stable-priced options, like sunflower oil, to utilize them for various purposes.

However, it's the health benefits of sunflower oil, and more health-conscious consumers, that is mostly driving up demand. There are many characteristics that make sunflower oil an attractive ingredient. Sunflower oil is light in taste and appearance and supplies more vitamin E than any other vegetable oil. It is a combination of monounsaturated and polyunsaturated fats with low saturated fat levels that offers proven cardiovascular benefits. Monosaturates can help reduce bad cholesterol levels in your blood, which lowers risk of heart disease and stroke. The versatility of this healthy oil is recognized by cooks internationally. Sunflower oil is valued for its light taste, frying performance, and health benefits.

In the U.S. market there are currently two healthy sunflower oil nutrition classifications: "Nusun®", where heart-healthy oleic levels range from 55 percent to 75 percent (about the same as olive oil), or "high oleic", where oleic levels are more than 82 percent. Both are developed with standard breeding techniques. They differ in oleic levels and each one offers unique properties. High oleic is preferred by consumers because of the

health benefits and is also able to withstand high fry temperatures, making it great for a variety of uses for the food industry.

With the help of plant breeders and agronomists, company's such as Nuseed are achieving higher levels of oleic acid in sunflowers than ever before. For growers, producing healthy, higher oleic sunflower hybrids means marketing access to more specialty markets.

"SUNFLOWER SEEDS ARE HIGH IN PROTEIN AND RICH IN HEALTHY FATS. THEY ARE A GOOD SOURCE OF VITAMIN B, VITAMIN K, IRON AND ALSO A GOOD SOURCE OF PROTEIN."

- MIKE KOTZBACHER

Sunflower Products on Grocery Shelves

Sunflowers are finding their way into a variety of new products once they leave the grower's farm. Sunflower oil, kernels and whole seeds can be a low-cost ingredient to help keep the cost of the finished good competitive for the consumer to purchase.

Red River Commodities (RRC) is one of the companies tapping into healthy consumer trends and sustainability. Food manufacturers rely on RRC for high-quality, human-grade food ingredients. An ag processing company that sources crops directly from trusted growers and processes them into products for our food manufacturing customers, RRC handles a variety of crops but sunflowers are their specialty.

Mike Kotzbacher, Senior Vice President of RRC, says sunflower kernels can be used for many different products. "Food ingredient companies use them for baked goods, cereal bars, protein bars, etc.," he explains. "Sunflower seeds are high in protein and

rich in healthy fats. They are a good source of vitamin B, vitamin K, iron and also a good source of protein."

RRC has been marketing SunButter, a sunflower butter that uses sunflower kernels, for more than 20 years. "It is processed in a nut-free facility and is free from all eight of the top food allergens," says Kotzbacher.

Other markets RRC supplies to include inshell sunflowers and birdseed. RRC roasts, salts, and flavors the inshell sunflower and sends to various customers such as Pepsico and Conagra Foods for retail sales. The company also uses sunflowers to produce birdseed for wild bird feeding. "The sunflowers are used in many different mixes to attract different types of birds," Kotzbacher explains.

And new to the marketplace, RRC has recently launched Suntein, a high protein, partially defatted, plant-based flour that is free from the top allergens. It has a protein value of 51 percent. "Suntein can be used in a wide variety of applications to enhance the nutritional value of foods to meet today's market demands. We also have an RTE (ready to eat) option available," says Kotzbacher.

Other companies like Smude Sunflower Oil, are focusing more on the actual oil from the sunflower. Smude Sunflower Oil is a heart healthy, non-GMO, and Minnesota-produced product. The company has grown rapidly, tapping into consumer demand for healthier oil products.

New Markets

Sunflower oil doesn't just have health benefits for food products. The application of sunflower oil is highly witnessed in the personal care market. Giant players of the beauty industry are incorporating sunflower oil in their clean-label and sustainable products. For instance, in April 2019, L'Oreal launched a sustainable beauty brand, Seed Phytonutrients, which contains sunflower seed oil.

Sunflower oil is rich in essential fatty acids and helps moisturize, regenerate, and condition the skin. Sunflower oil is considered for a variety of skin care products due to its lower pricing as compared to other nourish-



ing oils, like argan oil, almond oil, and olive oil. Additionally, it is also used as the primary vegetable oil in bath oil and massage oil formulations.

Closing the Farm to Fork Gap

In the past, it was more difficult to market new, specialty products in big retail grocery stores. However, today it is easier than ever before to promote and sell specialty products because of two trends: health-conscious consumers who are looking for these specialty products and the rise of digital marketing and e-commerce. If a product can't be found physically in a grocery store, it can be found online.

According to Kotzbacher, all of RRC's products can be found on store shelves. "Our SunButter is widely available across the U.S. on many retail shelves. You can also find our roasted, salted and flavored inshell in many grocery outlets and convenience stores. Our birdseed can be found in Farm and Fleet and grocery stores through the U.S.," Kotzbacher says.

Going hand in hand with rising demand for healthier products is the trend to be more sustainable, for consumers to know where their food comes from and to buy local. Which is exactly why companies like Smude Sunflower Oil and RRC have created entire

brands that promote the *farm to fork* process. The messaging on RRC's website has words like "trusted grower" and "sourced directly from growers, so all of our products are the finest, freshest available."

"Working directly with growers to source the best quality product is a must here at RRC," says Kotzbacher. "Having control of the supply chain from field to fork is very important to maintain the quality and consistency of what we produce. We have been working direct with growers for almost 50 years and they are an important part to our success. Continued partnership with them allows

Healthy Benefits of High Oleic Sunflower Diet and Cardiovascular Benefits

Sunflower oil is high in vitamin E and low in saturated fat. The two most common types of sunflower oleic profiles in the U.S. are NuSun® and high oleic, created as healthier oils having low levels of trans fat, good shelf life and neutral taste profile, making them attractive for commercial cooking applications.

Newer versions of sunflower oil have been developed as a hybrid containing linoleic acid. They have high monounsaturated levels lower than other oleic sunflower oils.

Sunflower oil of any kind has been shown to have cardiovascular benefits as well. Diets combined with a low-fat content and high levels of oleic acid have been suggested to lower cholesterol which, in turn, results in a smaller risk of heart disease. Sunflower oils fit these criteria. Studies of adults suggested that a balanced diet in which small quantities of saturated fats are replaced with sunflower oil has detectable cholesterol-reducing benefits. Research suggests that lower cholesterol levels can be caused by balances of polyunsaturated and monounsaturated fatty acids. Sunflower oil may help with this balance.

The chart below summarizes the main differences in fatty acid composition between 1-tablespoon (15-mL) servings of the three sunflower oils used in home cooking (<https://fdc.nal.usda.gov/fdc-app.html#/food-details/521139/nutrients>).

	High oleic	Mid-oleic (NuSun®)	High lineoleic
Calories	120	120	120
Total fat	14 grams	14 grams	14 grams
Saturated	1 gram	1 gram	1 gram
Monounsaturated	11 grams	8 grams	3 grams
Polyunsaturated	0.5 grams	4 grams	9 grams

Source: <https://www.healthline.com/nutrition/is-sunflower-oil-healthy>



good agriculture practices (GAPs) to be at the highest level to maintain food quality.”

For example, to make its SunButter product, RRC starts with the highest quality sunflower kernel available. They source it from carefully vetted growers and suppliers that are peanut and tree nut free. By keeping the sunflower kernel away from peanut and tree nut free environments, RRC can mitigate any risk of cross contamination.

Growers play a key role in ensuring they are following the processes to ensure there is no cross contamination and that there is traceability up and down the chain. ☀️

What is High Oleic Sunflower Oil?

High oleic sunflower oil is very high in oleic (monounsaturated) acid.

The oil has a neutral taste and provides excellent stability without hydrogenation. High oleic sunflower oil offers a trans-fat free oil solution for customers. The oil has many uses including bakery applications, spray coating oils for cereal, cracker and dried fruit; it is used in non-dairy creamers, many types of frying and other uses.

Nuseed offers a complete lineup of high oleic sunflower seed hybrids, including herbicide resistant options. To learn more about the hybrids available to grow on your farm visit nuseed.com/us/oilseeds.

Know Your Processors

Developed and tested right here in the U.S. there’s a Nuseed hybrid right for every market and every field. Getting to know processors in your region can give you added marketing flexibility, and some processors may have contract opportunities available to growers.

Company	Contact Person	Phone	Hybrid	Seed Type	Delivery Point
Red River Commodities	Scott Hegge	(701) 282-2600	Black Oilseed	Birdfood	Fargo, ND
	Nick Boll	(701) 541-4404	Badger DMR	Conoil	Fargo/Jamestown, ND
			Badger DMR-UNT (organic)	Conoil	Fargo, ND
Scouler Special Crops	Mike Bolz	(218) 684-4739	Panther DMR	Confection	Fargo/Jamestown, ND
			Badger DMR	Conoil	Mentor, MN
Advanced Sunflower	Jarrid Graff	(605) 350-0188	Badger DMR	Conoil	Huron/Redfield, SD
	Danny Dale	(605) 412-0129	Varies based on contract	Confection	
Global Harvest	Paul Knudsen	(866) 379-0404	Oilseed	Birdfood†	Roscoe/Harrod, SD
		(918) 430-6106			Farm pickup available
ADM- Benson Quinn	Brandon Godt	(605) 875-3278	Oilseed	Birdfood†	Harrod, SD
Sunbird Inc	Lee Klocke	(605) 350-7486	Oilseed	Birdfood†	Huron, SD
Hubbard Feeds Inc	Steve Hepper	(701) 223-4065	Oilseed	Birdfood†	Bismarck, ND
D & D Commodities	Jerry Grochowski	(888) 543-3308	Oilseed	Birdfood†	Argyle/Stephen, MN
ADM- Northern Sun	Guy Christensen	(701) 680-1045	All HO‡ and NS	Oil Crush	Enderlin, ND
					Pingree, ND
					Hebron, ND
Cargill	Darcy Uhrich	(866) 414-5356	All HO# and NS	Oil Crush	Fargo, ND

† 28lb test weight minimum; ‡ 85 percent oleic or greater; # 84 percent oleic or greater

ULTRA-EARLY SUNFLOWER GENETICS **DELIVER GROWER OPTIONS**

Nuseed's N4H161 CL is a grower's sunflower solution to the challenges of double-cropping, crop maturity challenges, weed resistance and standability.

Margins in production agriculture are slim, and as farmers work to maximize the economic return of every acre, double cropping is often a consideration.

Sunflowers make an excellent double-crop choice with the right seed genetics and crop management. In many instances, sunflowers are even more advantageous than soybeans in a double-crop rotation. The crop can both withstand colder temperatures than soybeans, allowing for additional growth after the first frost, and withstand hot, dry conditions better than soybeans. The latter is an important consideration given the likeliness

of the hot and dry conditions any double-crop will experience in the late summer months. These production management advantages, paired with the impressive growth every sector of the sunflower market is projected to see over the next five years, should see the crop add additional acres... and Nuseed is ready to deliver the sunflower genetics growers will need to both plant the additional acres and capitalize on those acres' returns.

Nuseed sunflower hybrids are born and bred in the U.S., positioning every hybrid to help growers find the value in the crop.

And because Nuseed's sunflower nursery is strategically located in the heart of sunflower country, Breckenridge, Minnesota, every hybrid is subjected and trialed against the same natural disease and pest pressures most U.S. sunflower growers face.

Recently, Nuseed unveiled a new ultra-early sunflower hybrid, allowing growers to capitalize on double cropping opportunities, as well as introducing the crop into new geographies that previously struggled to grow sunflowers because of altitude and insufficient growing degree days.

Ultra-Early, Ultra Opportunity

What is “ultra-early”? And “ultra-early compared to what?” Alison Pokrzywinski, Sunflower Product Manager, North America, says that there isn’t necessarily a definition of “ultra-early” outside of Nuseed.

“We’re taking the earliest hybrids that we have, and we have some early products compared to our competitors, and making them even earlier,” she says. “And we aren’t talking about one or two days earlier, we’re talking about one or two weeks.”

Pokrzywinski says one of the drivers behind the earlier hybrids is the scale of business Nuseed does in Canada — Manitoba, specifically — which necessitates a shorter growing season. The “early” she says, has been available in the Nuseed portfolio for several years now, however the ultra-early combined with impressive yield and hardiness, is a new addition.

“The original product in our portfolio was two weeks earlier. The maturity was really great, but it came at the cost of yield. There was nearly always a sacrifice in yield, and we just couldn’t quite get those yields to be where we wanted them to be, until now,” she says. “Everything we do has to benefit the grower and, obviously, maintaining yield is a big part of that.”

N4H161 CL is Nuseed’s answer. The new hybrid provides the ultra-early genetics growers need to meet the demands of a double-crop’s short growing season while also delivering outstanding yield potential.

“It has taken a bit longer to develop the (N4H161 CL) genetics because we’re not only trying to develop the genetics and make sure that they’re the right fit for the environment, we are also trying to establish an environment that is the right fit for them. So typically, it would take around seven years to develop a new hybrid; we’ll be just short of 10 years by the time this hybrid hits the market,” says Nuseed Sunflower Breeder, Jeremy Klumper. “We have to have more than the data to back up what we’re presenting. We have to have good recommendations when it comes to how to grow and manage these ultra-early crops.”

Klumper says that N4H161 CL is proving to be a top performer, opening opportunities for growers in different geographies and offering new double cropping rotations. The team at Nuseed has the collective knowledge and resources to ensure growers get the most out of the genetics.

“We can’t just say, ‘This is how the industry handles this crop’ because it really is so much different,” he says of the hybrids uniqueness within the sunflower seed market. “To make all of our new and innovative hybrids available for growers, we have a very experienced production team who are responsible for managing large scale crops that produce high quality seed.”

The new opportunities the hybrid is providing has growers excited. As a Nuseed Field Sales Lead, Jed Wall is hearing that excitement. “Nuseed sunflowers and canola, and the N4H161 CL hybrid offers two things, other than maturity, that growers are very excited about: plant height and the other is stalk and root structure.”

The new ultra-early hybrid grows to approximately waist level, a significant height difference from traditional hybrids that reach more than head high; the advantages of a shorter plant are both environmental and economical.

“Growers will be able to get over these sunflower plants with regular sprayers, rather than flying on fungicide, insecticide and, if they choose, desiccant,” says Klumper. “So, a huge advantage that will be afforded to these growers will be the elimination of the costs that come from having to fly on pesticides.”

Finding New Acres

Pokrzywinski says that another definition of ultra-early is expanded geography. “As you go further north, into some of the areas with shorter growing seasons, like Saskatchewan and Manitoba, or even into higher elevations in Montana, those areas can’t grow sunflowers because of the shorter seasons and fewer growing degree days. The ultra-early hybrid really allows us to expand the geography for sunflowers into those areas. Those areas that normally couldn’t plant

a typical full season sunflower, now have the opportunity to do so,” she says. “And Nuseed’s N4H161 CL hybrid provides growers in those new geographies with the option to plant sunflowers without sacrificing yield.” Pokrzywinski says that the new hybrid gives growers in those areas the opportunity to plant in early May and have the sunflower crop off the field by late August — a growing season that affords benefits outside of geography and growing degree days.

“That growing season really allows producers to take advantage of premiums at the processor level,” she says. “What we see, especially in the oil and birdseed markets, is that there is an uptick in pricing because stocks are low and processors need to keep product coming in.”

Ultra-early genetics are also expanding the sunflower geography further south, into Texas and expanded acres in Kansas, a gain that can, in part, be attributed to increased and improved double cropping opportunities in those areas.

Sunflowers have excellent drought tolerance, so once the hurdle of germination is cleared, the crop typically sees a yield, regardless of environment. This fact alone makes sunflowers an excellent double crop option to follow wheat. The caveat: to reach maturity in such a short amount of time an early maturing, or ultra-early, hybrid is required. And because weeds can be an issue with limited post-emergence herbicide options, having a plan of action in place for control is essential.

The N4H161 CL hybrid is the complete package for growers who are looking to plant sunflowers as a double crop.

“If growers are in a double crop area, they probably haven’t ever double cropped with sunflowers because the maturity of most sunflower hybrids just won’t fit into a double crop situation. With the N4H161 CL hybrid sunflowers become a feasible option for growers,” Klumper says.

The short stature and incredible standability, as previously mentioned, makes the crop ground rig sprayer accessible, and N4H161 CL includes the Clearfield® trait for advanced

DOUBLE-CROPPING

weed control, particularly pigweed species. This option provides growers control on broad-spectrum residual grasses and broad-leaf weeds.

An ultra-early hybrid option also provides options within a double cropping rotation, a cropping strategy that Pokrzywinski says growers should consider.

“Once we get into southern South Dakota and down into the High Plains, there’s a lot of potential for ultra-early products and the double crop can really go one of two ways. So, option number one would be that the grower plants ultra-early sunflowers early in the growing season, desiccates to get the sunflowers off the field and then goes in with winter wheat. That’s really a different way of thinking, something I would consider a newer concept for a grower to consider because they’re usually only thinking about option two, which is ‘What can I put behind my winter wheat’ – a harvest in wheat in July and then go in with ultra-early sunflowers,” she says. “There really is a lot of merit to the first option and growers should consider it.”

Utilizing wheat as the double crop and sunflowers as the primary, rather than the reverse, has been shown to improve wheat stands and yield. By drilling wheat directly into the sunflower stubble, more drifting snow is trapped, and erosion is prevented. Both of which prevent soil moisture evaporation.

Edging Out the Competition

Genetics are the drivers of progress within production agriculture – precision equipment is a moot point if a crop can’t outperform its environment to deliver yield. Nuseed excels in advancing the traits that deliver profitability to farmers because of the company’s investment in the technology that allows for faster progress.

Today, Nuseed’s N4H161 CL is the only ultra-early sunflower hybrid on the market that delivers a trifecta: up-to a two-week earlier maturity; shorter stalk height and improved root structure for unsurpassed standability and weed control options; and the Clearfield® trait for advanced weed control.

“With the new hybrids we’ve come out with in the last year or two, especially this N4H161 CL, we’re opening up some really good opportunities in areas where they just

haven’t been available before because the genetics didn’t exist,” Wall says of Nuseed’s leadership in sunflower genetics. ☀️



The Desiccation Decision

To desiccate or not to desiccate, that is the question that many sunflower farmers face each harvest season. The answer, more often than not, lies with Mother Nature.

“The main advantage of desiccating a sunflower crop is that it speeds up a farmer’s ability to get in the field,” says Nuseed Field Sales Lead, Trygg Olson. “The last few years, we’ve had really late falls, pushing into November. So, if guys are waiting for natural kill off and then looking at additional time for dry down, that’s a big delay to harvesting. If they get any kind of moisture, late season diseases or lodging, those will all cost yield and quality. The goal of desiccation is to get harvest started early; get the crop out of the field and preserve yield and quality to be able to move those sunflower seeds into a saleable market.”

Economics drive desiccation, as well. Sunflowers are gaining acres due to the double cropping opportunities new hybrids are delivering. And the late-season hardiness of those hybrids, combined with later frosts, often necessitate desiccation.

“One of the most important recommendations I make to growers that are planning to plant early and harvest early in hopes of getting a second crop planted, is the importance of desiccation. The new N4H161 CL hybrid has really good late season plant health; it does stay green for a long time, even as the seeds are drying down, so desiccation is a great way to get those plants dried down and sunflowers out of the field so you can come in with a second crop,” says Alison Pokrzywinski, Sunflower Product Manager, North America.

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A MEGA OPPORTUNITY

Estimates indicate more than 80 percent of people worldwide aren't getting enough omega-3 through the food they eat. The good news is that this essential nutrient can now be grown in fields right here in the United States. Nuseed's Omega-3 Canola provides new opportunities for canola growers by adding value to the crop and opening entirely new markets.

Omega-3 fatty acids are considered necessary for optimum human health.

We cannot make these critical nutrients, so they must be consumed in the foods we eat. It is estimated that 83 percent of people across the world are deficient in omega-3 according to the daily intake recommended by the World Health Organization. New nutritional research consistently shows the value of omega-3 in maintaining overall health and is one of the fastest growing categories in the dietary supplement industry as more consumers bridge the gap between how little omega-3 they consume and how much is needed.

The primary source of the omega-3 nutrients, wild fish, are currently under intense

pressure to supply rapidly growing global demand. According to the Food and Agriculture Organization of the United Nations, aquaculture produces almost half of the fish consumed in the world. The industry is expected to increase since wild fish populations are declining, and human populations are growing. However, these farmed fish need high-quality feed, rich in omega-3 fatty acids including long-chain omega-3s such as docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). Omega-3 is vital for fish health, and like humans, fish cannot produce these nutrients. They must come from diet. The omega-3 content of farmed fish originates in microalgae that smaller wild fish eat. For the aquaculture industry to grow and provide quality nutrition for human



Katrina Benedicto,
Nuseed's Marketing
and Communications
Director



Benita Boettner,
Nuseed General
Manager Omega-3

consumers, it needs new sources of omega-3 that are not dependent on diminishing ocean resources.

More than ten years ago, Nuseed recognized the global omega-3 supply challenge and

started exploring alternative sources for long-chain omega-3 fatty acids. The company collaborated with the Commonwealth Scientific and Industrial Research Organization (CSIRO) and the Grains Research and Development Corporation (GRDC) in Australia to develop Nuseed Omega-3 Canola with a unique profile that contains several omega-3 fatty acids, including DHA, EPA, and ALA.

According to Katrina Benedicto, Nuseed's Marketing and Communications Director for Omega-3, this profile offers substantial benefits for animal and human nutrition, along with supply advantages that can fill an unmet need and reduce pressure on our oceans to supply this essential nutrient.

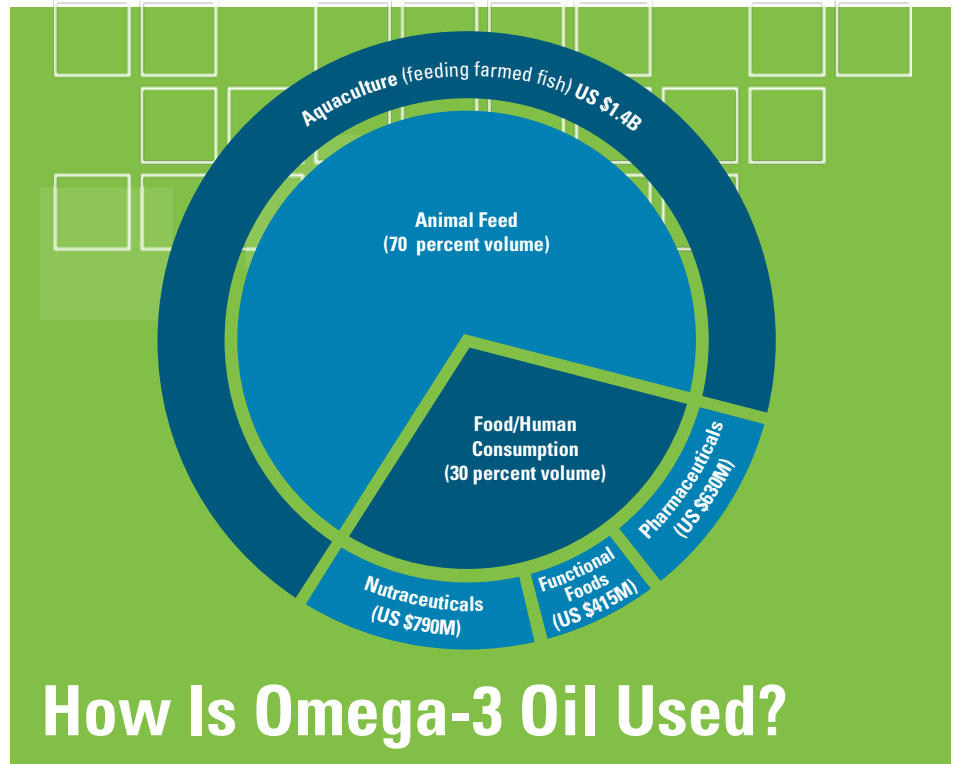
"Nuseed Omega-3 Canola provides aquafeed and human nutrition markets with a sustainable alternative to marine oils," says Benedicto, adding that the growth potential of this market in coming years is huge. "Plant-based omega-3s are a high growth segment within the human nutrition industry and are expected to reach \$1.3 billion in revenue by 2029."

Nuseed Omega-3 Canola is processed into the company's proprietary oil ingredients, Aquaterra® for aquafeed and Nutriterra® for human nutrition markets. Both products are rich in DHA, EPA, and ALA.

Consumer Demand

Nuseed recently conducted consumer research that revealed that 64 percent of vitamin and mineral supplement (VMS) consumers prefer a plant-based omega-3 and that 90 percent recognized advantages of its Nutriterra® Total Omega-3 canola oil over fish or algal oils. This innovation is uniquely capable of fulfilling unmet preferences that will attract new consumers to the omega-3 category.

"There is a belief that the omega-3 category is mature, yet more than 83 percent of Americans are deficient in these essential nutrients, indicating room for growth. Our research reveals the perspectives that have kept consumers from meeting their daily recommended intake and the motivations that will invigorate this category," said Benita Boettner, Nuseed General Manager Omega-3, in a press release.



How Is Omega-3 Oil Used?



Mark Smith, Nuseed Nutraceutical Lead

Aquaculture (farming fish and other marine animals) is the main feed-based market for omega-3 oils. Fish are a source of omega-3 oils, but they do not make them;

ocean microalgae make the oils which the fish consume in the food chain. Adequate consumption of long-chain omega-3s is important for fish health and consumers.

Functional Foods have essential nutrients, such as vitamins and minerals, added to improve the nutritional function of the food for improved health outcomes. It can be used to help address health concerns by enhancing everyday foods in a convenient way for consumers.

Pharmaceuticals are aimed at treating a medically diagnosed illness or condition using specific dosages for specific health outcomes, under a physician's care. Products take many years to develop, with

additional testing often at higher doses than supplements.

Nutraceuticals are dietary supplements for human consumption that provide nutrients which are typically not consumed in sufficient quantities for optimum health. Research completed in 2016 found that DHA and EPA consumption rates are insufficient in most regions of the world, leading to avoidable health problems. Bringing Nutriterra to market is a huge focus for Nuseed, who recently hired Mark Smith as the Nutraceutical Lead.

"We can replace the omega-3 found in scarce marine ingredients with a more sustainable crop – canola grown in the U.S. and traceable back to farms," says Smith, who adds that it's the same contract and process for growers whether the Omega-3 Canola grown on their farm is directed to aquafeed or human nutrition. Smith says Nuseed Omega-3 Canola oil can't be used for cooking because high temperatures breaks down the long-chain fatty acids, but it can be used in oil-based salad dressings, mayonnaise, and so on.

The survey was conducted in partnership with Qualtrics and included over 1,200 current VMS consumers. Participants were screened to emphasize Gen Z and Millennials (64 percent) and current or previous omega-3 users (84 percent). Key findings included:

- Ocean health is a top concern for 2/3 of consumers
- Only one in four consumers are aware of non-fish sources of omega-3
- Sixty-four percent of consumers prefer a plant-based omega-3 when provided an option
- Biotechnology is embraced by younger consumers and those who identify as health enthusiasts

Growing More with Less

Nuseed has been growing its Omega-3 Canola commercially since 2018 when the company received United States Food and Drug Administration approval to cultivate. Right now, the Omega-3 Canola is being grown in Montana and North Dakota, but Benedicto says customer demand is increasing rapidly and Nuseed needs more growers. She cites several benefits to the program including on-farm pick up to help with logistics and market access, prompt payment, and rebates for Nufarm inputs.

“Our technology has the opportunity to double the world’s available omega-3 fatty acids on less than 5 percent of current canola land,” says Benedicto.

According to Nuseed, one to two hectares of this canola has the potential to provide the DHA oil yield equivalent to 10,000 kilograms of fish.

Farm to Fork

Nuseed is a member of Excellence Through Stewardship (ETS) and has achieved ETS certification for its Nuseed Omega-3 Canola under the extensive ETS protocols. ETS is a global non-profit organization that promotes the universal adoption of product stewardship programs and quality management systems for the full life cycle of agricultural technology products. The ETS Stewardship Audit Process involves independent third-party audits of operations to verify that stewardship programs and quality management systems are in place.

Nuseed Omega-3 Canola is traced through the identity preserved system with set checkpoints with lot number, seal number, field and bin GPS and sample testing for quality, genetics and fatty acids at every point of transition from field to receiver. This protects the value of Nuseed Omega-3 Canola for Aquaterra and Nutriterra.

ETS provides a continuously improving platform for adopting stewardship best management practices,” says Benedicto, “and certification strengthens public trust. The process validates the qualities we promise to our customers, so they can assure their own customers that they’re getting a quality product. Isolation and stewardship prevent other traits from getting into our product and vice-versa.”

According to Benedicto, growers sign an identity-preserved (IP) contract to grow the Omega-3 Canola in their fields. Currently this process is led by Nuseed reps in Montana and North Dakota who connect with growers and assist them in the contract signing process. The contracts lay out everything growers need to know from a stewardship perspective. She says the IP contracts are vital in the traceability story.

“Consumers want to know how their fish are farmed and are increasingly interested in what these fish eat. Fish fed an Aquaterra diet use fewer marine resources than conventional diets while providing higher levels of omega-3 in the fillet with omega-3 canola produced right here in the U.S.,” says Benedicto.

It’s just an inspirational story all around. “Wild fish sources can’t meet global demand for human nutrition or supply aquaculture’s sustainable growth, but our technology and canola producers can produce enough long-chain omega-3 to meet the world’s needs. Together, we can take the pressure off the world’s oceans” says Benedicto. 🌞

Sign-up to grow NuSeed Omega-3

Canola: <https://nuseed.com/us/wp-content/uploads/sites/4/2021/12/03-Grower-Program-2022.pdf>

A Growing Market

“The global omega-3 market size generated a revenue of \$19.7 billion in 2019 and is further expected to reach \$49.7 billion in revenue by 2030, exhibiting a CAGR of 8.8 percent during the forecast period (2020–2030). According to the categorization made based on end users, the dietary supplements category is predicted to register the fastest growth during the forecast period. This can be attributed to the widespread consumption of dietary supplements due to the increasing consumer awareness about the requirement of food supplements and the adoption of healthier lifestyles. One of the biggest trends being witnessed in the human nutrition market is the consumption of plant-based products. The consumers showcasing the inclination toward turning plant-based food are also exhibiting a shifting consumption trend toward plant-based dietary supplements. They are also more likely to embrace biotechnology and are motivated to buy environmentally friendly products.

Due to the consumer’s preference for quality sources, it is expected that the demand for plant-based supplements will witness massive surge over the next decade. Furthermore, due to the increase in concerns raised over the safeguarding of marine ecosystems and biodiversity, the prominent players in the market are developing non-marine alternatives to fish oil, which is the primary source of omega-3.”

Source: Market Research Report published by P & S Intelligence.

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COVER CROP SOIL BENEFITS **PLUS CONTRACT CROP INCOME**

Global demand for independently certified sustainable, non-food low-carbon biofuel feedstock brought new agronomic and economic opportunity to Nuseed Carinata growers in Argentina. Now Nuseed plans to scale production and bring the opportunity to U.S. growers.





Worldwide, between main crop harvest and next season's planting, when weather and current plant genetics prevent typical main crops from being grown, there is a drop in photosynthesis and atmospheric carbon removal. Cover crops, plants that grow well in this typically dormant period to "cover" and protect soil, sequester carbon during the winter or fallow season while suppressing weeds, and capturing excess or unused nutrients. Cover crop residue left on the field in the spring also provides slow-release nutrients as it decomposes during the main crop growing season.

"The combination of removing atmospheric carbon and restoring soil carbon and soil health makes cover crops, like Nuseed Carinata, literally one of the largest tools the world has to combat climate change, remove carbon from the atmosphere and improve soil," explains Glenn Johnston, who leads Nuseed Carinata Global Regulatory. "By growing Nuseed Carinata for biofuel feedstock we can reduce emissions and fossil fuel reliance, remove atmospheric carbon and restore soil carbon, all without displacing primary food crops or requiring additional farmland. The demand for low-carbon fuel feedstock and the value our program adds

enables Nuseed to pay growers for adopting sustainable farming practices and improving their soil."

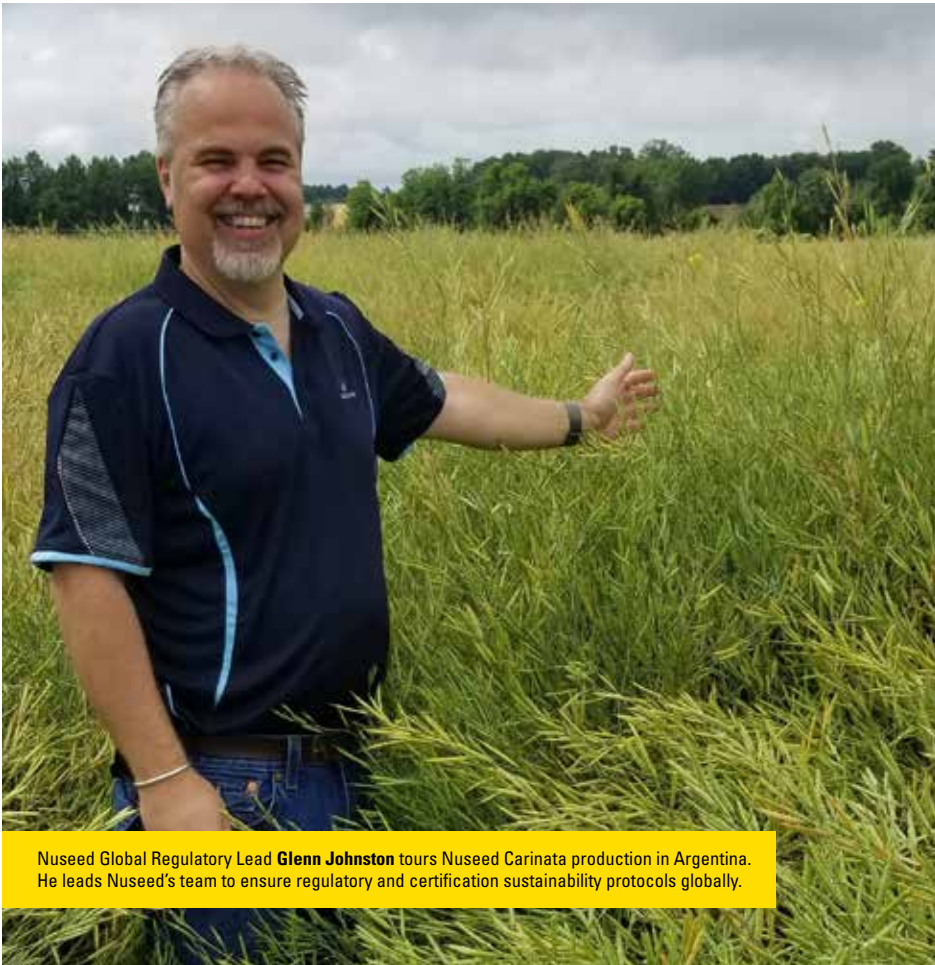
Paying growers for sustainable farming practices and carbon stewardship.

The development of the Nuseed Carinata Value Chain, connecting growers to end-use customers and new biofuel markets, is a key advantage and critical to grower adoption. Nuseed's mission is to deliver value beyond yield that can be shared with participants in the supply chain, via a closed-loop contract structure. Bringing the economic benefit from the end use back to the grower is key to sustainable agriculture adoption on the farm and the Nuseed Carinata program.

"Historically cover crops were viewed as a longer-term investment just in soil health," says Johnston. "Today, because of the demand for certified, sustainable biofuel feedstock Nuseed Carinata growers increase their income off existing land, between main crops, for adopting and documenting the required sustainable farming practices, as well as the long term pay-off of improving their soil for higher yielding crops in the following growing seasons. There's added value in what they grow and how they grow it."



Nuseed Carinata reduces carbon emissions by replacing fossil fuels plus removes atmospheric carbon and restores soil carbon as it grows between main crops, providing growers additional income from existing farmland.



Nuseed Global Regulatory Lead **Glenn Johnston** tours Nuseed Carinata production in Argentina. He leads Nuseed's team to ensure regulatory and certification sustainability protocols globally.

Nuseed Carinata, was first commercially introduced to Argentinian growers in 2019. The crop was exported to France and crushed with the resulting carinata oil used by Europe's largest biodiesel processor, Saipol, for certified, low-carbon biofuel and the co-product, a traceable source of non-GMO plant protein.

The new contract market opportunity rewards growers for adopting the required sustainable farming practices, which provide quantifiable carbon savings. Listed by the International Civil Aviation Organization (ICAO) as having similar greenhouse gas (GHG) savings to typical low carbon intensity feedstocks, primarily waste and used cooking oil, Nuseed Carinata is recognized as a comparable carbon reduction sustainable aviation fuel (SAF) feedstock with the advantage of scalable production.

"It's been a welcome opportunity in Argentina, and exciting to be making a positive

impact on carbon, soil health and the farm economy," shares Sebastian Bravo, Nuseed Carinata Business Manager based at the Nuseed Innovation Center in Venado, Argentina. "Growers are very interested in getting additional income between main crops while protecting and improving their existing farmland, as well as being rewarded and supported in adopting sustainable farming practices."

As Nuseed Carinata global production increases, the plan is to expand commercial production to the United States over the coming years. In the U.S., Carinata's low-carbon feedstock can be used in domestic biofuel production and the program's carbon savings will also be an advantage to local governments and companies working towards carbon reduction targets and policies.

Increasing Cover Crop Acres

A successful increase in cover crop adoption will require education, agronomic support



Sebastian Bravo, Nuseed Carinata Business Manager in Argentina shares his passion for Carinata's ability to improve soil, reduce carbon and generate additional farm income.

and economic return on investment. According to the most recent Sustainable Agriculture Research and Education (SARE) 2019-2020 cover crop survey, farmers who used cover crops in 2019 ranked yield benefits following cover crops high. Additionally, the survey indicated that growers were also motivated by cover crops' abilities to deliver other benefits, like weed control, soil health, erosion control, livestock grazing and more. Growers indicated reduced herbicide costs in soybeans (38.7 percent of producers), corn (39 percent), wheat (31.9 percent of producers) and cotton (70.6 percent). The most common level of savings was \$6 to \$10 per acre. Among the farmers who did not report a cut in herbicide applications or costs, a majority still reported improved weed control with the use of cover crops.

The prospect of introducing a new contract cover crop to U.S. growers, with on-farm agronomic, economic, sustainability and carbon reduction benefits, is exciting and challenging. "Once growers understand all the benefits, including additional income from existing farmland, and know the Nuseed team is there to support them, they are keen to take the next step, adding Nuseed Carinata to their crop rotations," says Bravo. ☀

WHERE ON THE WEB: Ready to Grow

Learn more about Nuseed Carinata and the offtake and market development agreement with bp at nuseed.com.

FOCUSED ON THE FARMER

When it comes to hybrid development Nuseed has their sights set on staying ahead of the agronomic curve and meeting the needs of their customers.



When the team at Nuseed sets out to develop a new hybrid of canola or sunflower, they have three objectives in mind, each rooted in delivering solutions and profitability back to the farmer.

Every Nuseed hybrid focuses on yield, disease resistance and quality.



Katy Navabi, Canola Research Development Lead

“Our goals are addressing farmers’ challenges,” says Nuseed’s Canola Research Development Lead, Katy Navabi. “And their challenges are diseases that we can help solve through genetic resistance that comes

from the hybrid; high, consistent yields that provide more profit — yield stability is a very important selection criteria for us; and then meeting their customers’ needs with quality.”

Navabi says yield stability year-over-year and location-over-location is always the goal of a hybrid. “We want to produce hybrids that perform well in all types of conditions,” she says.

Starting from scratch in a breeding program requires genetic diversity that either already exists through other hybrids, accessions, core collections in gene banks, public collections or created genetic diversity.

“We create the genetic diversity if it doesn’t already exist,” says Navabi. “We can do that through chemical and radioactive mutations or we can make traditional breeding crosses. We are good at making what we need.”

Battling Downy Mildew

The Nuseed team did just that when they set out to improve downy mildew (DM) resistance in their sunflower hybrids.

“One of the projects that we started back in 2016 was an effort to integrate advanced downy mildew genetics into our new hybrids. That started out by identifying the most robust genes we had to work with, knowing that it would be a lengthy process. We picked two different DM genes that provide full resistance to all known strains of DM. One was on the female side of the hybrid and the other was on the male side of the hybrid,” says Nuseed Sunflower Breeder, Jeremy Klumper.

The idea was to make sure that a Nuseed hybrid with a stack of DM genes would help improve the durability of the resistance over just using one gene. What we ended up with are hybrids that offer advanced DM resistance. Nuseed’s future hybrids will carry a three gene stack of resistance plus the seed treatments such as Plenaris and Dynasty. The benefits of advanced downy mildew resistance in European countries is already being



proven to provide farmers with the genetic tools they need to fight the disease. "In some of our European countries, we have now started registration where we have three different downy mildew genes that are all stacked in the same hybrid," Klumper says. "And we're only a year away from having multiple genes of resistance here in North America. These multiple genes, plus our seed treatments, should give us bulletproof resistance to downy mildew for the foreseeable future."

Currently, very few products in North America can boast any type of advanced downy mildew resistance, making Nuseed hybrids leaders in the fight against downy mildew, a position Klumper hopes will help to improve the rest of the industry.

"The more acres that have advanced downy mildew resistance, the more pressure there will be on other hybrids that don't have that advanced gene package. Those companies are going to respond to that pressure," he says.

Additional to downy mildew resistance, ultra-early maturing hybrids gives flexibility to shorter growing seasons.

The Early Advantage

The further north sunflowers are grown, the more challenging it is for the crop to achieve the number of growing degree days it needs. Klumper says that Russia is a focus for him, and where he sees the largest increase in acres due to the shortened time to maturity.

"There are regions that see people growing sunflowers and they want to grow them, but they just don't have the ability to plant and get a crop off consistently. These ultra-early hybrids are going to give those growers a higher success rate of harvesting that crop when they can get into the field," he says.

Current ultra-early hybrids include high oleic oil profile offerings and are a fit for the oilseed crush and birdseed markets.

Situations where planting is delayed in the spring, expanded geography and double-cropping, are where farmers are finding extreme value in the ultra-early hybrids, where maturity can be reached as much as two weeks earlier than a traditional maturing hybrid.

"We're excited about the products that we have coming down the research pipeline," says Alison Pokrzywinski, Sunflower Product Manager, North America. "But the product we're most excited about right now is the N4H161 CL. It provides growers options to think outside of the box."

The specially developed Clearfield® hybrid is not only positioned for short growing seasons and double crop systems, it also achieves an unparalleled level of standability.

Typically, growers would expect to see sunflowers reach eye-level or taller heights, depending on the environment the crop is grown in. N4H161 CL matures at waist-level, an advantage that Klumper says offers growers a lot of crop management flexibility.

"We're fairly confident that most growers will be able to get over N4H161 CL sunflowers with a ground rig sprayer, which will save the cost of the aerial applications sunflower growers usually have to budget," he says.

The shortened plant height also means less biomass for the combine to contend with.

Another contributor to the excellent standability of the crop, late season plant health for the N4H161 CL hybrid is second-to-none. The plant stays green and resilient well into the dry-down period for the seeds. For this reason, desiccation is recommended.

The N4H161 CL isn't the first ultra-early hybrid Nuseed has developed, but it is the leader in performance and profitability.

"Our previous ultra-early hybrid actually matured earlier but it did have some performance challenges. First, we felt the hybrid

benefitted from a higher (plant) population... significantly higher. Growers of the original hybrid were going in at least 30,000 seeds per acre because the head wasn't flexing with a lower population," Pokrzywinski says.

"By making the N4H161 CL mature just a few days later, we've been able to drop that population rate back down closer to what we see with full season hybrids. It makes the N4H161 CL more economical to plant."

In terms of yield, the N4H161 CL hybrid offers comparable to slightly lower yields than the full season hybrids, a significant improvement in comparison to past ultra-early sunflower hybrids.

"Yield is something that we continually work on. Ultra-early has to be profitable and benefit the grower, and obviously if we are sacrificing a lot of yield, we aren't doing that. We have a lot of products in the research pipeline right now that we are incredibly excited about because they are going to provide even better yields combined with ultra-early technology," says Pokrzywinski. ☀

Successful Foundations

Nuseed founded its canola breeding program more than 15 years ago in Australia, and that foundation has accredited an unmatched level of genetic diversity to the program. Nuseed canola possesses a level of genetic diversity from many different sources.

"Basing the Nuseed canola breeding program off of our Australian program provides a new source of genetics for the North American grower," says Roger Rotariu, Nuseed Marketing Lead, North America. "And it greatly enhances our ability to fight blackleg." Rotariu says that the worst blackleg infected field he has ever seen in North America wouldn't exceed the least infected field he has seen in Australia, noting that the severity of the disease in Australia greatly surpasses what growers contend with in North America.

The efficacy in fighting the disease is something that Nuseed is no stranger to. Where many companies are working with three to five resistance traits, Rotariu shares that Nuseed is currently working with up to 27 resistant trait combinations, providing a huge genetic advantage for growers fighting blackleg.

"Our blackleg resistance trait portfolio, products like NC471 TF, is just the tip of the



iceberg," Rotariu says. "When the product was registered this past year, it had the lowest incidence of blackleg coming through the Canadian registration system. It is significantly advanced in blackleg control."

Maturity is another advancement Nuseed has set its sights on to help growers get canola out of the field before unpredictable fall weather sets in. With the introduction of NC155 TF, Nuseed offers growers a TruFlex™ canola with Roundup Ready® technology that is extremely early maturing and high yielding. The hybrid also flowers earlier and longer which allows for exceptional pod set while

maturing quickly to allow for quicker harvestability.

And what good is an early maturing hybrid without improved harvestability? Nuseed is meeting grower challenges from every angle, including increased harvestability through improved plant stand.

"In the Australian market, 95 percent of canola is straight cut, not swathed," Rotariu says. "Those are the genetics we are bringing to North America. Our products stand very well and have a real advantage of running through the combine. It's about efficiency and maximizing yield retention throughout harvest with our genetics."

PARTNERSHIPS ARE KEY

in Figuring Out the Data Puzzle

Nuseed’s collaboration with IN10T is bearing fruit as sunflower growers continue to find ways to capitalize on their data collection.

There’s lots of data being generated these days, but figuring out what to do with it all is the next challenge for sunflower growers.

The good news is that Nuseed made some significant inroads in 2021 when it collaborated with IN10T, an independent, farmer-centric, data-driven company, to make sense of all the data being generated by growers — and figure out how to harness it to make those same growers even more successful.

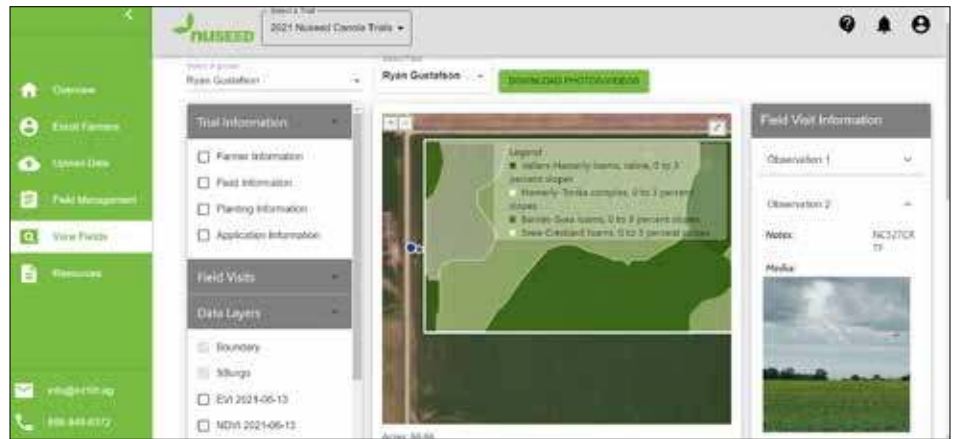
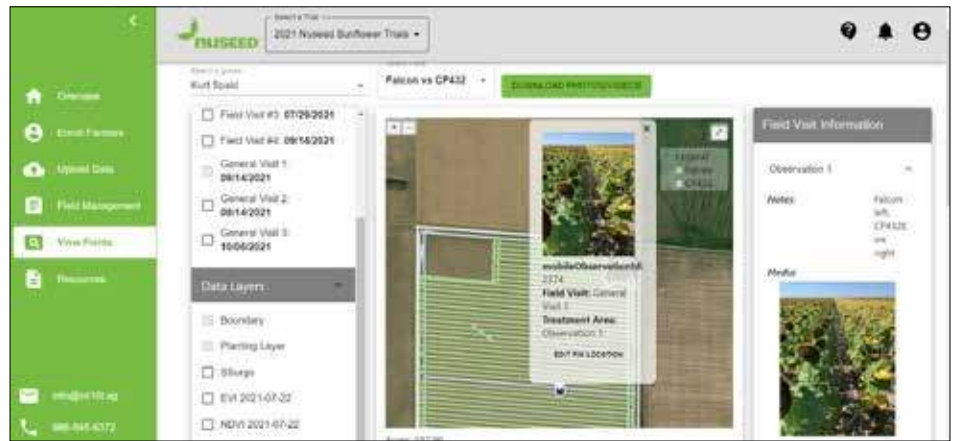
“This was a way for us to have a number of commercial side-by-side comparison trials completed without having sales staff running around with weigh wagons. The time and effort and coordination needed to do that is pretty significant, so this helped us make that process a lot more efficient,” says Roger Rotariu, North American Marketing Lead for Nuseed.

“We really need to take advantage of precision agriculture and digital agriculture and utilize the tools and information that is housed and sometimes collected and forgotten.”

Platforms like FieldView, MyJohnDeere, Case IH AFS, Hummingbird, Trimble and many others use data to provide valuable info to the farmer. What makes platforms like these so handy is they allow growers to harness the power of data, which is something that can often be difficult to do.

That’s where a company like IN10T (pronounced “intent”) comes in.

Each farm is complex, every farmer is differ-



The IN10T INvision platform looks at yield data, location data, time data, rainfall data and satellite imagery coming from farmers enrolled in Nuseed trials.

ent, and the ag industry is changing daily. But while agriculture is becoming increasingly more innovative and technology-driven, bringing emerging products and solutions to the field can often be a slow and challenging process.

In 2016, Randy Barker and Kevin Heikes saw a need to help streamline that process. They founded IN10T to connect businesses with

farmers and help deliver the valuable insights that enable businesses to make better decisions.

That allows IN10T to help accelerate the adoption of new technology, says the company’s Canadian Vice President Patrick Comte.

One of the biggest pain points that IN10T’s clients have is trying to capture all the digital



Patrick Comte is Vice President, Canada at IN10T.

data that's available. There are so many different platforms and different pieces of new technology out there, but actually capturing that data and making sense of it and doing the analytics is always the tough part, he says.

Through the IN10T FarmerTrials network, clients can tap into a system of over 1,500 farmers who desire to test and learn about cutting-edge technologies and solutions. This valuable network accelerates the product development process by getting it in the hands of their target customers in real-world scenarios earlier in the product lifecycle.

IN10T just recently expanded into Canada, and as it establishes that market and picks up new clients, a lot of its work will be focused on crops like canola and sunflower, to name just two.

In 2021, Nuseed and IN10T partnered to help Nuseed efficiently use the data generated and shared by its growers in large-scale field trials.

IN10T captured the data, contextualized it and provided the desired analytics to Nuseed. There are currently around 30 farmers taking part in the three-year project, and that number is expected to increase as Nuseed is looking for more farmers to participate.

"We started with some canola trials up in Canada and ended up bringing in some canola trials from the U.S. as well and brought some of their sunflower trials in the U.S. into our platform, too," Comte says.



Roger Rotariu is North American Marketing Lead with Nuseed.

All three projects are built into what IN10T calls its INvision platform, which pulls all the data into one place and includes everything from weather data, satellite imagery, and on-farm data. IN10T has also created an in-field app specifically for Nuseed, which gathers data from hybrid trials. Using the app, Nuseed can monitor in real time what happens during those trials.

"The product or innovation that Nuseed is creating needs to work, and it needs to work for the farmer in their farming system. Farmers have increasing amounts of machine data, harvest data, application data, location data, and Nuseed is really looking for a system that can help them understand their product better, and how it's performing on farms," says Randy Barker, chief executive officer of IN10T.

"Tracking their innovations at the farmer level is really important, so that there's a common feedback between how their products continue to perform in a commercial setting with farmers, and so they're seeing the same data as the farmer would."

The IN10T INvision platform looks at yield data, location data, time data, rainfall data and satellite imagery coming from farmers enrolled in Nuseed trials.

"Nuseed needs to know how their hybrids are performing in different regions. So the idea is if you can get enough trials in a larger geography, you can start looking for trends around how products are performing in

certain geographies under certain conditions, various stressful variables are in play," Comte says.

"The more data points we can get provides Nuseed with a lot more data around where they feel they can position those hybrids, because it's not a one-size-fits-all approach for all hybrids."

Through its partnership with IN10T, Nuseed can look at all the farmers that are using a product and use the data collected to facilitate communication and cooperation between the farmer (Nuseed customers) and the innovator (Nuseed).

For Kurt Spaid, who farms in Pierre, South Dakota, information that helps him better control his planter is vital, especially when it comes to sunflower. The data collected by the IN10T platform could allow Nuseed to provide him with vital insights to help him better plant sunflower.

"The size and shape of the seed is odd compared to others. They're a little crooked or big on one end and skinny on the other, plus different hybrids are of different sizes. Then, of course, seed treatment poses a challenge as well," he says. "If I can fine-tune my planter to plant a specific hybrid of sunflower just right, that's of huge value to me."

If Nuseed can do an even better job recommending products in different regions of the United States and Canada, it increases confidence with its retail network in recommending those hybrids to farmers and being confident that they're going to perform, Rotariu notes.

"This is so crucial for both our sunflower and canola products. For example, we have a new sunflower product we are testing, it's an ultra-early sunflower. Knowing exactly how it performs in different regions is going to be key to the success of this product. You don't just put a new product out there and tell people they should buy it. You have to prove that it works and that it does what you say it will do. The data we're collecting during field trials better helps us do that." 🌻



SUNFLOWER SEED PLANTABILITY KEEPS GETTING BETTER

The more challenging conditions get, the more sunflower growers need options and reliability in their seed supply.

Sunflower seed is a living organism, produced just months in advance of sales. Because of that, seed quality is subject to the year's environmental conditions. For example, a tough seed-growing season might mean under-sized seed, more challenging for the farmer to plant.

Seed treatment packages that help sunflower growers ward off diseases, improve germination and get the crop off to a good start have

traditionally left sunflower seed sticky and clumpy, decreasing the ability of the seed to flow easily through planters.

Not to mention sunflower seeds themselves come in many sizes depending on the hybrid, and even seed shape can vary. All of these factors can inhibit seeding precision and lead to one of the top yield limiting factors in sunflowers - not achieving a uniform stand.

Which is exactly why Nuseed is pursuing cutting-edge seed coating technologies, says Garrett Driver, Nuseed Supply Chain Manager. Nuseed's goal is to ensure their growers receive the uniform, easy-to-plant seeds they expect no matter what seed treatments are applied, what seed size growers prefer, or the conditions when the seed was grown.

To that aim, the more options the better, Driver says.

"We're working on the cusp of new technology that exists in the seed treatment and polymer world," Driver explains. "Having different treatment options is really about providing more confidence in the supply chain of seed to a grower and ultimately, confidence in the growers' experience with what they're purchasing."

Building on the New "Green" Seed Success

Nuseed rolled out a new green colorant polymer seed coating in 2020 that improved flowability, decreased bridging in the planter and increased singulation.

Achieving a high seed-planting singulation rate is critical to yield success in growing sunflowers, says Trygg Olson, Nuseed Field Sales Lead. Skips leave space in the fields and doubles or even triples produce too small of heads to be harvestable.

Nuseed also added a new seed treatment option for downy mildew — Plenaris© — which requires a lower usage rate than previous products. That also improved plantability since the less product on the seed, the better flowability through the planter, says Jed Wall, Nuseed's Field Sales Lead in Wahpeton, ND. Wall was instrumental in providing input as Nuseed worked with different brands and water rates to find the best coverage and flowability for their new and improved polymer seed coating.

Using the new seed coating and treatment options, Nuseed growers reported seed singulation in the 98 to 99 percentiles from their 2020 plantings. Farmers were thrilled, Olson says.

"It's literally a night and day difference between our old offerings and what we offer

today in terms of plantability and flowability aspects," Olson says.

Wall agrees. "This is the best flowing seed we've ever seen in the business."

The benchmark for flowability has always been untreated seed, Driver explains. So, the goal of Nuseed's work on seed coatings is to get as close as possible to the performance of untreated seed.

"Untreated seed, it doesn't matter the crop, generally flows the best. As you add chemistry to it, it reduces the flowability. So, you're always trying to balance the expectation of what the grower needs for insecticide, for fungicide, but still provide that level of efficiency that isn't going to make someone frustrated or turn away from your product," Driver says.

And a successful seed coating adds to the grower experience in more ways than just a good stand, Driver says.

"They're going to be more efficient, they're going to cover ground faster, and it's just one less thing that they're going to be focused on or worried about as they're trying to get seed in."

Plus, it turns out Nuseed's new green seed coating added benefits even beyond what was expected.

Many growers reported they were able to reduce their use of talcum powder or graphite used to help flowability in their planters. With the new Nuseed coating it simply wasn't as needed, Olson reports. And the new polymer improved the uniformity of the chemicals applied to the seed, Driver points out.

"We're not only seeing a more uniform appearance in the kernels in the bag, we're also seeing a more uniform application of the chemicals that are being applied to the seed," Driver says.

ProSizing Sunflower Seeds and Beyond
Nuseed also offers the option of ProSize™ seeds for specific sunflower hybrids, another option giving growers more uniformity in their seed choices.

ProSizing is a third-party process applied by Germaines Seed Technology. It adds weight, size and uniformity to the seed. It is beneficial for smaller oilseed hybrids, making them all a perfect, size three seed that flows effortlessly through planters, Olson says.

"It looks the same as if you take a handful of popcorn kernels, everything is identical, everything is sized perfect," Olson says. "And what we've been seeing with it is phenomenal, 99 to 100 percent singulation."

ProSizing is also a bonus for seed producers. Seeds that were unsellable because they were too small to run through farmers' planters reliably, but are otherwise perfectly viable, can be coated to bring them up to planting size. This means more reliability in every year's crop, no matter what the conditions were when the seed was grown.

But proSizing isn't for all farmers. Some feel the benefits don't outweigh the extra costs or hassle, Driver says.

"It's like Pepsi versus Coke. There are people that are loving it, and there are people that can't get far enough away from it," he says.

ProSizing works well with new vacuum planters but not with older-style planters, Olson says.

"It's a great fit if you have some of the new vacuum planter technologies, but if you have some of the older plate planters or finger type planters, no, we've got to go back, we can't use the coated seed we have to go back to the standard," Olson says.

Because proSizing makes sunflower seeds so much larger and changes their shape to a rounded seed, rather than the traditional sunflower seed shape, it can be advantageous for growers that don't want the hassle of changing out planting plates between similarly-sized and shaped crops, like soybeans and corn.

"That's the market that I think proSizing has really captured," Driver says.

On the other hand, for sunflower growers that would like a bit more added weight and uniformity to their seed without going as far

as proSizing, Nuseed has been working on an additional option, Driver says.

Developed in conjunction with Aginnovat, a California-based seed improvement company, this new style of seed coating doesn't change the natural shape of sunflower seed or significantly increase the size as proSizing does. Instead, it simply adjusts the seed size and shape variability slightly to help improve flowability through the planter.

It is beneficial for some of Nuseed's smaller oilseed hybrids, Driver says.

"If a grower doesn't want proSized or likes the natural size of the seed, but they'd love to have it be just a little bit bigger or a little bit heavier but still flow really well through the planter, well that's where this hits that sweet spot," Driver says.

The Farmer Plays Their Part in Planting Success

Nuseed has been working hard to improve the plantability of its sunflower seeds through seed coating technology and they can even give growers the proper disc sizes and air settings for their seed based on the hybrid and lot number. But farmers have to do their part to make sure their equipment is in working order, Olson says.

Seed plates shouldn't be worn. That can result in not enough pressure to keep the seed in the right place or holes too big, allowing more than one seed through at a time.

Often farmers will say they only have 2,000 acres on their planter. But by 2,000 acres, plates are starting to get worn out, Olson says.

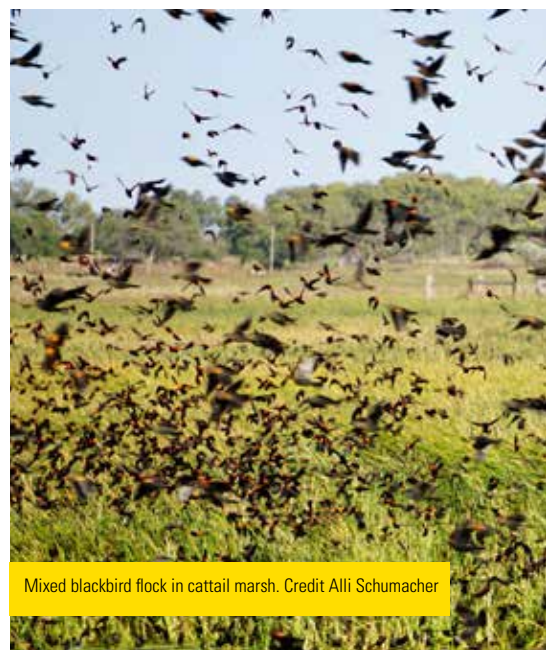
"Make sure the plates are right, even if they have to take their plates into their local dealer and run a test on them, or just get new plates. It's easier to have everything said and done before we start planting than to be in the middle of the field and have issues," Olson says.

It all comes down to getting the best stand of sunflowers possible.

"Our goal is to help the farmer get the best singulation they possibly can," Olson says. 🌻



Mixed blackbird flock in sunflower field. Credit Alli Schumacher



Mixed blackbird flock in cattail marsh. Credit Alli Schumacher

FLY AWAY HOME

Repelling birds – the latest research

Blackbirds have been a serious concern for sunflower growers since the dawn of time. Recent estimates of crop damage caused by these birds are hard to come by, but in 2013, annual sunflower loss in North Dakota alone was about \$3.5 million. Bird damage is greatest near roosts, and takes place roughly over about eight weeks from seed-set in mid-August to harvest in October.

While various methods have provided some degree of control over the years, there is exciting progress being made to identify and guide the use of several newer, effective technologies.

In a thesis submitted at North Dakota State University (NDSU) in late 2021, Master’s student Mallory Gyovai White reports on her research into sunflower farmers’ perceptions of new and current crop damage mitigation

methods. Overall, farmers reported few effective control methods available to them. The most-effective tool is cattail marsh management, but it’s being used less frequently than those methods that are perceived as relatively ineffective (e.g. propane cannons).

However, cannons have become a popular method to repel blackbirds in the U.S., most likely due to their scalability and cost-effectiveness. But even though this control method is fairly common, research has been scant into how best to use it. In 2021, Dr. Page Klug at the USDA-APHIS-Wildlife Services, National Wildlife Research Center in North Dakota and undergrad (now grad student) Jessica Duttenhefner at NDSU conducted new research into the startle response of caged blackbirds and brown-headed cowbirds to canons placed at various distances.



Propane cannon in sunflower. Credit Page Klug, USDA

“Based on this study, our recommendations are to place your propane cannons 300-500 meters apart and create paths to allow interior cannon placement,” says Klug. “Further research should examine whether greater distances cause a significant startle response, and a look at the impact of other factors such as cannon direction and weather.”

Another aspect of preventing damage is effective monitoring of bird populations. In 2020, Klug and her colleagues published



Male and female red-winged blackbirds in sunflower field. Credit Morgan Donaldson

results of a long-term study of using Weather Surveillance Radar (WSR) as a monitoring tool. From 2012 to 2019, they used WSR data to derive daily abundance estimates of blackbirds at an autumn roost in North Dakota.

“We then integrated these estimates with previously-developed bioenergetics-economic models to estimate local sunflower damage,” Klug explains. “We found the greatest losses usually occurred during a brief period in October, when peak blackbird abundance coincided with large percentages (>50 percent) of mature but unharvested sunflower fields. Most sunflower fields were harvested later than peak blackbird abundance (360,000–1,120,000 birds) and maximum daily damages (USD \$900-2,000 per day) surrounding this one roost.”

This suggests that advancing harvest time is a viable strategy to avoid the greatest losses in yield, which could be accomplished by planting early maturing crop hybrids or crop desiccation. “Our analyses suggest that if sunflower producers within 10 km of this single roost had shifted harvest two weeks earlier, they may have saved up to \$1,800 a year,” says Klug. “We need to stress, however, that a coordinated harvest with neighbors is important to avoid having isolated early-maturing or late unharvested fields that are likely to attract large numbers of birds.”

In addition to her farmer survey, White also studied the use of drones to drive birds away. During peak blackbird damage time in 2019 and 2020, she evaluated the behavioral responses of free-ranging blackbird flocks to the first approach and to 10 minutes of hazing (swooping and circling) of a large spraying drone. White found the drone was viewed as less of a threat when it was launched further away from small flocks, later in the day, and in fields with a greater percentage covered by cattail marsh.

“Our hazing trials resulted in average flock reductions of 35.6 percent, along with reduced activity after drone exposure with an average of 19.4 percent less flight time and 49.7 percent fewer flock lift-offs after drone hazing,” she says. “Thus, birds in open agricultural environments used the crop or other local habitat as refugia until the threat passed, which is further supported in that 80.6 percent of the flocks that abandoned returned within 15 minutes.”

Overall, drone use efficacy is boosted by extended hazing time, increasing negative stimulus (adding repellents, other frightening aspects or multiple drones), starting hazing earlier in the season on small flocks to avoid a foraging area being established and by hazing in the morning. Duttonhefner is now studying the effectiveness of using a spraying drone to deploy an avian repellent called methyl anthranilate. ☀



DJI Agras spraying drone in front of sunflower field. Credit Page Klug, USDA



Jessica Duttonhefner loading birds into cage for propane cannon study) Credit Page Klug, USDA

Understanding Causes of Combine Fires Leads to Solutions

New knowledge of what leads to most combine fires, including notoriously fire-prone crops like sunflowers, leads to a less stressful harvest season.



South Dakota farmer Steve Pfeiffer had used all the old tricks to prevent combine fires during sunflower harvest. They didn't work.

"We'd tried everything. Asbestos kits around the manifold. Done the old chain drag thing. None of these successful" Pfeiffer recalls. He was so frustrated with the problem he ended up reducing his sunflower acreage partly because "we were just having so much damn trouble with fires, it was a headache."

Then Pfeiffer had a neighbor with a combine fire that went out of control. Afterwards,

through word of mouth, he heard about an after-market add-on kit reputed to prevent the problem. He decided to give them a try on two of his three combines.

"We bought two (kits) and never had a fire in those machines. But the other combine was plagued with fires all year long," Pfeiffer says.

Taking Action on Combine Fires

Pfeiffer purchased "FireStop" kits from Harvest Fire, a company started by Dan Humburg, a retired South Dakota State University (SDSU) agricultural engineer professor.

Humburg is an industry expert in what causes combine fires in the first place, especially in sunflowers, expertise he gained while leading an SDSU research project funded by the South Dakota Oilseeds Council.

Sunflowers, Humburg says, had become the "poster child for the concept of a fire in a combine." Growers reported stopping multiple times a day to extinguish smolders in their hopper, usually with a few squirts from a water bottle.

"If you can imagine the stress of driving your car down the road and knowing that at any

moment it's going to catch fire? Well, you wouldn't like to start a long trip under that circumstance. (Farmers) have to start harvest with the idea, I've got two weeks of this, riding the front edge of the seat smelling air, waiting for the next fire to start," Humburg says.

Humburg quickly discovered that sunflower growers had already realized through trial and error that if they went too fast, fires would start, even within minutes of a minor increase in engine load.

That confirmed Humburg's suspicion that a hot exhaust system was a likely culprit in ignition. But what was it about sunflowers that made them so volatile as compared to other crops in the first place?

A Dusty Fire-Storm Potential

In their lab studies, Humburg's SDSU research team discovered that sunflower pith is ground up as it moves through the threshing system, creating a cloud of friable dust that hangs in the air and clings to all parts of the combine and engine. Was the dust the culprit?

"If you look at those particles apart underneath the microscope, they look like Swiss cheese. They're just big pockets of air and a little bit of material. It's all primed with air and ready to burn," Humburg says.

In ignition tests, sunflower pith dust sitting on a hot plate rose in temperature when the plate was set as low as 500 degrees F, a much lower temperature point than ground-up corn stover or soybean material. Meanwhile, sensors deployed on a combine had recorded temperatures as high as 800 degrees on exhaust components when the combine was well loaded, well above the ignition point for sunflower pith dust.

Humburg had even heard reports of a sunflower dust cloud seeming to explode. One farmer told him he had stopped and was cleaning off his engine with an air compressor when his father drove by on another combine and sucked some of the dust cloud into his radiator.

"All of that dust in the air lit up in front of him. He said it looked like you lit a spark on

the Fourth of July, there were small sparks sailing and swirling in the air all around," Humburg says. "That's what we believe happens when they're in the field under

the right conditions. When they cross the engine-load threshold that brings the exhaust temperature to that level, it ignites as soon as it hits the turbo in the air stream. And now

6 Tips for Combine Fire Safety

Most farmers are well aware of the potential danger of combine fires, but it is always a good idea to review your procedures well ahead of harvest time, says John Nowatzki, a North Dakota State University (NDSU) extension agent and agricultural machine systems specialist.

He recommends farmers implement the following fire-prevention policies, no matter what crop they are harvesting.

#1. A Fire-Prevention Mentality

Slow down and don't cut corners.

"Farming accidents most of the time occur because you get in a hurry," Nowatzki says. "You're trying to get done, you're competing with the weather. That's when mistakes happen."

#2. Keep It Clean

The most important thing is to keep the engine clean. Use an air compressor or leaf blower to blow dust off, Nowatzki recommends.

There is no set rule for how often to clean off dust, some farmers do it every time they unload. Nowatzki advises at least daily.

"If it's a fire that has started in the combine itself, it's almost always because that dust has collected. They don't clean it often enough," Nowatzki says.

#3. Consider Harvest Conditions

The dryer and hotter it is the more likely to have a fire. Consider combining early in the morning when there is a little bit of dew on the crop.

"When you've got everything really dry that's when you see the fires," Nowatzki says.

#4. Prevent Field Fires Caused by Auxiliary Vehicles

A pickup truck's exhaust system is close to the ground. If it's hot and comes into contact with dry, combustible crop material a fire can easily ignite. Make sure to park on soil where there is no vegetation.

"Exhaust systems under vehicles are a big issue. On a combine or a tractor, you don't have to worry about that," Nowatzki says.

#5. Service Your Fire Extinguishers

When a fire does happen, make sure you're prepared.

"Fires realistically don't happen too often, make sure your fire extinguishers are updated yearly," Nowatzki says.

#6. Call 911 First!

Farmers tend to think when a fire does get started, they can control it themselves. While that may end up being the case, better safe than sorry.

"Call 911 first, before you do anything," Nowatzki says.

For more information on harvest-time fire prevention, NDSU has a downloadable checklist for farmers on their website - www.ag.ndsu.edu/publications/crops/crop-harvest-fire-prevention-checklist



you have this blast of air going there that's carrying sparks."

Those sparks settle into the hopper, most typically on the left side of the machine where the air blast is pushed, starting a small, growing burn unless the farmer catches it — usually by the scent of smoldering sunflower seeds, Humburg says.

Humburg's research turned into add-on kit prototypes that filter the air that hits the exhaust system, preventing the dust from being ignited in the first place. This turned into a business after he retired from SDSU in 2016, largely because of a steady barrage of requests from farmers. Harvest Fire currently sells FireStop kits for \$5,950 for multiple older Case IH and John Deere combine models. In addition, they can create kits for models they don't have per request.

Humburg says that combine manufacturers have "paid attention" to the SDSU work, and newer combine models may be less likely to ignite. However, it can depend on the model, the crop and the grower's specific conditions.

Resting Easier During Harvest Time

Humburg's research and subsequent solution have led to the happy result of better options and less worry for sunflower growers, says John Sandbakken, Executive Director of the National Sunflower Association.

Humburg's add-on kits have a good reputation amongst growers, but other solutions are in the marketplace now as well, including installing an air tower (chimney) on the combine's air intake to help bring in clean air instead of dust.

And farmers now know what works best — and what doesn't — to prevent fires. Humburg discovered during the SDSU research phase that it is unlikely fires start due to static. So, dragging a chain to discharge static to the ground likely won't make any difference in preventing fires because static isn't causing the fires, as Pfeiffer and many other farmers had already discovered.

But keeping the dust off the hot elements of the engines, slowing down so their engines don't run so hot or even harvesting during the evening when conditions are cooler and

there's more moisture in the air can help, Sandbakken says. Purchasing add-ons like the FireStop kit or air towers give growers even more security.

"It's controllable. Follow the safety practices of blowing off your combine. If you have an older combine, get one of Dan's kits or one of these air intakes. You will probably have very few issues," Sandbakken says.

Sandbakken says the word does appear to be getting out, at least to sunflower growers. The frequency of fires during sunflower harvest seems to be going down while fires in other crops appear to be occurring more. A likely cause of that may be more extreme hot and dry conditions during harvest time, meaning the ignition temperature of other types of crop dust.

"What's happening is combine fires are showing up in other crops, like soybean and even grains. It's the dust because it is so dry," Sandbakken says.

Brent Heidecker, an Alberta, Canada farmer, struggled with fires in his annual canola harvest. Like with sunflowers, he noticed the big problem appeared to be the dust created in the thrashing process. The longer the canola was swathed before combined, the more combustible the crop seemed to be.

They had small smolders every year, but the turning point was three years ago, losing the combine his 78-year-old father was driving.

"By the time he realized the combine was on fire, he had time to get out, but that was about it," Heidecker says. Fed up, Heidecker purchased the FireStop kits.

They still follow all the same safety protocols, including keeping a water pump on their grain carts just in case. But, they haven't had a fire since they installed the kits.

"We basically quit worrying, where before it was constant," Heidecker says. ☀️

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WHY SUNFLOWERS ARE FITTING THE BILL FOR GROWERS

For Manitoba's Ian Pritchard, changes in both climate and markets are making this crop an eye-catcher for farmers.

As a seed seller, Manitoba's Ian Pritchard says he wants his customers to feel secure in their purchasing decisions. Anything he can do to guide them into growing crops that are right for their farm helps ensure their success as growers during a challenging time when climate and market changes are top-of-mind for many.

It just so happens that sunflower is a good fit and has become a powerful tool in helping his customers make money and grow a crop that can be reliable year after year.

"The past two years have been dry. 2020 started out with excess moisture actually, but the growing season was dry, and harvest was dry. 2021 was exceptionally dry with drought conditions, but in both cases, sunflower has been excellent," says Pritchard, based in Treherne. He's a co-owner of Pritchard Brothers Ltd.

"Some growers are telling me that the only crop they're not collecting crop insurance on in 2021 is sunflower. That's a huge benefit of this crop. It can be less expensive to grow than some other crops, too. My customers are very happy with it."

He notes that many contracts have an Act of God clause, so if disaster strikes, there's no costly buyout.

"As much as 80 percent of the sunflower seed I sold was confection type at one point, and now it's about 75 percent oil sunflower. The market for bird food has surged and my growers are also making good money from growing sunflower. Between that and the drought tolerance of this crop, it's a big win."

A reduction in sunflower acres began in southern Manitoba after 2010, when growers faced some very wet growing seasons and wet harvests. Quality issues with the confection sunflower crop meant growers were looking for an alternative.

"Quality is king with a human consumption crop and the oil sunflower hybrids just came out on top with a number of growers, and it really took off. You had a situation where the climate was driving growers to look for an alternative, and they sure found one."

As demand for bird food went up as a result of the pandemic, growers had even more reason to grow oil-type sunflower seed.

"WE JUST CAN'T DEPEND ON GETTING AN EARLY HARD FROST ANYMORE IN MANITOBA."

Pritchard's advice for growers wanting to get into sunflower is to treat it like a specialty crop.

"Test your soil for your nutrients. Sunflowers root deep and can reach nutrients deeper in the soil than shallower-rooted crops. Weed control is big and can be an issue as sunflowers don't compete well with weeds early on. On the oil side, we have Clearfield® tolerant hybrids and Express® tolerant hybrids, so we do have more weed control options than we have with confection sunflower."

Still, his most popular confection sunflower hybrid is 6946 DMR, which is conventional with no herbicide tolerance but preferred by many processors.



SNAPSHOT

Account Manager: Ian Pritchard

Location: Treherne, Manitoba

Company: Pritchard Brothers Ltd.

Motto: "Always strive to be better."

"Weed control is just a good all-around practice to have on a farm, even if you do use herbicide tolerant hybrids. My number one tip for growers is to plant on a clean field regardless of the hybrid they use, as even herbicide tolerant systems aren't perfect."

He also recommends the use of a desiccant harvest aid for sunflower.

"We just can't depend on getting an early hard frost anymore in Manitoba. Years ago we often got a hard frost in mid-to-late September that would dry down the crop for harvest, but that hasn't happened for quite some time."

Looking to 2022, Nuseed is offering the new N4H161 CL high oleic hybrid. This ultra-early hybrid is perfect for Northern climates with short growing seasons. With a shorter plant height, N4H161 CL has excellent root strength and late-season plant health.

"That's a great option for growers concerned about late planting," he says. 🌻

IN CELEBRATION OF THE SAVVY GROWER

Rodney Agnes of Legacy Seeds says farmers who grow sunflowers are some of the most market-savvy people out there.

Rodney Agnes of Legacy Seeds in North Dakota loves working with sunflower growers. He says their hard-working spirit and eagerness to adopt new technology and keep up with market demand keeps him inspired.

"Farmers who grow sunflower have done a lot of work to educate themselves and get set up for it. They know why they're growing it and what market demand they're meeting. They're set up for growing this crop. They have the capacity, the dryer system. They went out and got the planter or a header for the combine. It takes time to build up the infrastructure to be a serious sunflower grower," he says.

"Sure, I can sell you a hybrid that will grow in almost any field, but the farmer has to be committed to it. Those farmers are the ones growing up to 5,000 acres of sunflower."

That need to commit is the first thing he tells people thinking of getting into sunflowers, but it's not as hard as it sounds. He says it's possible to test the waters to see if you like growing it without necessarily making too much of a financial investment.

"The growers who are wanting to dabble in it might grow anywhere from 150 to 500 acres and just kind of establish themselves with the crop and put it into the rotation. It can take a little time to get a feel for it. You don't have to go big or go home; it's possible to ease into it slowly and see if it's for you."

Agnes says the market opportunities coming down the pipe are going to have more growers looking at sunflower.

"Contracts are going to get very aggressive. You're going to see the prices go up to where I think there's going to be a lot of farmers taking a really hard look at this and starting to dabble a little bit more in it, and the ones who before just dipped their toe in the water are going to put some more acres in," he says.

For those just getting into it, he has some advice for things to think about.

"You're going to need a good aeration bin. You don't want to take it off too wet, because then you're going to have trouble. If you do have a small dryer, that can help when it comes to what we often call a 'snow crop' up here in North Dakota. Also, patience is a virtue. A lot of people harvest their soybeans in the fall and that's it, they're tired and want to be done. But when you see per acre what you can make on sunflower, I think people are willing to stick it out a bit longer for that return."

**"YOU DON'T HAVE TO
GO BIG OR GO HOME;
IT'S POSSIBLE TO EASE
INTO IT SLOWLY AND
SEE IF IT'S FOR YOU."**

For those wanting to explore sunflower or ramp up acreage, he advises being careful not to get into a rotational pinch.

"With sunflowers, the field you planted them in tends to be really dry the following year, because the sunflowers really go down and tap a lot of that stored moisture. So that's



SNAPSHOT

Account Manager: Rodney Agnes

Location: Alice, North Dakota

Company: Legacy Seeds

Acres of sunflower in region:

Approx. 20,000

Motto: "My relationship with the grower comes first. Business comes after that."

something to keep in mind if you're limited in acres."

Agnes is especially excited about some new Nuseed hybrids. Falcon is part of the Express® portfolio. Strong agronomics and excellent stalk strength make for a low management season. With consistent yields from East to West, Falcon is a staple in the Nuseed lineup and works well for crush and bird food.

N4H422 CL has consistently high test weights and uniformly clean stalks. A black seed coat with above average oil content makes it an ideal hybrid for the bird food or the oil-crush market.

Finally, N4H470 CLP delivers an all-around win on the farm. With excellent agronomics including solid stalks and roots, plus the added benefits of downy mildew resistance and improved weed control with the Clearfield® Plus production system, growers will achieve solid yields and top-end oil content, Agnes adds. ☀️

HOW SUNFLOWER HELPS TO RELIEVE THE STRESS OF UNCERTAINTY ON THE FARM

A Red River Valley grower treats his sunflowers like a high-value crop and is handsomely rewarded.

Zach Leier has been selling sunflower seed for almost a decade, starting after he got out of college in 2016. The account manager for Legend Seeds in Bismarck, North Dakota, says sunflower offers a unique opportunity for growers to diversify their portfolio when it comes to the crops they grow and really mitigate risk.

"Sunflower is sort of considered a specialty crop out there. It's the progressive growers that we work with, and they're looking for advantage in the market. They want to make more money, and in many cases just add some diversity on the farm as a way to manage those risks," he says.

"They're pretty market savvy and pretty aware of what's going on in the marketplace throughout all the crops."

He expects this "specialty crop" to be big in 2022 with the drought that came last year.

"In many places there's a lot of residual nitrogen left in the soil and sunflowers are one of those things that our growers know can tap down into the deeper nitrogen in that lower subsoil and just make better use of what is left. With the high fertilizer prices we're seeing, that's a big plus."

He says sunflower is a popular rotation crop in his territory and the growers he works with say the positives far outweigh any potential concerns when it comes to growing them.

"Our main market that we're probably going to tap into in 2022 is either the bird food

market or the oil crush market. One of the good things that Nuseed offers their customers with their portfolio is not only do they hone in on the agronomics and how well the product is going to do as far as yield and oil content go, but they also look at keeping the market diversity open for their growers and make sure that the seed can be marketed in multiple ways."

"JUST KNOWING THAT IF THE WEATHER STINKS, YOU'RE STILL GOING TO HAVE A CROP TO HARVEST AND YOU'RE STILL GOING TO GET PAID, REALLY HELPS BRING THE STRESS LEVELS DOWN."

Even with weather challenges, he says sunflower is proving to be a reliable crop.

"We went through the big drought in 2021 and I think sunflower offers the growers that peace of mind they're looking for. Even with everything 2021 threw at them, sunflowers did really well even if a lot of people were predicting disaster. It kind of really proved to them that the peace of mind sunflower brings is worth a lot," he says.



SNAPSHOT

Account Manager: Zach Leier
Location: Bismarck, North Dakota
Company: Legend Seeds
Acres of sunflower in region: Approx. 100,000
Motto: "Put the grower first."

"Just knowing that if the weather stinks, you're still going to have a crop to harvest and you're still going to get paid, really helps bring the stress levels down."

Leier says with exciting new Nuseed hybrids on the way in 2022 on both the Conoil and high oleic side, he looks forward to helping growers continue to be successful.

"I'm always trying to make sure that we're doing everything the right way and putting the grower first. That's the path to success in this business." 🌻

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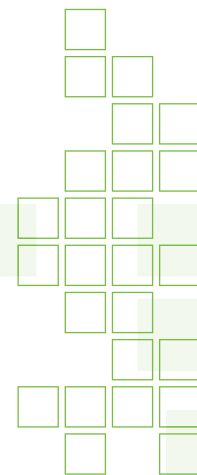


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