

C MAGAZINE

Growing Soy Oil Demand

Renewable diesel boosts
soy crush, drives opportunity

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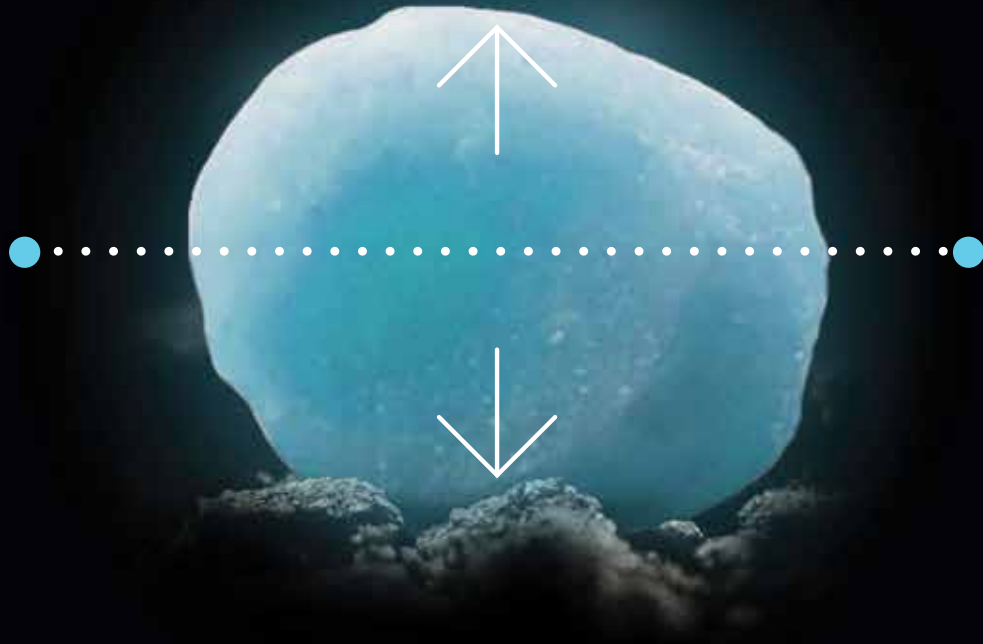
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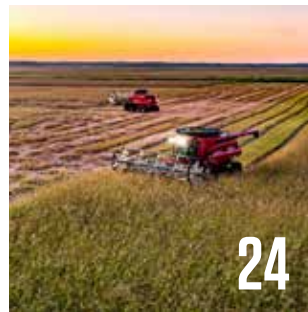
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ON THE COVER: Rapidly growing demand for renewable diesel and the call for more soy oil as the leading feedstock for renewable diesel production has boosted soy crush margins and triggered crush expansion plans. Learn more about the factors behind the demand surge and what the movement could mean for farms and cooperatives.

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Jay Debertin, president and CEO, CHS

Connecting for Growth

Soybean oil has never been in such high demand. And that spells opportunity for cooperative owners.

Over the years, CHS has responded to new markets for soybeans and soy processing outputs from soybean meal to soy flour and soy oil. Working side by side with growers and cooperatives, we helped meet consumer demand for food products containing no trans fats by providing high-oleic soy oil, supported use of soy oil in plastics manufacturing and addressed new food uses for high-protein soy flour.

The next phase in oilseed demand creation is already here: using soy oil and canola oil as feedstocks for renewable diesel fuel. While much of the regulatory activity around renewable fuels has been on the West Coast, the unprecedented demand pull has affected soy markets across the U.S. and worldwide.

As you'll read in this issue, CHS facilities continue to add soy crush and refining capacity to meet the swelling demand. Our two soy processing plants in southern Minnesota — together one of the largest vegetable oil refineries in the U.S. — are now processing about 30% more beans annually and will soon be able to produce 35% more refined soy oil per year. In northern Minnesota, our canola processing plant continues to produce canola oil and meal from canola grown in Minnesota, North Dakota and Canada.

While soy oil is grabbing most of the headlines, the ability to leverage high-quality soybean meal to support livestock production is another way we see opportunities to provide value to our owners while feeding a hungry world.

We will continue to help CHS owners take advantage of these opportunities by leveraging those assets and advocating on their behalf to encourage ongoing improvements to our nation's infrastructure and to support policies that reflect the needs and values of cooperatives and agriculture.

Together, we will keep creating connections to empower agriculture.

A handwritten signature in black ink that reads "Jay D. Debertin". The signature is written in a cursive, slightly slanted style.

Have a question or feedback for the CHS management team? Get in touch with us at feedback@chsinc.com.



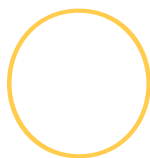
SOY OIL DEM

By Peg Zenk

**Renewable diesel demand drives oil crush margins
and processing expansion.**



DEMAND SOARS



nce a surplus product looking for uses, soybean oil has become a sought-after renewable fuel feedstock. As demand for green energy options grows across the globe, production of lower-carbon fuels — specifically renewable diesel — is poised to skyrocket.

Renewable diesel production capacity nearly doubled, from 971 million gallons per year in May 2021 to 1.92 billion gallons in May 2022, according to the U.S. Energy Information Administration. Over that same period, there was little additional soybean oil supply available, so prices moved to historically high levels, says Todd Biedenfeld,

director of vegetable oil and sunflower sales for CHS.

Today, nearly a dozen new soybean processing plants or plant expansions are underway in the Midwest alone and even more new facilities are on the drawing board, he notes. “The soy crush market is trying to recalibrate itself, but we’re still seeing high values for both futures and basis. That’s

contributing to healthy margins, which are being reinvested into industry expansion.”

Ahead of the Curve

In time for the 2021 harvest season, CHS completed a \$100 million renovation of its Fairmont, Minn., soybean processing plant that produces crude soybean oil to expand >

Richard Stadheim, right, and his sons, Garrett, left, and Bennett, center, deliver soybeans from their Albert Lea, Minn., farm to the CHS soy processing plant in Fairmont, Minn. Bennett's twin boys, Beckett and Lars, front, are already becoming involved in the operation.



➤ annual crush capacity by 30%. Built in 2003, the plant operates around the clock, receiving 350 truckloads a day on average and drawing soybeans from growers and cooperatives within a 90-mile radius of the plant, says Jim Graham, director of capital projects for CHS global grain and processing businesses.

Expansion is also underway at the CHS soybean refinery in Mankato, Minn. The plant is already one of the largest vegetable oil refineries in the U.S. “When all upgrades are completed later this year, annual refined soybean oil production at the Mankato facility will increase by more than 35%,” Graham says. “Our Mankato facility produces refined, bleached and deodorized soy oil for food-grade use, and our flour mill produces soy flour that is sold around the world.

the long haul. It has allowed us to capture the increase in margins that we’ve seen in recent years, and it also puts us in a good position to explore other opportunities for growth in the future.”

Adding Value for Owners

Soybean producer Richard Stadheim has sold the majority of his crop to the Fairmont plant since it opened in 2004. “I was really pleased when CHS built this facility in southern Minnesota, close to growers. We’ve always hauled our beans there directly because it means more dollars in our pocket.”

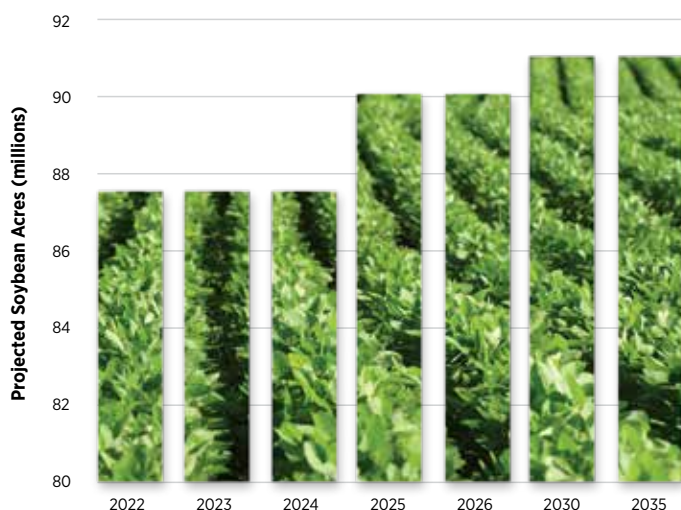
Along with his two sons, Bennett and Garrett, Stadheim raises corn, soybeans and beef cattle near Albert Lea, Minn. He says he appreciates the recent Fairmont facility upgrades.

“Unloading is even easier now and we’re usually in and out of there in less than 30 minutes. It’s a really nice facility, very clean and efficient, and the employees are very good to work with. CHS should really be proud of that plant.”

“We’ve been able to orchestrate this construction and renovation without interrupting the day-to-day operations of either the crush plant or the refinery,” he says. All soy oil produced at the Fairmont plant is trucked about 60 miles to the Mankato facility for refining, Graham explains, making coordination of the two projects critical.

“With these expansions, CHS is well-positioned to meet the growing demand for soy oil,” says Darrin Carlson, director of oilseed crush at CHS. “CHS has been in the soy crush business for decades and we’re in it for

More Soybean Acres Needed



Source: CHS global research

Nearly 91 million acres of soybeans will be needed to support projected U.S. soybean oil crush demand, says Joe Lardy, CHS research analyst. “American farmers have planted more than 90 million acres of soybeans only once before, in 2017, so we’d be moving to a whole new level of production. It begs the question, which commodities will give up acres to make room for more soybeans?”

Defining Renewables

A green tsunami is sweeping the globe and most corporations want to show they're involved, says Joe Lardy, CHS research analyst. "We're seeing environmental, social and governance [ESG] initiatives to reduce the carbon footprint of businesses, their processes and end products. Renewable fuels are a big part of that effort."

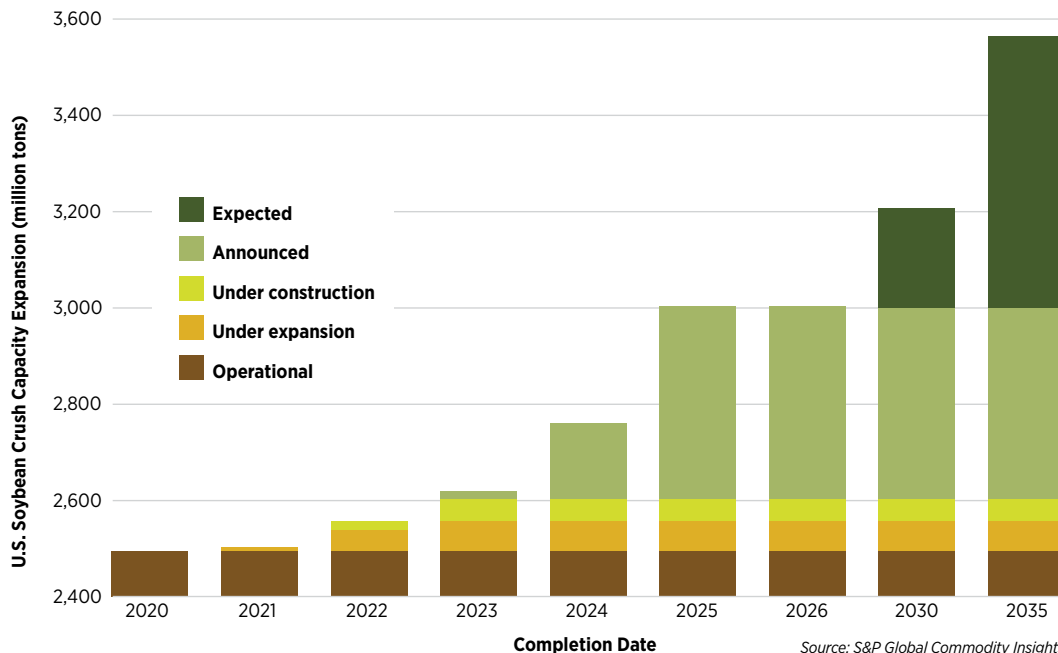
A Low Carbon Fuel Standard (LCFS) has been enacted in three states — California, Oregon and Washington — and other states are considering similar legislation and standards. In 2022, the U.S. renewable diesel market was between 1.5 billion and 1.6 billion gallons, says Ron Batey, refined fuels pricing and economics director with CHS. "Forecasts say that by 2026, there will be an additional 1.1 billion gallons of renewable diesel demand generated from LCFS legislation enacted in those three states alone."

"Soybean oil offers the greatest potential for producing renewable biodiesel."

— Joe Lardy

"Currently, 80% to 85% of all U.S.-produced renewable diesel is being used in California," he says. "As of last summer, California had already replaced 45% of petroleum diesel used with biomass-based diesel. Washington began implementing similar LCFS legislation at the beginning of this year, with demand for renewable diesel there expected to increase quickly."

U.S. Soybean Crush Responds to Demand, Prices



Source: S&P Global Commodity Insights

Airlines are also looking for sustainable fuel, notes Lardy, and renewable diesel would be a logical feedstock. "When you start to add up the potential demand, even just within the United States, it's huge."

To be considered renewable, a fuel must be produced from non-fossil feedstock, such as plants, animal fats or processing waste or byproducts. Ethanol led the way in biofuels, but that industry may have topped out, says Lardy.

"There's a 10% blend wall for ethanol and a limit to how much more can be used," he says, "so the energy industry has been looking at alternative feedstocks, such as soy oil, used cooking oil and even beef tallow. Soybean oil offers the greatest potential for producing renewable biodiesel because it's already a major commodity and it's scalable — we can make more."

Renewable diesel burns cleaner than traditional biodiesel, which is a blend of renewable fuels and petroleum-based diesel. Renewable diesel is made only from renewables, so it's more

efficient and generates lower emissions, adds Biedenfeld. "From a use standpoint, there is no difference between renewable diesel and petroleum-based #2 diesel, so it's considered a drop-in product. That makes it a very attractive fuel option for meeting low-carbon mandates in some states."

Soy Conundrum

Historically, U.S. soybeans have been crushed primarily for soybean meal, which comprises 80% of the intact bean. With projected sharp increases in soy crush volumes over the next decade, where will all the meal go?

Currently, about two-thirds of soybean meal produced in the U.S. is fed to U.S. livestock and about one-third is exported, says Carlson. With the projected increase in soybean crush to meet renewable diesel demand, more meal will likely be fed to U.S. livestock.

"Soybean meal is established globally as a premium protein >



Expansion at the Mankato, Minn., CHS soybean refinery will boost refined soy oil production by more than 35%, says Jim Graham, who oversees capital projects for CHS global grain and processing businesses.

WHAT'S FUELING POLICIES?

Three key drivers have supported the development of renewable fuel policy incentives in the United States, according to Dan Mauer, CHS government affairs Washington, D.C., representative.

1. Environmental benefits

Renewable Fuel Standard regulations are administered by the U.S. Environmental Protection Agency (EPA) and mandate that a portion of U.S. motor fuel must be blended with renewable fuels to reduce greenhouse gas emissions.

2. Economic development

The federal biodiesel tax credit was established in 2004 to allow biodiesel to be more competitive with petroleum-based fuels.

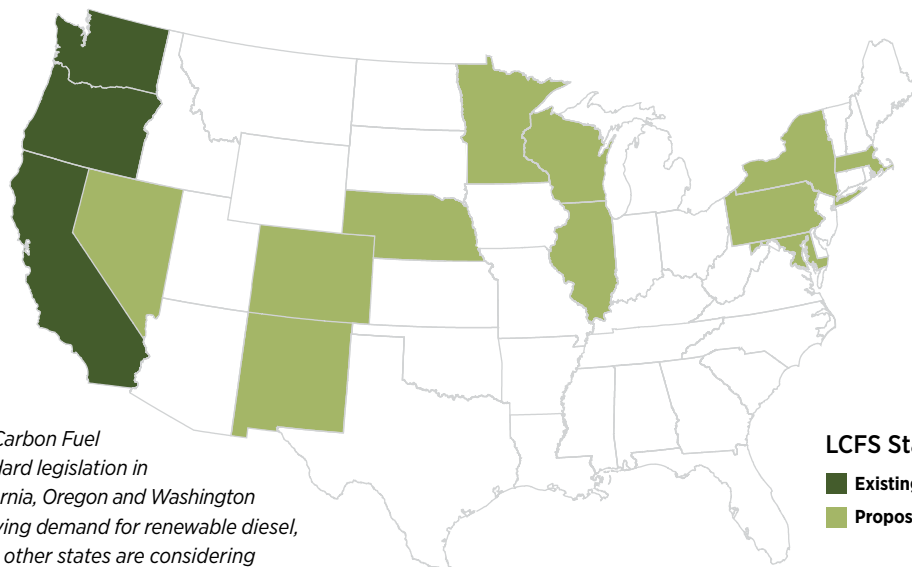
3. Energy security

The Low Carbon Fuel Standard (LCFS), set at the state level, is focused on reducing the carbon index. California was the first to adopt this standard in 2009, and that standard is emerging as the favored approach in other states.

"The Inflation Reduction Act of 2022 extends current tax credits for renewable diesel through 2024 and creates a clean fuel production tax credit starting in 2025 that will simplify alternative fuel qualifications based on lifecycle carbon reduction — the larger the reduction, the bigger the tax credit," explains Mauer.

There is a degree of uncertainty about all renewable fuel policies because they are dependent on the political will of both federal and state legislatures, he notes, "but there is a lot of enthusiasm for renewable diesel as a sustainable fuel to help states meet LCFS goals. Soybean oil is going to be a critical feedstock in accomplishing that."

Low Carbon Fuel Standards in the U.S.



Low Carbon Fuel Standard legislation in California, Oregon and Washington is driving demand for renewable diesel, while other states are considering joining the movement.

Source: National Conference of State Legislatures

> source for feed. If it becomes more price-competitive, it could displace some DDGS [distillers dried grains with solubles] from ethanol production," says Carlson, "but the United States will also need to increase soybean meal exports and look for new markets.

"It doesn't matter how high soybean oil prices get. Processors need to have a consistent market for soybean meal," he adds. "Most plants have only a few days' worth of meal storage on site. Railroads and trucks have to be moving that meal all the time in any weather. That will require additional investments in infrastructure throughout the country."

Handling all that additional meal will also require expanding export facilities at major ports around the country, he adds. To help meet the need, CHS is expanding its Myrtle Grove, La., export terminal. The \$105 million investment will include storage and handling upgrades, which will grow market access

for farmer-owners and help move 30% more bushels and byproducts like soybean meal through the facility. Expected to be completed in late 2023, the construction project will bring total storage capacity to 850,000 bushels.

To further expand export capabilities, CHS recently announced intent to expand its TEMCO, LLC, joint venture operated with Cargill to include a terminal in Houston, Texas. Located 40 miles inland from the Gulf of Mexico via Galveston Bay, the added facility will provide shipping access for grains, oilseeds and byproducts through the Port of Houston.

Beyond Beans

"The tide has risen for other oil crops thanks to the increased demand for soy oil," says Biedenfeld.

In late 2022, the EPA approved canola oil as a renewable feedstock after diesel made with canola was shown to reduce emissions by

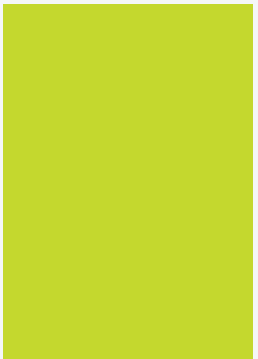
50% compared with standard diesel fuel. CHS owns and operates a canola processing and refining plant located in northern Minnesota, outside Hallock. Acquired in 2015, the plant processes 400,000 tons of canola seed annually.

"The margins are still higher selling canola oil into the food market, but we have started to sell some canola oil for renewable diesel as those prices have become more competitive," says Biedenfeld.

"As a company, CHS has a long history of supporting food processing sectors, and that's not likely to change," he adds. "Decades of experience in the oil seed industry, along with our recent expansions, make CHS well-equipped to help meet the needs of a growing renewable diesel market as well." ■

LEARN MORE: Read more about how CHS is speaking up for owners at chsinc.com/advocacy.

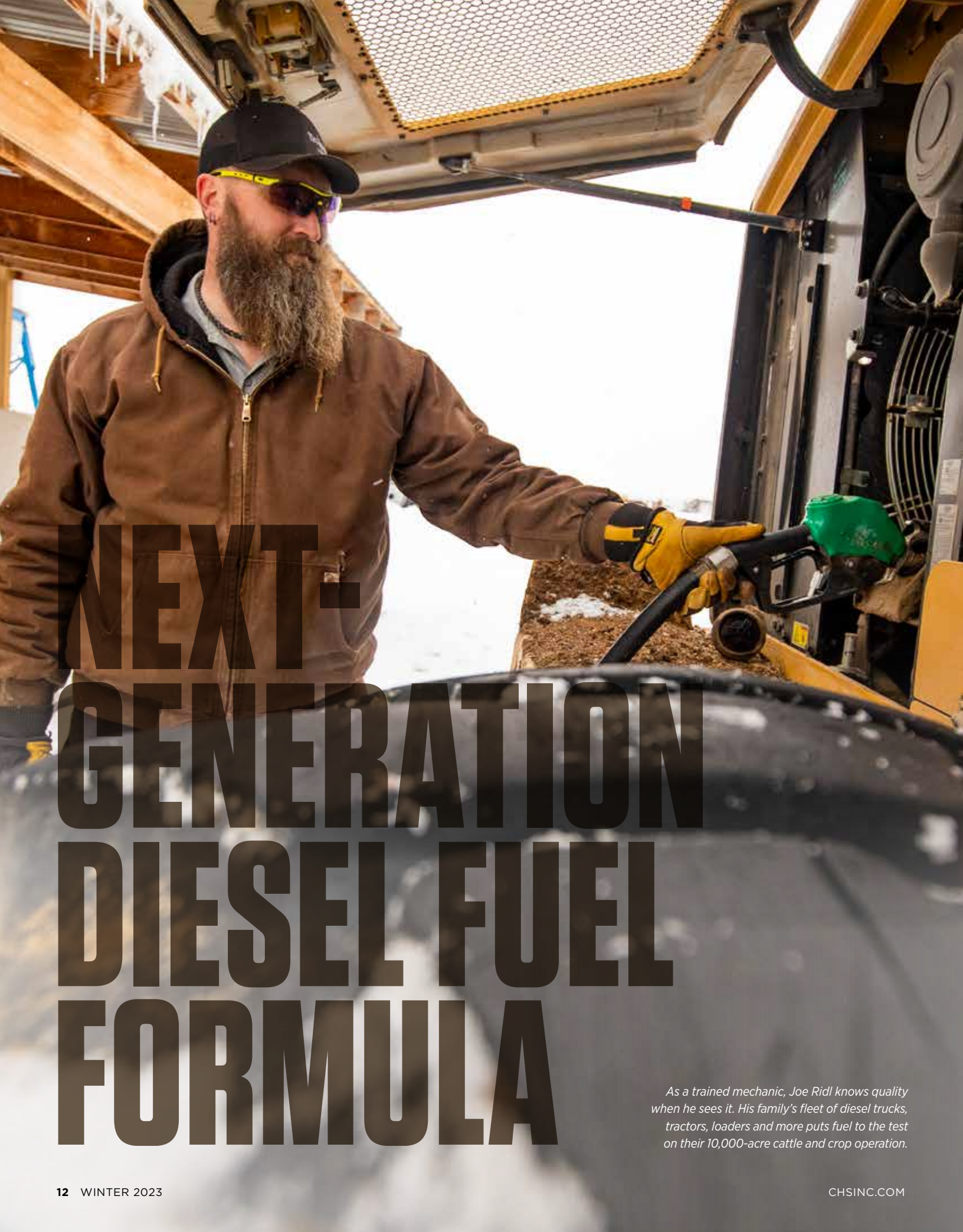
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NEXT- GENERATION DIESEL FUEL FORMULA

As a trained mechanic, Joe Ridl knows quality when he sees it. His family's fleet of diesel trucks, tractors, loaders and more puts fuel to the test on their 10,000-acre cattle and crop operation.

As agriculture evolves and producers work to stay ahead of the curve, Cenex® premium diesel fuel is ready to meet the challenge.

The old milkhouse and sprawling fields are still there, but make no mistake: The Ridl operation you'll find in Dickinson, N.D., today looks much different than it did a century ago — and for good reason.

The Ridl family doesn't shy away from change.

What began as a small dairy and hog farm in the late 1920s has transformed into a diverse crop and cattle operation spanning 10,000 acres. A future-focused approach is key to the operation's longstanding success.

"With how quickly our world and our industry is changing, you won't be in business long if you're afraid to adapt," says Art Ridl, a third-generation producer who took the helm of the family operation with his brother, Kurt, in the 1980s. "My dad and grandfather built a solid foundation for our operation, but the changes we've made along the way are helping us grow today."

These days, you'll find Holstein steers and nearly 250 registered Angus cows where dairy cattle once grazed. Acres of flax, oats, canola, soybeans and crambe have been replaced by spring wheat, malt barley, corn, sunflowers and hay. When his sons, Joe and Rusty, were old enough to help run the operation, Ridl tapped the technical expertise of the next generation to bring data-driven solutions to the operation, from high-performance seed to the

DNA profiles provided with each bull sold.

"We're always experimenting and trying new things to stay a few steps ahead," he says. "We have to stay proactive to make sure we're finding opportunities that will keep us moving forward."

Staying on Track

One thing hasn't changed: The Ridls' dependence on Cenex® premium diesel fuel to keep their operation humming.

"We've used Cenex premium diesel as far back as I can remember," says Ridl, but he's quick to note that history doesn't drive his purchase decisions. For Ridl, performance is paramount.

"We can't keep our operation on track without equipment that's ready to go, and when it comes time to perform, Cenex premium diesel never lets us down," he says. "When you see consistent performance day in and day out without hiccups, that speaks volumes. That's the quality I need."

Ridl uses Cenex Roadmaster XL® premium diesel fuel to power his truck fleet and Cenex Ruby Fieldmaster® premium diesel to run his tractors, payloaders, skid-steer loader and forage grinder-mixer. In cold weather, he counts on Cenex Wintermaster® premium diesel to keep equipment moving.

Joe Ridl is a trained mechanic and can easily spot a problematic product when it comes time for a tune-up, his dad says. They see

return on their fuel investment firsthand when it comes to maintenance.

"We're always open to trying something new if it could be a benefit, but we love how these fuels stand up to dirt and combat normal wear and tear," Ridl says. "It pays off for us in the field and in maintenance we don't have to worry about."

Made to Anticipate

Like the Ridls, the technical experts behind their go-to Cenex premium diesel fuels are no strangers to innovation.

As farming operations work to keep pace with technologies, policies and advances shaping the future of ag, Cenex brand experts are evolving premium diesel fuels to meet the needs of producers today and fuel the farms of the future.

Last fall, after more than 14 months of research, development, testing and analysis, the CHS energy team released the next generation of Cenex premium diesel fuels. The enhanced formula includes an additive package engineered to not only boost power, performance and engine protection in on-road and off-road equipment, but to anticipate and meet the challenges of future engine technology.

"It's been 10 years since we updated our comprehensive additive package," says Erin Wroge, senior product manager for >

"With how quickly our world and our industry is changing, you won't be in business long if you're afraid to adapt."

— Art Ridl



“The success of our customers is the heartbeat of everything we do. Equipment doesn’t do them any good if it’s not up and running.”

— Erin Wroge

Art Ridl, left, and his son Joe, right, work with their local Certified Energy Specialist Jared Bookhardt, center, to secure fuel to power their diverse operation. “The operation and its equipment have evolved, but Cenex® fuels have always kept pace,” says Bookhardt. “That’s a constant that continues to deliver.”

EPA EMISSION STANDARDS: THEN AND NOW

Creation of EPA emissions standards in the 20th century spurred advancements in engine technology and the fuel that powers it.

1994-1997

Tier I: The first federal standards for new off-road diesel engines are adopted in 1994 and phased in from 1996 to 2000.

ENHANCED FUEL FORMULA HELPS MINIMIZE DOWNTIME

The newly enhanced formulas of Cenex Roadmaster XL® and Cenex® Ruby Fieldmaster® premium diesel fuels feature nine comprehensive benefits to keep engines running cleaner, longer and stronger.

- 1 Advanced, aggressive detergency package** breaks down harmful engine deposits, cleans up and removes injector deposits, and boosts fuel economy.
- 2 Two-phase total water management system** separates water from fuel, allowing gravity to pull water to tank bottoms for easy drainage, then encapsulates remaining negligible water for safe passage.
- 3 Maximum filterability and enhanced biostability** protects equipment from contaminants to extend fuel storage life, reduce fuel degradation, keep fuel injectors and pumps clear, and maximize fuel efficiency.
- 4 Reduced exhaust cylinder temperature deviations** optimizes fuel burn evenly across all cylinders for complete combustion, which produces less soot, extends engine life, leads to fewer regenerations and minimizes wear and tear on the exhaust aftertreatment system.
- 5 Injection and combustion optimization** prevents coking and internal diesel injector deposits, while reducing filter and injector repairs and replacement.
- 6 Storage stability** reduces gum and varnish buildup and preserves fuel integrity to optimize combustibility.
- 7 Corrosion protection** prevents rust, corrosion and corrosion-caused leaks, while slowing natural diesel fuel degradation from oxygen exposure.
- 8 Improved lubricity** provides 10-15% more lubricity and protects injector and fuel pumps from wear.
- 9 High cetane number** improves cold weather starts, generates fewer emissions and fewer regenerations, and reduces wear and tear on the exhaust aftertreatment system.

> refined fuels at CHS. “In that time, we’ve seen an evolution in diesel engine technology to meet the changing standards designed to provide better fuel economy and reduce emissions.”

Since the previous generation of Cenex premium diesel fuel was launched in 2012, the U.S. Environmental Protection Agency (EPA) rolled out Tier IV emission standards, and engine technology adapted to follow suit. Policy discussions to implement newly released Tier V standards are already underway.

The updated Cenex premium diesel formula was designed with stricter emission regulations in mind to ensure users are prepared when those new standards come into play.

“This is a chance to get out ahead of what’s coming down the pike within the industry and to build on the superior performance Cenex premium diesel provides,” says Wroge. “We know a major focus will be lowering emissions and we proactively planned for that in this updated formula, but we’ve also taken the opportunity to increase fuel efficiency, enhance performance and help users get the most out of their equipment and fuel investments.”

Designed to Deliver

The optimized formula features four key enhancements, including 1) an advanced aggressive detergency package for better overall engine health and a cleaner environment for efficient consumption, 2) a two-phase total water management system to keep water and contaminants out of storage tanks and fueling systems, 3) maximum filterability and improved biostability, and 4) a balanced, complete fuel burn for excellent fuel economy.

With these enhancements working together, ultra-clean injectors and cylinders make better use of fuel, putting less strain on the exhaust aftertreatment system and requiring fewer regenerations. When fuel stays clean, it flows efficiently through all components for more balanced combustion and reduced downtime.

“The success of our customers is the heartbeat of everything we do,” says Wroge. “Equipment doesn’t do them any good if it’s not up and running. This enhanced formula arms customers with the protection, power and precision they need for the tough jobs they carry out each day, keeping them off the sidelines and on the move.” ■

READ MORE: Take a closer look at the enhanced premium diesel fuel formula at cenex.com.

2000-2008

Tier II regulations restrict sulfur in refined fuels.

Tier III regulations set new tailpipe and evaporative emission standards beginning with 2017 vehicles, plus new fuel standards.

2008-2015

Tier IV standards require emissions of particulate matter (PM) and nitrous oxide (NOx) to be reduced by about 90% using technology like advanced exhaust gas aftertreatment systems.

2021

The California Air Resources Board holds its first public workshop on **Tier V** emission standards to further reduce PM and NOx emissions by an additional 50-90% by 2028-2030.

Late 2022

EPA established final rule for **Tier V** emission standards to further reduce air pollution from heavy-duty vehicles and engines, effective with 2027 model year engines.

CROSSING GUARD

In the resort town of Red Lodge, Mont., you find all types of travelers passing through town on their way to or from Yellowstone National Park.

Those who venture east will wind through the Yellowstone Valley, with rich soil and mountain-fed water to nourish crops. The area provides opportunities for residents to successfully cultivate the land and enjoy year-round outdoor recreation.

— Adam Hester





An intrepid young deer steps into a Red Lodge street.

An aerial photograph of a rural farm landscape. The foreground and middle ground are dominated by large, golden-brown agricultural fields, likely harvested corn. A winding river or stream flows through the upper portion of the image. In the lower right, a farmstead is visible, featuring several large, cylindrical metal grain silos, a white barn, and various pieces of farm equipment. The sky is not visible, as the fields and farm buildings fill the frame. The overall tone is warm and autumnal.

Navigating Ag's Future

By Nelson Neale

Neale leads the CHS global research team.

6 trends to leverage over the next five years

I like to start conversations about the future with this Chinese proverb: “When the winds of change blow, some build walls while others build windmills.”

Are you building walls while the world changes around you? Or are you building windmills?

While change often comes slowly to agriculture, it will come and we need to be prepared for it. The global research team at CHS sees several drivers to watch as you execute on your business strategy over the next five years.

1 Outside Forces Matter

Agriculture is not insulated from what's happening in the broader world, so we need to pay attention to outside forces at work.

U.S. economics were relatively quiet for a long time after the recession of 2008-2009. In fact, I would say we had 15 years of a strong bull run:

- Equities markets rose steadily and considerably. That put money in pockets and fueled 401(k) plans.
- Unemployment declined to record lows.
- Interest rates were near zero, thanks to federal monetary policies.

Fast-forward to today and we are in the midst of spiking inflation and broad market concerns over Federal Reserve restrictive actions to control it. These swift-moving macroeconomic forces have quickly spilled into other markets, including commodities.

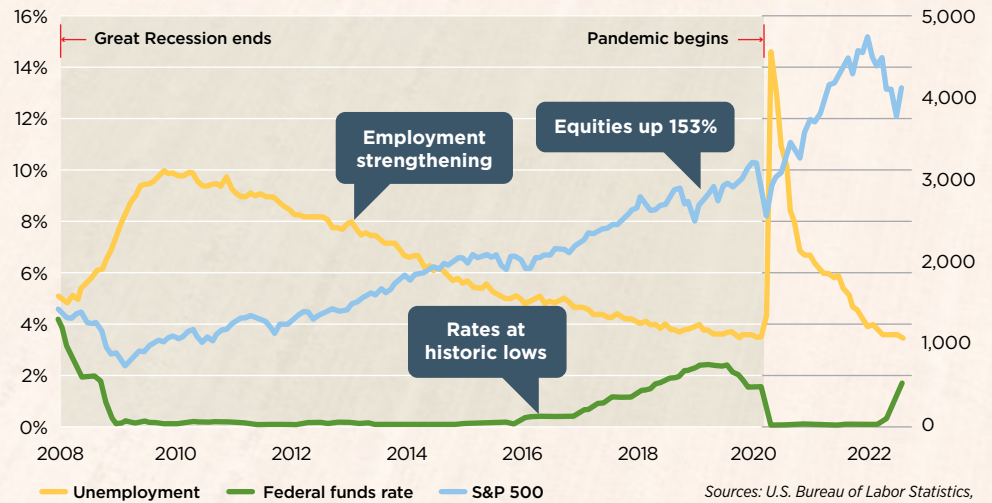
In early 2022, as the Federal Reserve began to pursue rate hikes, equities markets went “risk off,” backing away from markets and taking commodities with them. As a result, corn moved from more than \$8 per bushel to roughly \$6 per bushel in a few months. The typical fundamental drivers that influence ag prices — planting progress, weather, etc. — didn't matter.

Bottom line: The trillion-dollar equities markets trumped the billion-dollar commodities markets, proving ag commodities are not insulated from outside economic forces. While the impact of markets outside of commodities was largely muted before 2021, we can't afford to ignore them in the current economic environment. >

Corn Price Run-up and Nosedive, 2022



U.S. Economic Drivers, 2008-2022



2 Labor Market Upset

Labor will continue to be a hot topic in agriculture and globally. We have seen three major drivers behind limited U.S. labor availability:

- When the pandemic hit, baby boomers tapped out of the labor market, taking more than 3 million people out of the workforce.
- Between 1 million and 2 million people of prime working age (25 to 54) dropped out of the workforce to care for family members during the pandemic.
- Immigration reform in 2016 made it difficult for new workers to enter the country to meet labor demand.

For those still working, expectations have changed, as noted in a recent McKinsey & Company study. What used to be important to traditional workers — career advancement and development, compensation, meaningful work — is less important to newer employees. Those new workers rate workplace flexibility at the top of their wish list, followed by compensation, meaningful work and support for health and well-being.

As we think about attracting and retaining talent for agriculture, the rules have changed. Members of the latest generation to enter the workforce — often called Gen Z — are tech-savvy, have a do-it-yourself (DIY) mentality and are highly competitive. They want a say in decision-making — after all, they grew up having a say in family decisions — and they demand career pathways and details on where they're going and how they'll get there.

GEN Z IS CHANGING THE WORKFORCE

90%

say tech sophistication impacts where they want to work

75%

are interested in work situations with multiple roles

Source: David and Jonah Stillman, "Gen Z at Work"

3 Supply Shifts

Crop input prices and, perhaps just as important, availability will continue as a key theme in agriculture.

On the crop protection side, most active ingredients now come from China and are subject to what's going on in that country in terms of both production and demand. Supply chain upsets, both current and future, will impact how much product is delivered to U.S. agriculture and at what price.

Crop nutrient production is another global industry, although the U.S. is a fairly significant fertilizer producer, providing about 15% of the world's total fertilizer

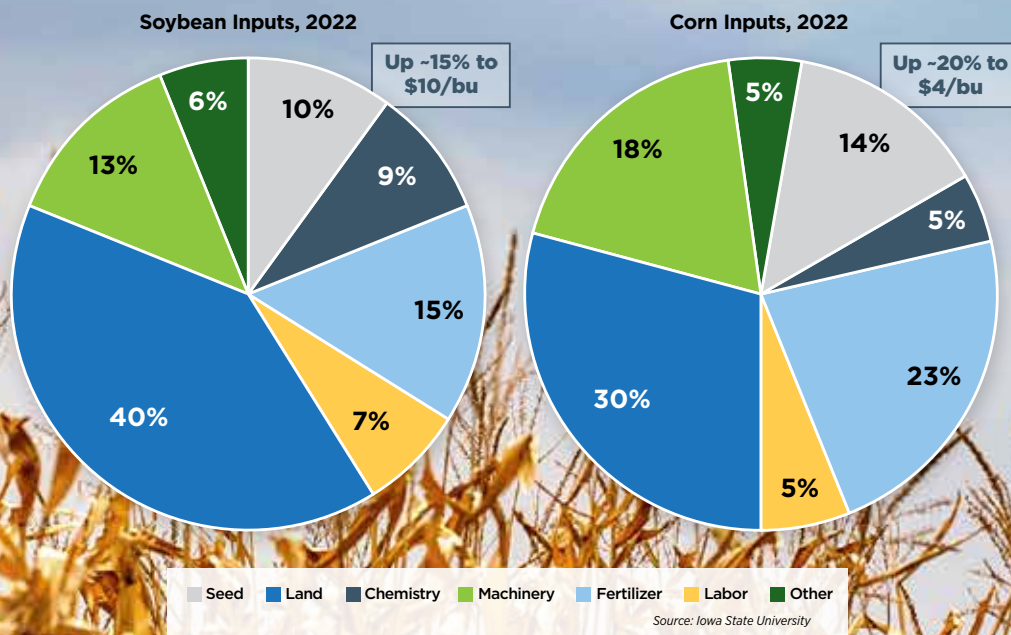
production. Unfortunately, our demand is greater than our production, so we are subject to global trade and competition for products. While we import crop nutrients from Canada, much also comes from the Middle East and North Africa — that's where normally cheap natural gas feedstocks for fertilizer production are available to help us close the demand gap.

All these market and industry factors combine to impact U.S. crop producers through volatile if not increased production costs. Iowa State University researchers say soybean input

costs rose 15% and corn input costs rose about 20% in 2022 — and that fertilizer costs were 23% of corn production costs and 15% of soybean costs. With the renewable diesel movement and the cost to grow the crop, do you switch from corn to soybeans?

We'll need to gain efficiencies. Those could come from application technology advances like spot spraying or from genetic shifts like short corn genetics that reduce nitrogen and crop protection needs and make the crop more resilient to volatile weather.

Input Cost Effect on Prices and Margins



4 Renewables Renaissance

It is rare to have a new source of demand in the commodities world. Lightning already struck once for agriculture in the mid-2000s with ethanol as a fuel oxygenate and additive for gasoline. It's about to strike a second time with soybeans and renewable diesel.

Today, U.S. farmers produce 15 billion bushels of corn every year and 5 billion bushels go into ethanol, fully one-third of our corn production. But is the ethanol arc waning? In 2022, there were more than 50,000 electric vehicle (EV) charging

stations in the U.S. — nearly 12 times the number of E85 stations, according to the U.S. Department of Energy. Federal government and industry predictions say we could have 25 million new EVs on the ground by 2030, or about 30% of all new car sales. How much corn would be displaced if EVs rise as predicted and gas and ethanol demand decreases? Figure 25 million cars at 550 gallons of fuel per year, with 10% of the fuel being ethanol. That displaces 2 million to 2½ million acres of corn. That much decline can

happen from prevented planting in one or two states in any year!

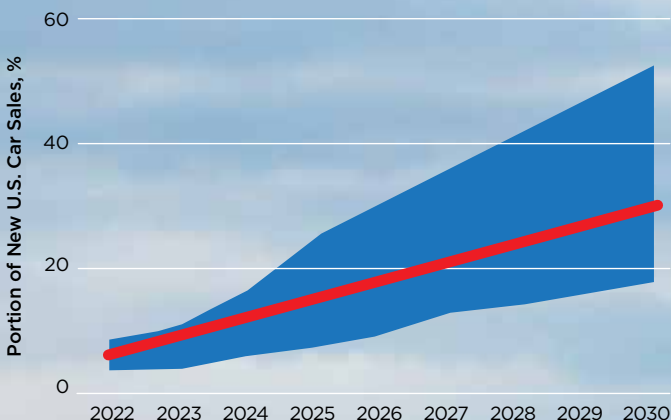
While EVs will continue grabbing headlines, there will still be demand for corn. And that's not taking into account the impact of potentially moving to E15 blends or sustainable aviation fuel, which is derived from ethanol. In short, corn demand is not going away any time soon.

As noted on page 9 in this issue, soybean markets are responding to renewable diesel demand fueled by low-carbon fuel standards. If you total up the expanded soy crush capacity

being built now, we'll need 9 million to 11 million or more additional soybean acres to satisfy the demand.

Where will all those beans come from? We export roughly half of the beans we produce in the U.S. today, so you can anticipate many of those acres being tipped back toward domestic demand. And the soy crush byproduct is no longer soybean oil; longer term, we'll have to figure out what to do with all the soybean meal. >

Electric Vehicles Sales Take Off



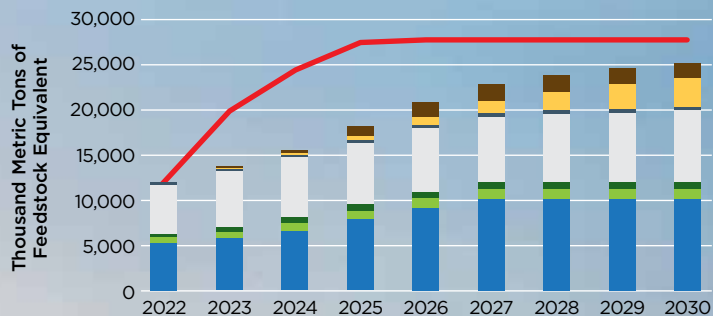
Source: CHS global research

But How Much Corn Is Displaced?



Source: CHS global research

North American Feedstock Biofuel vs. Biofuel Production and Capacity



- U.S. soybean oil
- Canada canola oil
- Canada canola oil exports for North American biofuel
- U.S. energy crops
- Canada low-carbon feedstocks
- U.S. canola oil
- U.S. low-carbon feedstocks
- North American planned capacities

Source: S&P Global Commodity Insights

5 Deglobalization Changes the Game

This might be the most important factor to affect agriculture long term: a transition away from a global world order toward deglobalization. Four countries matter significantly in agriculture and their actions will determine what happens next.

A major exporter of corn and soybeans, the **United States** has long enjoyed effective infrastructure to get crops from the country's interior to the coasts. We are ag tech innovators and leading importers of crop inputs.

Watch for continued focus on exports, as well as reimagining domestic energy production through use of feedstocks like

soybean oil. This may result in a pivot of soybeans from export to domestic consumption. Conversely, long-term buyers of soybean meal will be needed.

A prolific producer of soybeans and secondarily of corn, **Brazil** has a lot of land and isn't afraid to convert it to ag uses, including for industrial-scale farming with farms of 5,000 to 10,000 acres or more. According to the most recent Brazilian ag census in 2017, at that point, the country already had more than 51,000 farms with more than 1,000 hectares (2,470 acres). While soybean production in South America has continued to grow, weather effects have reduced yield there, just as they

have in North America.

Watch for continued emphasis on large-scale production and exporting core grains and oilseeds, particularly corn. With deglobalization comes the opportunity for bilateral trade agreements like the recent announcement that China will accept Brazilian corn. But also be mindful of currency fluctuations between the U.S. dollar and Brazilian currency, which could have a significant impact.

China is a demand sink for all commodities. Its increasingly industrial livestock sector is shifting rations and that is changing demand for soybeans, soybean meal and corn. China is

also a key producer of fertilizer and crop protection ingredients, which the U.S. needs.

Watch for China's commitment to its five-year plan and the country's changing demographics. China has committed to expanding agriculture with the goal of being self-sufficient.

According to the U.S. Census Bureau International Database, by 2030, more people in China will be over 65 years old than are under 15 years old and that will likely create a tipping point for commodity demand, if it hasn't already happened.

Much of the world's wheat is grown in **Russia** and Ukraine and we expect that to continue. Those

4 Countries to Watch

U.S.

- Key producer of corn, soybeans and wheat
- Major global exporter
- Net importer of crop inputs
- Mature logistics
- Ag technology innovator

Brazil

- Largest global producer of soybeans, significant corn crop
- Global exporter
- Available land for expansion
- Industrial-scale farming
- Infrastructure improvements
- Currency fluctuations

Russia

China

- Dominant import position for soybeans with corn growing
- Industrialization of protein complex
- Dominant position in ag chemistry production
- Key to global fertilizer trade
- Five-year plan

Source: CHS global research

countries are key to fertilizer trade and are big players in energy. Because their production has to flow in and out of the Black Sea, they have less access to ocean transportation than we have in the U.S.

Watch for continued difficulty in market access and potentially crop production as the Russia-Ukraine war continues.

Global markets and geopolitical situations change every day, so you need to keep them in mind as you work your plan through annual cycles. Tomorrow won't be the same as today, so lean into change and make it work for you.

- Largest global exporter of wheat
- Key to global fertilizer trade
- Logistics centered around Black Sea ports
- Global player in energy

6 Tech Talks

Technology continues to advance how we work and agriculture is not immune to those advances. Viewing and embracing technology as a competitive advantage versus simply a cost of doing business will continue to propel the most successful enterprises.

Key developments driving technological change in agriculture include:

Robotic process automation (RPA). RPAs are essentially robots loaded onto computer systems to do repetitive transactional work. Anything a human can do with a computer, an RPA — or bot — can execute, including things like processing emails and preparing invoices. This type of efficiency may help offset current and pending labor shortages.

Drones. You've probably seen drones doing agronomic scouting. They can also measure volumes of grain or count livestock and other inventories. Drones are being used at CHS to inspect elevators and other facilities to improve safety by keeping people off scaffolds and elevators.

Autonomous vehicles. According to the American Trucking Associations, we will have a shortage of 160,000 truck drivers by 2031. As an industry, we will be forced to look at technologies that will help us fill that gap from an efficiency standpoint and safety perspective. Autonomous tractors have been launched and retailers like Walmart are testing autonomous delivery vehicles between distribution centers and retail stores.

The time to embrace technology is now — it will transform the industry but requires focus and investment if we are going to use technology to meet the challenges we face. ■





The Godward family uses customized combines to harvest cultivated wild rice in northern Minnesota.



Wild Rice

RANGE

By Adam Hester

As summer turns to fall in northern Minnesota, the buzz of wakeboarding boats quiets and the fried food aroma from lakeside restaurants fades. Migrating waterfowl, heading south for the winter, pay attention as the grand bodies of blue water the state is famous for narrow into a neat dike system feeding majestic green fields. The fields offer a resting place for feathered travelers and produce the official state grain: wild rice.

The grid system covers about 5,000 acres near Aitkin, Minn., and was designed by Nick Godward's great-grandfather. The younger Godward now runs the cultivated wild rice and soybean operation with his brother, Brandon, and father, Tom.

Over the past 60-plus years, Tom has added his chapters to this success story. Many of his close friends in this tight-knit community have jokingly called him a "mud farmer." Tom quickly responds with, "I'm proud of what I do, although

I find I need to be smarter about it every year."

With the complexities of growing wild rice, it helps to be not just smarter but to have a supportive community. The Godwards work with agronomist Nick Smeby to evaluate the diverse peat, sand and mineral soils they manage and plan multiple rounds of fertilizer applied throughout the summer.

If Mother Nature allows, the rice fields are flooded each fall after inputs are applied. The sheets of water help with

insect and pest control over the winter. Seed can be put down the next spring with frost still on the ground. Constant field scouting is needed as the rice plants emerge and then the fields are drained to allow the growing plants to flourish.

"Nearly all the fertilizer is top-dressed using variable-rate equipment to accommodate changes from year to year," says Smeby. The Godwards rely on the CHS location based in Long Prairie, Minn., for precision ag support, including >

> the YieldPoint® program, and to contract diesel fuel purchases to help manage price.

With Minnesota wild rice production at 5 million to 10 million pounds per year, it is a small player in the global grain game, but packs a mighty punch as a nutritious, delicious option for consumers looking for healthful choices. With the continued hard work and pride emanating from the Godward family and their bountiful operation in Minnesota's North Country, the state's cultivated wild rice footprint looks to be in good hands. ■

Fourth-generation wild rice grower Nick Godward enjoys a short break in front of one of the combines operating throughout the family farm during the busy harvest season. The Godwards work closely with Universal Harvester based in Ames, Iowa, to retrofit combine headers with lightweight, durable reels that cut stems without breaking the rice.



Current farm patriarch Tom Godward runs his favorite combine through a rice field. Over five decades, he has grown the northern Minnesota operation into a global business.

Mud is under the soles of boots throughout the Godward operation much of the year. When asked about operating machinery in those conditions, Tom Godward says, "We're so good at getting machinery out that most people around here call us when they're stuck in the mud."





The sun sets on the wild rice range as Nick Godward empties the combine into another load for their local processor. Rice is typically harvested at 30% to 40% moisture.



Nick Godward inspects the cultivated wild rice at harvest time. The rice processor cures and roasts in batches to suit a range of customer requests for color and other characteristics.



CHS REPORTS FIRST QUARTER FISCAL YEAR 2023 EARNINGS

CHS has reported net income of \$782.6 million for the first quarter of fiscal year 2023, which ended Nov. 30, 2022, compared to \$452.0 million for the first quarter of fiscal year 2022.

Fiscal 2023 first quarter highlights include:

- Revenues of \$12.8 billion compared to \$10.9 billion in the first quarter of fiscal year 2022, a year-over-year increase of 17%.
- Continued robust global demand for commodities, coupled with market volatility, resulted in strong earnings across all business segments.
- Significantly improved earnings in our Energy segment resulted primarily from higher refining margins driven by strong demand in rural America and global market conditions.
- Our soybean and canola processing businesses in our Ag segment benefited from strong demand for meal and oil.
- Our CF Nitrogen investment delivered strong earnings due to robust urea and UAN demand.

“The U.S. agricultural industry has benefited from ongoing strong global demand for grain and oilseed commodities,” says Jay Debertin, president and CEO of CHS Inc. “Our continued strong earnings are attributable to market dynamics and supported by our investments on behalf of our owners in infrastructure, supply chain capabilities and innovative technology that drive efficiency and operational improvements. As we enter 2023, CHS remains well-positioned to maximize value for our member cooperatives, farmer-owners and customers.”

Energy: Pretax earnings of \$396.6 million for the first quarter of fiscal year 2023 represent a \$327.4 million increase versus the prior year period and reflect:

- Improved refined fuels market conditions including higher refining margins and discounts on heavy Canadian crude oil, partially offset by higher renewable energy credit costs and increased refinery maintenance expenses
- Higher refined fuels and propane volumes driven by strong demand due to more favorable weather conditions during fall harvest compared to the same period in fiscal year 2022
- Lower propane margins resulting from hedging-related impacts due to volatile pricing in the first quarter

Ag: Pretax earnings of \$287.3 million represent a \$0.9 million increase versus the prior year period and reflect:

- Strong global demand and constrained supply for grain and oilseed

- Improved margins in our oilseed processing business due to robust demand as well as mark-to-market gains
- Lower margins on our grain and oilseed commodities, driven by unfavorable mark-to-market impacts, as well as less favorable pricing for our agronomy products
- Decreased volumes across most of our Ag segment due to numerous factors, including drought conditions in portions of our trade territory

Nitrogen Production: Pretax earnings of \$96.9 million represent a \$0.3 million increase versus the prior year period and reflect continued favorable performance of our strategic investment in CF Industries Nitrogen, LLC, due to strong global demand for urea and UAN.

Corporate and Other: Pretax earnings of \$36.7 million represent a \$22.2 million increase versus the prior year period and reflect increased equity income from our Ventura Foods joint venture, which resulted from more favorable market conditions for edible oils.

CHS INC. EARNINGS* BY SEGMENT (in thousands \$)

	Three Months Ended November 30,	
	2022	2021
Energy	\$396,594	\$69,190
Ag	287,299	286,425
Nitrogen Production	96,873	96,583
Corporate and Other	36,704	14,465
Income before income taxes	817,470	466,663
Income tax expense (benefit)	34,554	14,720
Net income	782,916	451,943
Net loss attributable to noncontrolling interests	318	(18)
Net income attributable to CHS Inc.	\$782,598	\$451,961

*Earnings is defined as income (loss) before income taxes.

GET MORE: Sign up to receive CHS press releases by email or RSS feed at chsinc.com/news.

CHS AND CARGILL TO EXPAND TEMCO OPERATIONS TO INCLUDE TEXAS GULF

CHS and Cargill have announced intent to expand the scope of their joint venture, TEMCO, LLC, by adding the Cargill-owned export grain terminal in Houston, Texas.

The addition will expand TEMCO export capabilities, providing shipping access for grains, oilseeds and byproducts through the port of Houston. TEMCO currently

operates three facilities, which are located in Portland, Ore.; Kalama, Wash.; and Tacoma, Wash.

The Houston terminal is located approximately 40 miles inland from the Gulf of Mexico via Galveston Bay. With 6 million bushels of storage and capacity for 350 rail cars, the facility handles up to 250 million bushels annually.



CHS and Cargill plan to expand their TEMCO joint venture by adding the Cargill-owned export grain terminal in Houston, Texas. (Photo courtesy of Cargill.)

CHS PLANS NEW SOUTH DAKOTA GRAIN SHUTTLE FACILITY

CHS will begin construction this spring on a new grain shuttle facility in southeast South Dakota.

The 1.1-million-bushel grain facility will be built near the intersection of Interstate 29 and State Highway 44 in southeast South Dakota and tie into an existing rail loop used for CHS agronomy operations. The facility will feature fast, efficient receiving and loadout capabilities to give area farmers greater market access in the Pacific Northwest grain corridor.

“This investment in infrastructure and supply chain capabilities is part of a coordinated and focused effort to drive operational and efficiency gains throughout the CHS network,” says Kent Mulder, CHS vice president of operations in South Dakota and the Southern Plains.

CHS OWNERS ELECT BOARD MEMBERS, PASS AMENDMENTS

CHS owners elected five members to three-year terms on the CHS Board of Directors during the 2022 CHS Annual meeting held Dec. 1 and 2.

Newly elected was Jerrad Stroh, Juniata, Neb., representing Region 8 (Nebraska, Kansas, Colorado, New Mexico, Oklahoma, Texas). He succeeds Steve Riegel, who has retired from the Board.

Reelected to three-year terms were Al Holm, Sleepy Eye, Minn.; Kevin Throener, Cogswell, N.D.; Hal Clemensen, Aberdeen, S.D.; and Mark Farrell, Cross Plains, Wis.

CHS owners voted to approve amendments to the CHS Bylaws. The amended bylaws give the CHS Board flexibility to schedule regional caucuses and Director elections at times and locations that enable the greatest number of owners to participate in CHS governance.



CHS owners elected five of their peers to the CHS Board of Directors at the 2022 CHS Annual Meeting. From left, Al Holm, Mark Farrell, Jerrad Stroh, Kevin Throener and Hal Clemensen.

Washington cooperative farmer-owners Evan and Ashleigh Jones provided the following reflection at the 2022 CHS Annual Meeting. They are members of HighLine Grain Growers, based in Waterville, Wash.

CONNECTED

“For our family, agriculture is more than just a job — it’s a lifestyle that binds us together.

“Whether it’s moving rigs early in the morning before school, hours of Simon Says in the combine or Saturday cheeseburgers around the tractor and drill, agriculture connects us.

“We thrive on the excitement of watching the wheat change from a

green leaf in the spring to a golden, swaying crop in the August breeze. We embrace the long hours and missed meals and activities, knowing we will have the pleasure of creating something for the greater good.

“Like all good things, we know — and we are teaching our children — that we must push forward through the daily challenges

and obstacles, using those obstacles to allow ourselves and our operation to grow.

“Our goal is to become better stewards of the land, leaving it bountiful for generations to come, since we know agriculture is necessary for survival.

“We love this quote attributed to Edward Stewart: ‘Agriculture was the first occupation of man and, as it embraces the whole earth, it is the foundation of all other industries.’

“Our family takes pride in knowing we are playing a small part in this noble endeavor.” ■





Evan and Ashleigh Jones are helping their son, Jaxon, and daughter, Quinn, navigate the joys and challenges of farm life.



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C TOMORROW

Digging into New Ways to Boost Crop Performance

The search never ends for technologies to help crops meet their genetic potential. Overcoming wild weather swings and other hurdles calls for deep knowledge of crop needs, plus a proactive defense strategy.

Biostimulants are gaining attention as a new option for sparking plant response, but measuring their return on investment needs more scrutiny, says Brian Kuehl, who heads crop protection research and development for CHS.

“The active ingredients in biostimulant products are generally targeted to enhance nutrient efficiency, improve plant stress tolerance and/or enhance plant growth,” he explains. “At CHS, we have been evaluating biologicals for more than 10 years. We have found that not every product works well in every situation.

“Results are highly dependent on environmental conditions, including weather, soil type, day length and more.”

The promise to support soil health in addition to boosting yield and other performance factors makes biostimulants an area of interest, Kuehl says. Potential benefits could be applied to corn and soybeans, as well as to high-value crops like potatoes and sugarbeets.

“We continue building CHS research programs to more fully understand the conditions in which specific biostimulants perform best. Combining that knowledge with local expertise from cooperative agronomists will help growers make the best decisions for their cropping programs.”

— Cynthia Clanton



Research continues to determine how sugarbeets and other crops can benefit from effective use of biostimulants.