C MAGAZINE

Will Ag Help Fuel Greener Skies?

What's needed for sustainable aviation fuel to take flight

CHS

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ON THE COVER: The drive to reduce greenhouse gas emissions has aviation in its sights and sustainable aviation fuel is a leading solution. This new connection between ag and energy could affect both sectors in significant ways.

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Jay Debertin, president and CEO, CHS

Looking to the Future

It will take every solution available today — and some still to be discovered — to reduce carbon emissions as we strive to protect our planet while feeding the world. As a company and as part of the cooperative system, CHS and our owners are at the nexus of agriculture and energy, two sectors that will play key roles in creating a more sustainable future for everyone.

No single answer will address this complex challenge. As described in this issue, sustainable aviation fuel is one way to reduce emissions. While that technology is promising, many factors need to fall into place, including legislation and economic viability. A long-term view and lasting programs are needed to attract investments that will make a difference.

With both sustainable aviation fuel and renewable diesel — another solution to reduce greenhouse gas emissions — American farmers and the systems that support them will be critical to our ability to produce alternative fuels. At CHS, we are primed to provide the soy oil, canola oil, ethanol and other feedstocks needed to produce renewable fuels as the industry evolves and when we can provide value for our owners.

CHS is working to reduce greenhouse gas emissions in many ways. Examples include our collaboration with CF Industries on low- or no-carbon fertilizer and implementing software that makes delivery routes more fuel-efficient. It's a mindset we are putting into action every day with every project: Finding ways to shrink our carbon footprint while controlling costs and meeting our owners' needs.

As we each make business and personal decisions related to our carbon footprint, every effort will help us achieve a more sustainable world. Let's continue working together toward that brighter future as we create connections to empower agriculture.

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

Fueling Low-Carbon Skies

Farms and fuel producers could help decarbonize aviation — if early hurdles don't limit sustainable fuel adoption.

By Megan Gosch

Could crops fuel future air travel? As the United States works to tackle climate change and reduce carbon emissions, the aviation sector has been targeted for its potential to reach carbon-cutting goals by using renewable fuels.

While renewable fuels like biodiesel, ethanol and renewable diesel have been reducing emissions since the Renewable Fuel Standard was enacted in 2005, sustainable aviation fuel (SAF) is emerging as the most promising path to reach greener skies with the potential to cut carbon emissions by up to 80%.

A large-scale shift from traditional petroleum-based jet fuel to renewable alternatives could drive significant changes in both agriculture and energy, but what will it take to get SAF off the ground? And what could aviation transformation mean for American farmers and fuel producers?

"SAF production is already underway and growth is coming in the foreseeable future, but we're still in the early stages of adoption," says Ron Batey, refined fuels pricing and economics director with CHS.

"Widespread change across the aviation industry won't just require farmers to produce more feedstocks and refiners to process more gallons. Fuel grade standards need to be set, policies that make SAF economically viable need to be shored up and infrastructure needs to be built. Momentum is building, but there's a long road ahead."

"As a farmer-owned cooperative with both ag and energy businesses, CHS is uniquely positioned to have a seat at the table and advocate for our owners as opportunities emerge in this new market," says Darin Hunhoff, executive vice president for energy at CHS.

Push for SAF

Like other segments of the transportation sector, aviation has been identified not just as a key source of greenhouse gas (GHG) emissions — but one that's expected to grow significantly.

Aviation generates about 2% of worldwide carbon dioxide (CO_2) emissions, with U.S. aircraft emissions contributing roughly 24% of that total. As air travel continues to rebound to pre-COVID levels, U.S. jet fuel consumption reached 24 billion gallons in 2023 and is projected to reach 34 billion gallons by 2050. Without efforts to decrease aviation's carbon footprint, emissions could triple.

But unlike other light- and heavy-duty vehicle markets, solutions like electrification and hydrogen fuel cell technology face steeper hurdles for aviation.

"A key problem with pathways like electrification or hydrogen is that they have low energy density," >

Considered a "drop-in" fuel that can be blended with conventional jet fuel, sustainable aviation fuel has been used on a small scale for years.

> says Dave Balzer, senior director, energy economics with CHS. "Carrying a jet tank's worth of hydrogen or electricity would be too heavy to fly medium or long distances. The best option is to decarbonize the fuel the jet's engine is already equipped to burn."

"Today, airlines are blending small amounts of SAF with traditional jet fuel, so SAF accounts for roughly 0.1% of the total fuel used by major airlines."
— Ron Batey

According to the U.S. Department of Energy (DOE), sustainable aviation fuel can be made from a wide range of biological and waste resources, including fats, oils, greases, grains, oilseeds, algae, forestry residues, municipal solid waste and more. SAF has similar properties to conventional jet fuel refined from petroleum, making it a viable "drop-in" fuel that can be blended with conventional jet fuel and is compatible with today's aircraft technology.

"SAF has gained traction because of its relative near- and long-term potential," says Courtney Hall, senior director of sustainability at CHS. "It's an alternative that will certainly require innovation, but calls more for tweaks within the existing aviation infrastructure than for a drastic build of new systems. It's an avenue public and private stakeholders eager to cut emissions can start charting the course for today."

Federal Strategy

In 2021, the Biden administration announced the Sustainable Aviation Fuel Grand Challenge, which outlined commitments to target a 20% reduction in aviation emissions by 2030, with production of 3 billion gallons of SAF per year and net-zero aviation emissions by 2050 and the goal of producing 35 billion gallons of SAF per year.

The directive has charted a strategy for the DOE, U.S. Department of Transportation and U.S. Department of Agriculture to collaborate with labs, universities, nongovernmental organizations and stakeholders in aviation, agriculture and energy to accelerate research, development, demonstration and deployment to scale up SAF production.

Additional support was signed into law with the Inflation Reduction Act (IRA) of 2022, which included tax credit incentives for SAF sale and use. The 40B Sustainable Aviation Fuel Credit awards a baseline of $1.25 per gallon of SAF sold or used in a qualified mixture from 2023 to 2024, while the 45Z Clean Fuel Production Credit, which goes into effect Jan. 1, 2025, and sunsets at the end of 2027, will award up to $1.75 per gallon of SAF produced or sold. The IRA also funded $244.5 million in grants to support buildout of SAF infrastructure projects through the Federal Aviation Administration.

"Now the industry has the clearance to innovate, the capital and the government support to fast-track collaboration that will move the needle on SAF," says Hall.

Early Momentum

SAF has been used on a small scale for commercial flights for years, but airlines are now making formal commitments to cut emissions. Alaska Airlines has committed to reaching net-zero emissions by 2040 and has an agreement with biofuel company Gevo to purchase 185 million gallons of SAF. Delta has partnered with DG Fuels to purchase 385 million gallons of SAF. United Airlines has announced it will power 50,000 flights with SAF starting in 2028 through its Blue Blade Energy joint venture.

New plants have come online to process SAF, including LanzaJet's new commercial-scale ethanol-to-SAF biorefinery in Soperton, Ga., and with completion of a new project at Diamond Green Diesel's plant in Port Arthur, Texas, the facility could upgrade 50% of its current 470 million gallon annual production capacity to SAF.

Key feedstock-producing states have made early strides to support SAF scaling. Illinois, Minnesota and Washington have implemented their own SAF tax credits. And Minnesota has formed a coalition to build the country's first SAF hub, using a phased approach to scale production within the state.

"We're seeing SAF in headlines and, as with any emerging technology, it's important to see progress, but it's also important to be transparent about how far adoption has yet to go," says Hall.

"Only 150 million gallons of SAF per year are being produced worldwide today, and U.S. aviation depends on billions of gallons to power planes," says Batey. "Today, airlines are blending small amounts of SAF with traditional jet fuel, so SAF accounts for roughly 0.1% of the total fuel used by major airlines. It will be years before production and the logistics required match the headlines we're seeing today."

Scaling Up

Government agencies and aviation experts acknowledge goals to build SAF production to a level that could achieve net-zero aviation emissions are ambitious, but scaling SAF to commercial levels is possible.

"The technology that's processing crude oil or renewable diesel can also be used to produce SAF, and existing renewable diesel plants are making SAF today," says Batey. "But it's one thing to produce SAF and another beast entirely to scale it. It all starts with the feedstock."

Jet fuel consumption

24 BILLION GALLONS in 2024

34 BILLION GALLONS by 2050

The DOE has approved nine pathways to process SAF using a variety of feedstocks, though not all feedstocks hold the same potential for mass production.

Batey notes most SAF in use today is made from used cooking oil and animal fats, but resources to scale with these feedstocks are in short supply.

"Used cooking oil is pretty well tapped out with renewable diesel production. Algae and woody biomass are also approved feedstocks, but the potential to scale production of these resources is limited. Vegetable oils, like soy and canola, and corn via ethanol hold the most potential to scale up to the volumes carbon-cutting goals are aiming for."

"The feedstocks used for SAF are much more expensive than conventional crude oil," says Balzer. "The inputs needed to produce a barrel of fuel from crude oil may cost $70, but a barrel using soybean oil will cost around $160. The technology is here, but the equation to produce SAF in an affordable way has not been cracked. Significant subsidies or much higher prices are currently needed to make production financially feasible."

Setting Feedstock Standards

A formal standard for each SAF pathway will be key in determining which feedstocks are most viable for high-volume SAF production.

The Argonne GREET (Greenhouse gases, Regulated Emissions and Energy use in Technologies) model provides a formula that calculates the environmental impact of a fuel through each stage of production and use. Each fuel pathway receives a carbon intensity (CI) score, which reflects the amount of GHG emitted throughout the fuel's life cycle.

"The GREET model's CI scores could ultimately pick winners and losers among the pathways and feedstocks that can be used to scale SAF," says Batey. "A low CI score is needed to take advantage of SAF tax credits. Without those tax credits, it's not financially feasible to produce SAF."

The GREET model, first released in 1995, has been >

Potential SAF Feedstocks

Several feedstocks have been approved for use in sustainable aviation fuel (SAF), each with its own limit for blending with traditional jet fuel. No feedstock is currently approved to be blended beyond 50%.

- Oilseed plants and grasses
- Algae
- Ethanol
- Municipal solid waste
- Fats, oils and greases from cooking waste
- Agricultural and forestry residue
- Industrial carbon waste gas

Source: U.S. Department of Energy

> updated continually to reflect advanced technology and evolving environmental factors. An expanded version of the model that includes CI scores for key SAF feedstocks was released on April 30, 2024, by the U.S. Department of the Treasury and Internal Revenue Service. The model accounts for emissions produced through the refining process and use of the fuel, plus factors in how and where feedstocks were grown, meaning the same feedstock input could yield a different CI score if grown in Iowa versus in Illinois.

Fuel producers can reduce a pathway's CI score by reducing emissions with carbon-cutting methods throughout a fuel's life cycle.

Under new GREET model guidance, traditionally farmed corn-ethanol-to-jet-fuel and canola-to-jet-fuel pathways do not qualify as sustainable aviation fuels due to their CI scores. Fuel producers can reduce a pathway's CI score by reducing emissions with carbon-cutting methods throughout a fuel's life cycle, including using lower-carbon grains as feedstocks, although the additional resources needed may pose significant new barriers.

"Take the ethanol-to-SAF pathway, for example," says Mike Van Houten, senior director for continuous improvement at CHS. "Under the new GREET guidance, ethanol carries a high CI score, but implementing less carbon-intensive growing practices for corn or implementing methods to sequester the carbon produced in ethanol manufacturing can bring the CI score down.

"For fuel producers, the question becomes, what is the reward for being a low-CI producer? How much investment is needed to lower the CI score and earn tax benefits? Is the financial return worth the investment?"

Investing in Infrastructure

To reach net-zero aviation emissions by 2050, European SAF supplier SkyNRG estimates the U.S. will need to deploy about 250 SAF refineries, requiring an investment of nearly $400 billion. And, depending on the feedstock used, building new SAF production facilities is likely to pose geographic challenges as additional facilities attempt to align with existing aviation infrastructure.

"SAF produced at a converted crude oil refinery that previously produced conventional jet fuel will likely already have some of the equipment needed and a pipeline directly connected to an airport," Balzer says. "Building a new stand-alone plant could require building a pipeline to connect fuel with an existing airport, which is no easy feat."

Geography is also likely to hinder where carbon sequestration would be needed to offset emissions related to SAF production.

"Parts of the U.S. are well-suited to storing CO_2 underground, but most fuel processing plants don't sit in that geography," says Van Houten. "Those sites would also require the building of pipeline infrastructure."

Long-Term Legislation

Legislative policies and programs may play the most pivotal role in getting SAF off the ground.

"Between costly feedstocks and low production volume, SAF is expensive to produce," says Dan Mauer, Washington representative for CHS. Today, the price of SAF typically falls between two and four times higher than traditional jet fuel.

"No one wants to shoulder that cost while the SAF market matures, and that's where our federal programs and tax credits come into play. Without policy support at the federal level to offset the cost, fuel producers can't afford to take the risk and there is no growth for SAF."

While current legislation provides SAF producers with tax credits for eligible gallons, Mauer notes that these incentives are sunsetting in 2024 and 2027, so will be too short-lived to scale widespread SAF production and reach net-zero emissions goals.

"Today we're seeing early adopters investing in SAF, but to gain the wide support needed across the industry, stakeholders will need more certainty these credits will be sticking around to invest heavily in production and infrastructure," says Mauer.

State-level policies could also be key in building momentum and demand for SAF production. In addition to state SAF sales tax incentives, aviation fuels have already been included as "opt-in" fuels under the low carbon fuel standard (LCFS) programs in California, Washington and Oregon, and states that are now building out their own LCFS policies are likely to do the same.

"In coordination with the Renewable Fuel Standard RIN system and state-level tax incentives, revenue from carbon credits linked to state LCFS programs can serve as the third leg of a policy stool that supports SAF growth," says Dustin Haaland, director of trading and renewable fuels at CHS.

"However, LCFS incentives supporting SAF will likely rely on revenues associated with credits demanded by gasoline and diesel suppliers in that state, rather than jet fuel, since current federal rules prevent states from regulating most jet fuel."

While the core factors steering a renewable transition in the aviation industry are still taking shape, one thing is certain:

"Like other emerging energy technologies, incorporating SAF into our energy supply chain will be an evolution, not a revolution. Reducing greenhouse gases will rely on a combination of efforts and a mix of liquid fuel solutions will play a role in shaping the SAF market as it matures," says Hunhoff. ■

Current aircraft technology can use jet fuel blended with up to 50% SAF without equipment modifications.

ASTM standards do not allow SAF to be used as the sole aircraft fuel.

LEARN MORE: Find a video on the dynamics affecting SAF adoption at chsinc.com/c.

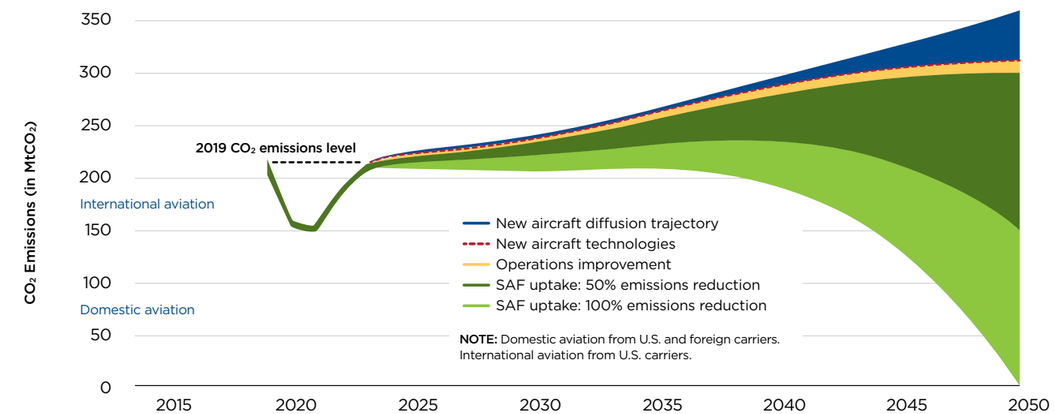
Grading Greenhouse Gas Impact

The GREET model is a formula used to measure overall greenhouse gas impact of a fuel throughout its entire life cycle. Each fuel type carries a carbon intensity (CI) score, based on geography, resources used in its production and more. Below are some of the factors used to determine a fuel's CI score.

Source: U.S. Department of Energy

Aviation emissions are expected to rise, even with SAF adoption

Increased growth in global air travel demand is predicted to keep aviation emissions on the rise, but a combination of factors, including new aircraft technologies and operational improvements, will help reduce emissions.



Source: U.S. Department of Energy

CANAL CRISIS

By Matthew Wilde

Shipping disruptions at the Panama and Suez canals hurt U.S. agriculture.

The Panama and Suez canals are key shortcuts for cargo ships moving U.S. grain and ag products to global customers and bringing in fertilizer to feed crops.

Traffic through the Panama Canal has been restricted since mid-2023 by low water levels, while ships have avoided the Suez Canal since late 2023 due to geopolitical conflicts. The restrictions have forced many ships to take alternative routes, adding time and expense to each trip. U.S. growers, suppliers and end users are paying the price.

"Logistical challenges at the Panama and Suez canals make U.S. grain less competitive and add costs to the supply chain," says Marion Le Bacquer, who oversees ocean freight at the CHS office in Geneva, Switzerland. The freight market is tighter, she adds, due to longer transit and turnaround times of cargo ships.

CHS typically books about 350 grain and fertilizer vessels each year, says Justin Cauley, senior director of transportation at CHS. Roughly 30% of those ships typically use the Panama Canal and 10% transit the Suez Canal.

Drought Affects Panama Canal

The Panama Canal connects the Atlantic and Pacific oceans. A system of locks raises ships from sea level to the level of Gatun Lake, which is used to fill the locks that allow ships to navigate the channel.

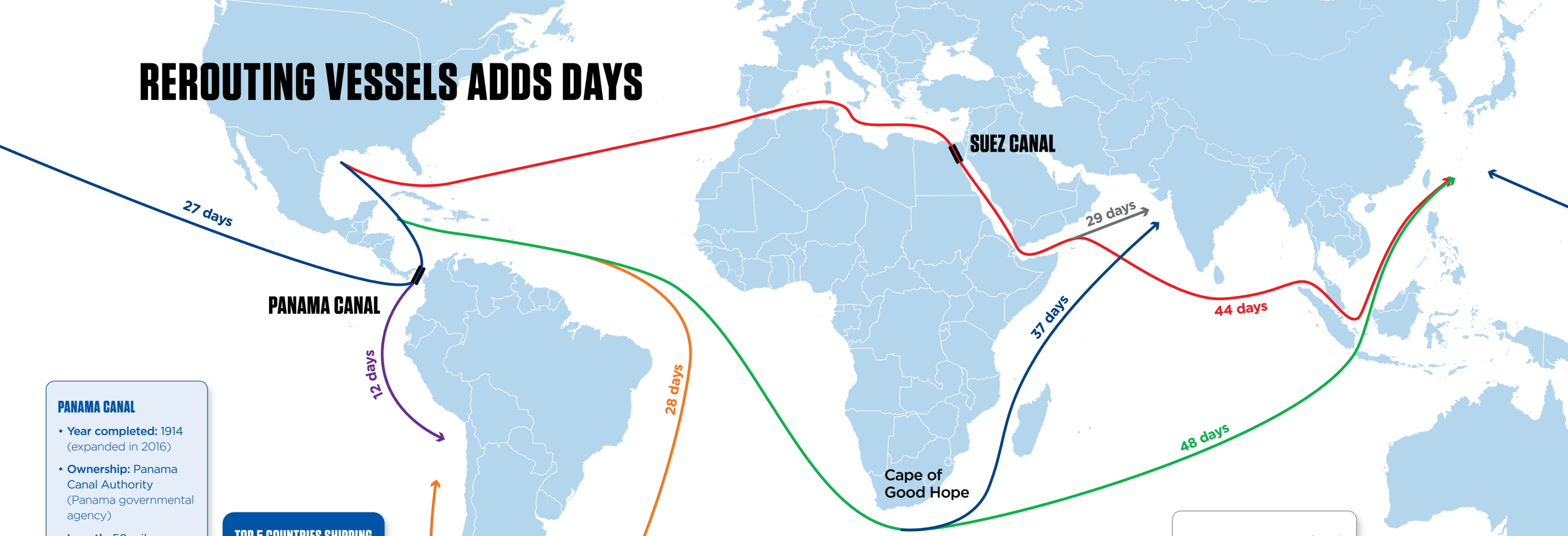
Drought caused Gatun Lake levels to drop significantly in early 2023. Since the lake is also the primary freshwater source for Panama, the Panama Canal Authority was forced to restrict ship drafts and vessel volume starting in June 2023 to preserve water. Available slots through the canal are auctioned off to the highest bidder, which has increased transit rates.

Grain and oilseeds shipped from the Gulf of Mexico to buyers in Asia would normally go through the Panama Canal, but are being rerouted across the Atlantic Ocean through the Suez Canal or around the Cape of Good Hope on the southern tip of Africa, Cauley explains. For the 2022 fall shipping season, 85% of CHS grain shipments destined for Asia that originated from the U.S. Gulf passed through the Panama Canal, but only 15% used the shortcut during the same period in 2023.

"Most grain buyers would rather have a longer transit time versus paying the premium to go through the Panama Canal, but some buyers are willing to pay a premium to expedite cargo," Cauley says.

Rerouting ships from the U.S. Gulf around the Cape of Good >

REROUTING VESSELS ADDS DAYS



PANAMA CANAL

- **Year completed:** 1914 (expanded in 2016)
- **Ownership:** Panama Canal Authority (Panama governmental agency)
- **Length:** 50 miles
- **Typical transit time** (excluding wait time)**:** 8-10 hours

Source: Soy Transportation Coalition

TOP 5 COUNTRIES SHIPPING CARGO THROUGH THE PANAMA CANAL

1. United States
2. China
3. Japan
4. Republic of Korea
5. Chile

Source: Panama Canal Authority, fiscal year 2023

SUEZ CANAL

- **Year completed:** 1869 (expanded in 2015)
- **Ownership:** Suez Canal Authority (Egypt governmental agency)
- **Length:** 120 miles
- **Typical transit time** (excluding wait time)**:** 11-16 hours

Source: Soy Transportation Coalition

SUEZ CANAL 2019 CARGO (TONS)

Oilseeds — 7.8 million

Vegetable oils — 17.2 million

Fertilizer — 21.2 million

Cereal grains — 54.1 million

Source: Suez Canal Authority

Source: U.S. Energy Information Administration, February 2024

SHIPS THAT TYPICALLY GO THROUGH PANAMA AND SUEZ CANALS

- **Handysize:** 15,000–35,000 metric tons deadweight (most common bulk vessel)
- **Handymax:** 35,000–60,000 metric tons deadweight
- **Panamax:** 55,000–80,000 metric tons deadweight
- **Neopanamax:** up to 120,000 metric tons deadweight
- **Suezmax:** 150,000 metric tons deadweight

Source: Soy Transportation Coalition, HandyBulk

> Hope adds about 30% more time and 30% more fuel. Every extra day at sea costs about $30,000, Cauley adds. "Grain and fertilizer markets have adjusted to reflect added shipping costs."

Safety Concerns Cut Suez Canal Traffic

The Suez Canal connects the Mediterranean Sea and Red Sea and is a key trade route between Europe and Asia. It's also a shortcut for fertilizer shipments from the Arab Gulf to the U.S.

Shipping companies have avoided the Suez Canal and the Red Sea since Houthi rebels began attacking ships in November 2023 in response to the war in Gaza. Commerce is being rerouted around the Cape of Good Hope. The longer journey has increased ocean freight rates.

"Fertilizer shipped from Qatar and other Arab Gulf countries to the U.S. is more expensive as a result," Cauley says.

Minimizing Impact

The integrated CHS supply chain and logistics experts are helping to minimize the impact of canal shipping disruptions, says Neil Johnke, a corn trading expert with CHS. Some grain and oilseeds that would have been shipped from CHS export facilities in the U.S. Gulf were loaded out of facilities in the Pacific Northwest (PNW) to avoid using the Panama Canal.

"Our customers in Colombia and Costa Rica got the corn they needed and our customers in China got the sorghum and soybeans they needed. It kept grain moving," Johnke says.

Ocean freighters need 15 to 20 days to sail from the PNW to China. It normally takes a ship leaving the U.S. Gulf Coast about 30 days to reach China when its transits the Panama Canal. It takes the same ship about 50 days to reach China sailing around the Cape of Good Hope.

For imported fertilizer, Cauley says planning is the key to meeting needs. CHS transportation experts continue to explore alternative shipping routes and logistics strategies to mitigate or offset cost increases related to canal limitations. ■

HEAR MORE: Visit chsinc.com/news-and-stories/podcasts for an Around the Table episode on the canal crisis.

Making Tracks

Our connection to the soil may be strongest as we begin the season and prepare for planting. Achieving the right combination of warmth, moisture and timing that will help the new crop succeed requires constant vigilance and a dose of good luck.

Changing weather patterns with frequent storms and heavy rainfalls have affected on-farm decisions from equipment and input choices to drainage or irrigation needs. Despite the challenges, springtime is always bursting with optimism for a rewarding season — and it all starts with the soil.

— Cynthia Clanton

STEERING THROUGH VOLATILITY

Five trends are paving a rocky road for agriculture.

By Kenneth Scott Zuckerberg and Nelson Neale

It's hard to imagine a more volatile time in agriculture than the past six years.

The party started with U.S. trade tariffs against China in early 2018, followed by enactment of the China-U.S. Phase One trade agreement in early 2020. The ink was barely dry on that major trade deal when COVID-19 started to spread worldwide. It became the worst pandemic the world had experienced since the 1918 Spanish flu epidemic.

Then, in February 2022, Russia invaded Ukraine, a leading agricultural producer. Commodity and fertilizer prices surged following the invasion based on expectations that production and exports for Ukrainian wheat, corn and sunflower would fall significantly. That fear helped drive July corn futures prices above $8 per bushel in April 2022, the highest level since September 2012.

Fast-forward to today and commodity prices have cooled. Cash corn prices briefly traded at $3.77 per bushel in early 2024, below the cost of production for most U.S. producers. December futures prices rebounded by the beginning of April to more than $4.70 per bushel — a level that could allow corn growers to break even this year.

Interest rates have increased since the Federal Reserve began raising the federal funds rate in March 2022 to curb inflation. Interest rates on U.S. farm operating loans, which averaged 5% in 2021, increased to an average of nearly 9% in 2023, as tracked by the Federal Reserve Bank of Kansas City.

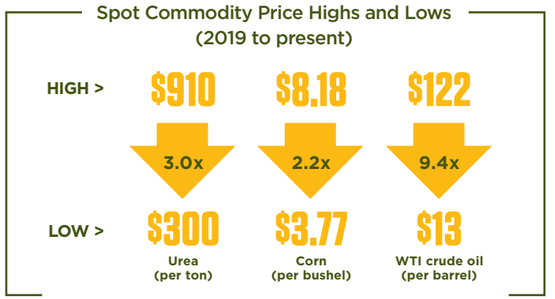
Despite those headwinds, the U.S. farming sector managed through this period of volatility. Farm profits were above average from 2021 through 2023, according to U.S. Department of Agriculture data.

But the roller coaster ride hasn't stopped. Farmers and ranchers continue to face high input and energy costs, elevated interest rates and rising labor costs — all against the backdrop of lower grain prices.

The key question now is this: **Will the ag economy stabilize over the next 12 to 18 months?**

While no one has a crystal ball to know how things will shake out, navigating through volatility begins with understanding the nature and magnitude of key threats and then implementing appropriate strategies to manage risk. >

Spot Commodity Price Highs and Lows (2019 to present)



Sources: CHS global research, Bloomberg Finance

1 Inflation and interest rates

The COVID-19 pandemic triggered an unexpected spike in inflation due to a confluence of interrelated factors. Most notable was the ramp-up in online consumer spending in mid- to late 2020 in response to shelter-in-place and work-from-home efforts to contain the virus and the massive amount of government stimulus designed to avoid an economic depression.

Consumers bought goods instead of purchasing services and out-of-home entertainment. Against a backdrop of constrained supply, this caused major backlogs in manufacturing, compounded by factory shutdowns and labor shortages in key manufacturing regions of the world.

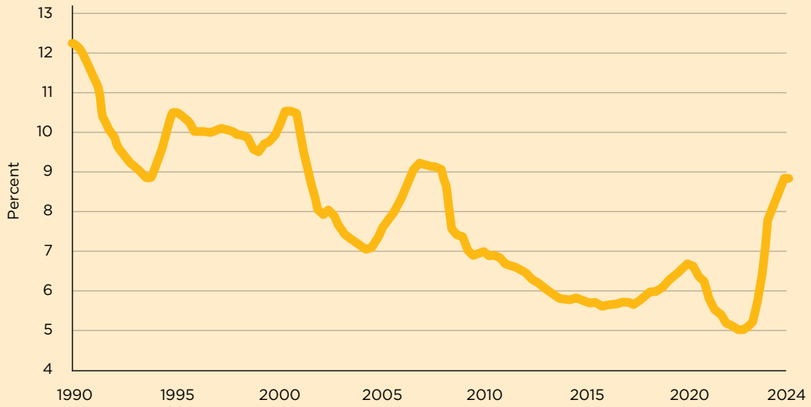
As economies began to recover, food, fertilizer and energy costs spiked sharply, partly in response to Russia's invasion of Ukraine.

In response to the inflation spike, the Federal Reserve began raising interest rates in 2022. The current fed funds policy target stands at 5.25% to 5.50%. While higher rates will result in higher costs of financing on new borrowing and floating rate debt, keep these points in mind:

- Although policy rates are higher now than they were following the 2008 global financial crisis, the current range of 5.25% to 5.50% is still below the long-term average fed funds rate of 5.69% from the 1950s until 2007. (The 2008 financial crisis was excluded from this calculation, since it was a once-in-a-generation shock to global economies and capital markets.) Therefore, the Federal Reserve's current policy rate range is more normal than it would otherwise appear.
- Despite the recent "hot" March consumer price index report, the Federal Open Market Committee (FOMC) may still cut interest rates this year if economic conditions warrant a change.

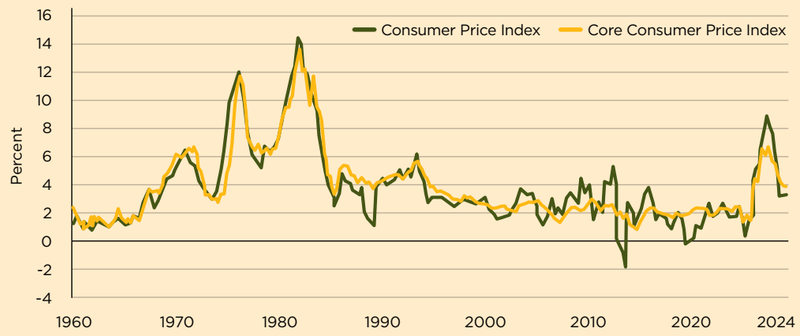
Nonetheless, the Fed's interest rate policies have meaningful and direct implications on variable-rate farm operating and crop input loans, so changes in interest rates translate directly to farm bottom lines.

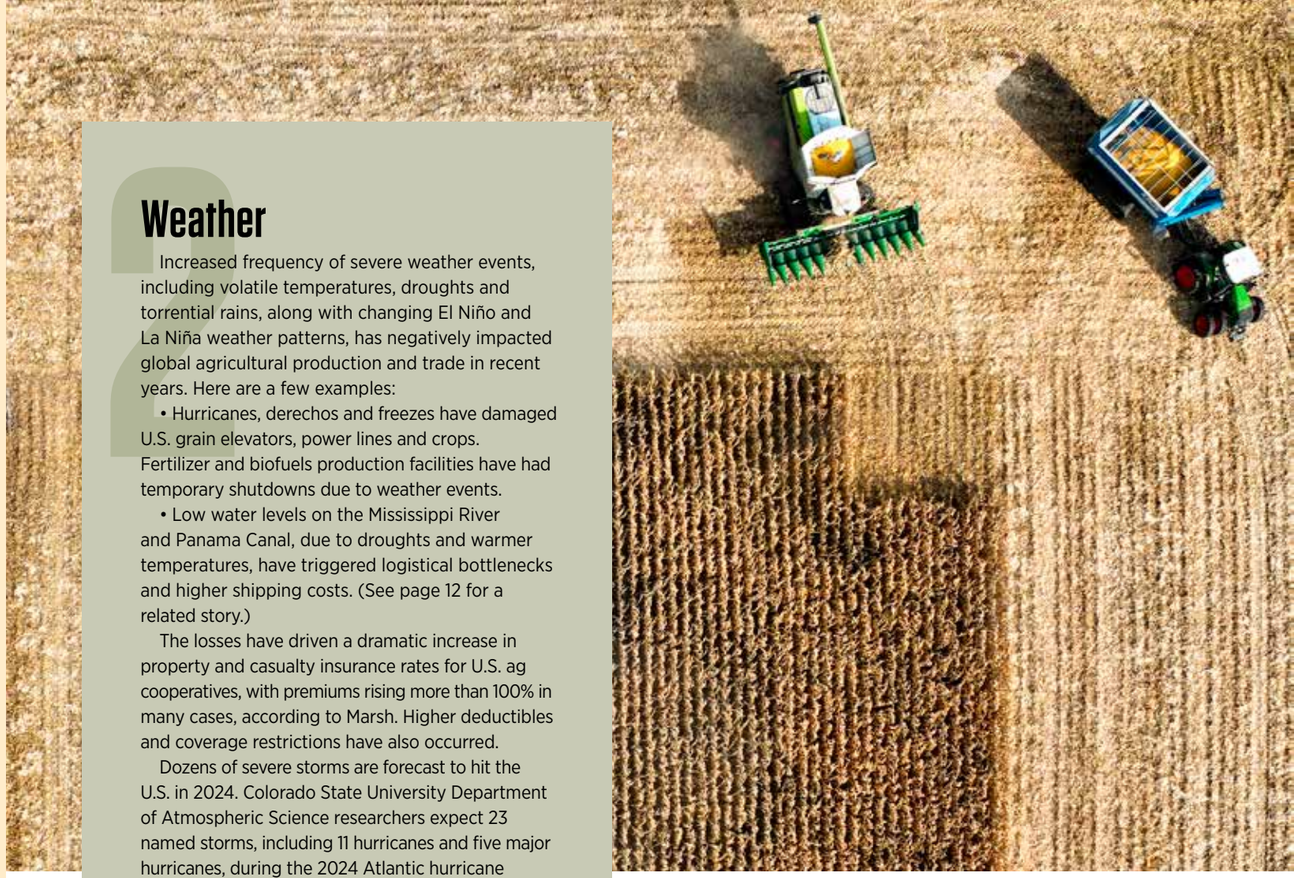
Farm Operating Loan Fixed Interest Rates (1990 to present)



Source: Federal Reserve Bank of Kansas City

U.S. Inflation (1960 to present)





2 Weather

Increased frequency of severe weather events, including volatile temperatures, droughts and torrential rains, along with changing El Niño and La Niña weather patterns, has negatively impacted global agricultural production and trade in recent years. Here are a few examples:

- Hurricanes, derechos and freezes have damaged U.S. grain elevators, power lines and crops. Fertilizer and biofuels production facilities have had temporary shutdowns due to weather events.
- Low water levels on the Mississippi River and Panama Canal, due to droughts and warmer temperatures, have triggered logistical bottlenecks and higher shipping costs. (See page 12 for a related story.)

The losses have driven a dramatic increase in property and casualty insurance rates for U.S. ag cooperatives, with premiums rising more than 100% in many cases, according to Marsh. Higher deductibles and coverage restrictions have also occurred.

Dozens of severe storms are forecast to hit the U.S. in 2024. Colorado State University Department of Atmospheric Science researchers expect 23 named storms, including 11 hurricanes and five major hurricanes, during the 2024 Atlantic hurricane season. That's up from 20 named storms in 2023 and 14 on average.

60
weather and climate disasters in the U.S. with losses exceeding $1 billion (2020-2022)

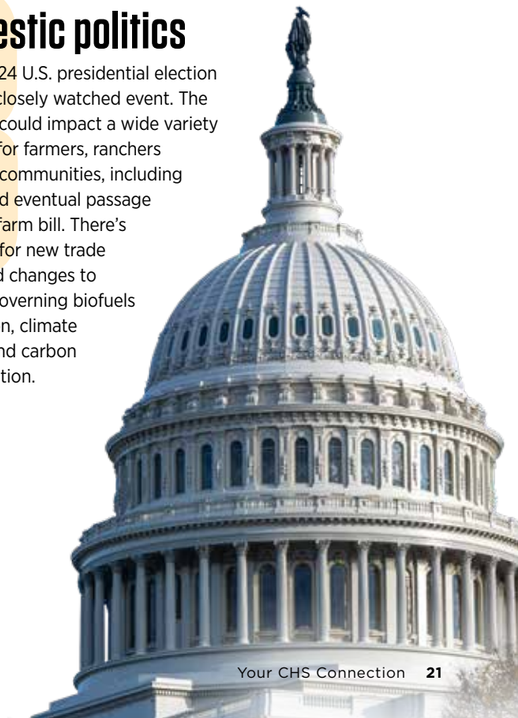
$2.6 trillion
in damages from U.S. weather and climate disasters (1980-August 2023)

18
average annual weather and climate disasters (2018-2022)

Source: National Oceanic and Atmospheric Administration

3 Domestic politics

The 2024 U.S. presidential election will be a closely watched event. The outcome could impact a wide variety of issues for farmers, ranchers and rural communities, including timing and eventual passage of a new farm bill. There's potential for new trade tariffs and changes to policies governing biofuels production, climate change and carbon sequestration.



China changes

China is undergoing a series of economic and structural changes that will likely affect long-term demand for U.S. ag products. China's economic growth rate has failed to recover following the initial post-COVID bump, the country's population is starting to decline, its youth unemployment rate exceeds 20% and its real estate sector is experiencing credit stress amid slowing demand and falling prices. These factors have the potential to significantly change the outlook for U.S. agricultural exports to China.

Geopolitical instability

Geopolitical instability is arguably one of the most pressing concerns facing the future of global ag trade. While America still holds considerable economic and military power, its influence on global security and democratic thinking may have diminished. Three theaters of geopolitical instability are currently disrupting global agriculture trade:

Region	Catalyst
Black Sea	The Russia-Ukraine war created long-term uncertainty for grain, crop inputs and energy trade flows
Indo-Pacific	Escalating tensions between China and the U.S. may lead to reduced U.S. exports of agricultural products (namely soybeans) and other disruptions in U.S.-China trade
Middle East	The Israel-Hamas war in Gaza has led to attacks on key shipping lanes and resulting supply chain and trade disruptions

LEARN MORE: Visit chsinc.com/news-and-stories/podcasts to find an Around the Table episode on volatility factors.

C.J. Benoit served two tours in the military before returning to college at the University of Montana Western and winning the 2024 Colt Challenge.

Lasting bonds are forged through a Montana horsemanship challenge.

Equine Passion

By Adam Hester

Every spring, life-changing experiences occur on the University of Montana Western (UMW) campus in Dillon, Mont., a self-proclaimed cowboy town.

The miracle that is calving season fills the air across stubbled fields and conversations around ranch offices and kitchen tables 24 hours a day. A rangy squall carrying a harsh combination of snow, sleet and freezing rain makes visitors wish they had packed a warm scarf like the ones locals wear in April.

This is the setting where more than three dozen students in the natural horsemanship program at UMW gather up their nerve and take part in the annual Colt Challenge. They have spent the past six months readying their unbroken colts — and themselves — for work in the equine industry.

UMW is the only school in the U.S. to offer a bachelor's degree in natural horsemanship. More than 70% of students in the program are from outside Montana.

Equine nutrition is a large part of the curriculum and CHS supports the learning by providing Equis® feed for the colts. Students are able to observe how good nutrition supports all-around performance.

"It's a large commitment for >

Asked about the experience of riding her colt, Jordan LeCompte from Bellingham, Wash., says, "It feels like an extension of myself, like I'm able to go further faster. It is almost like floating."

> students to come five days a week, three hours a day, through the long winter months and deal with hard horse problems every day," says Eric Hoffman, who directs the four-year program. "The really neat thing is watching them on these last two days [during the Colt Challenge] and seeing just how much they've learned. It makes me proud."

Passing the test of successfully guiding their colts through the challenging course might be the most rewarding experience of all for the students and their supporters. ■

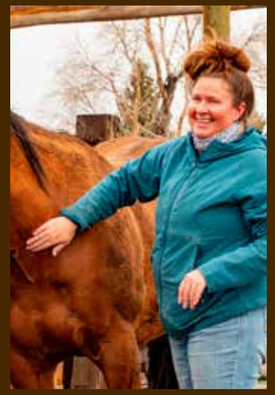
LEARN MORE: See the students in action in a video at chsinc.com/c.

Below left and right, students take their colts through a series of challenges, executing jumps, navigating fences, traversing unexpected obstacles, coming to a complete stop on command and more.

"It's freedom — starting a colt and having it know you and you know it beyond a physical level. It's a connection like no other."
— Kylie Keating, Nevada City, Calif.

"It's been truly rewarding to see my progress and know that not only am I capable, but all my classmates are capable of these skills. It's amazing!"
— Katherine Bills, Rockford, Minn.

"The students acquire a work ethic through this program. It's hard work becoming a horse trainer. You have to be diligent and work with your horses every day," says local rancher and donor Koy Holland. "I and other local producers are proud to support the program."



Local horse manager and owner of 2M Livestock Megan Bridges supports the Colt Challenge each year by donating colts for the students to work with.

CHS REPORTS SECOND QUARTER FISCAL YEAR 2024 EARNINGS

CHS Inc. has reported net income of $170.3 million and revenues of $9.1 billion for its second quarter of fiscal year 2024, which ended Feb. 29. 2024. Those results compare to net income of $292.3 million and revenues of $11.3 billion in the second quarter of fiscal year 2023.

For the first six months of fiscal year 2024, the company reported net income of $693.2 million and revenues of $20.5 billion compared to record net income of $1.1 billion and record revenues of $24.1 billion in the first half of fiscal year 2023.

Second quarter fiscal year 2024 highlights:

- Performance was solid across our segments, although earnings were down from the record second quarter of fiscal year 2023.
- In our Ag segment, earnings rose as agronomy markets were stronger compared to the prior year and grain and oilseed margins were stable.
- In our Energy segment, margins declined from the highs in the prior year due to changing market conditions, including the impact of a historically warm winter.
- Equity method investments continued to perform well, led by our CF Nitrogen investment.

"The first six months of our fiscal year have delivered overall good financial results," says Jay Debertin, president and CEO of CHS Inc. "Our supply chain investments and well-diversified portfolio, empowered by our people and technology, are helping us perform well as we connect farmers and local cooperatives with the inputs and services they need to help feed the world."

Energy: Pretax earnings of $51.6 million for the second quarter of fiscal year 2024 represent a $213.2 million decrease versus the prior year period and reflect:

- Decreased refining margins due to lower market prices and less favorable pricing on heavy Canadian crude oil, partially offset by a lower cost for renewable fuel credits.
- Lower margins for propane due to global market conditions.
- Reduced demand for propane and refined fuels, primarily driven by warm weather conditions across much of our trade territory.

Ag: Pretax earnings of $56.9 million represent a $138.4 million increase versus the prior year period and reflect:

- Improved margins for our wholesale and retail agronomy products due to improved market conditions.
- Increased margins for our grain and oilseed product category due to the timing impact of market adjustments.
- Higher grain and oilseed volumes due to improved efficiencies and a more balanced global supply and demand environment.

Nitrogen Production: Pretax earnings of $37.0 million represent a $44.7 million decrease versus the prior year period and reflect lower equity income from CF Nitrogen attributed to decreased market prices of urea and UAN.

Corporate and Other: Pretax earnings of $40.2 million represent a $7.8 million decrease versus the prior year period, primarily reflecting lower equity income from Ventura Foods, which experienced less favorable market conditions for edible oils.

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

	Three Months Ended		Nine Months Ended	
	February 29, 2024	**February 28, 2023**	**February 29, 2024**	**February 28, 2023**
Energy	$51,579	$264,822	$318,414	$661,416
Ag	56,851	(81,566)	226,571	205,733
Nitrogen Production	37,009	81,733	73,468	178,606
Corporate and Other	40,219	48,033	84,051	84,737
Income before income taxes	185,658	313,022	702,504	1,130,492
Income tax expense	15,325	20,974	8,803	55,528
Net income	170,333	292,048	693,701	1,074,964
Net (loss) attributable to noncontrolling interests	26	(273)	471	45
Net income attributable to CHS Inc.	**$170,307**	**$292,321**	**$693,230**	**$1,074,919**

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

GET MORE: Sign up to receive CHS press releases by email at chsinc.com/about-us.

GROWING THE CHS GRAIN SUPPLY CHAIN

CHS has signed an intent to purchase agreement for eight grain assets in five states from Cargill. With this purchase, CHS aims to continue optimizing its enterprise supply chain while providing market access and end-to-end value to owners.

Grain facilities included in the sale are in Pipestone and Maynard, Minn.; Morris and Seneca, Ill.; Holdrege, Neb.; Cheyenne Wells and Byers, Colo.; and Parker, S.D.

"Our farmer-owners look to CHS to provide them with local assets that have the speed and space to serve their needs today and into the future," says Rick Dusek, executive vice president of ag retail, distribution and transportation for CHS. "Purchasing these grain assets is part of a larger strategy to invest in our enterprise supply chain, efficiently connecting our owners to the global marketplace."

The purchase is tentatively planned to close in early June 2024.

CHS HEDGING CLASSES SET FOR JUNE

The CHS Hedging team will host a series of half-day education courses June 10-13, 2024. The in-person classes at CHS in Inver Grove Heights, Minn., will help participants apply commodity price risk management strategies.

Fees range from $299 to $349 per course. Learn more and sign up at **chshedging.com/insights/education**.

VERIZON AND T-MOBILE DISCOUNTS AVAILABLE TO CO-OP OWNERS

Cooperative farmer-owners are now eligible for discounted rates on devices and monthly plans with Verizon and T-Mobile. To qualify, a two-year contract is required. Existing customers are eligible for the discount.

To learn more about the program or if you have questions regarding participation, email **chswirelessprogram@chsinc.com**.

HELP SHAPE THE COOPERATIVE SYSTEM'S FUTURE

Cooperative system leadership opportunities are available for current and emerging leaders:

CHS Board of Directors candidate applications are being accepted for 2024 elections to be held at the 2024 CHS Annual Meeting, Dec. 5-6. Directors represent all CHS owners and help shape the future of CHS. Eligible applicants must submit candidate documents by Sept. 1, 2024, to be included on the 2024 ballot. Learn more by contacting Megan Bern at megan.bern@chsinc.com or 651-355-3726.

The **2024 CHS New Leaders Forum** will take place Dec. 3-4, 2024, in Minneapolis, Minn., prior to the 2024 CHS Annual Meeting. Farmer-owners 45 years of age and younger are nominated by their cooperatives for this learning and networking event. Find details at **chsinc.com/new-leaders**. Registration will open in October 2024.

PLAN TO ATTEND CHS OWNERS MEETINGS

Two CHS virtual owners forums are scheduled for July 24, 2024 (noon Central time), and July 25, 2024 (10 a.m. Central time). The identical forums will provide financial and business updates and take audience questions. Visit **chsinc.com/owner-events** for access to the virtual forums.

The 2024 CHS Annual Meeting is scheduled for Dec. 5-6 in Minneapolis, Minn. Education sessions are planned for Dec. 5, with the general session to begin that afternoon and conclude with the business meeting the morning of Dec. 6. Registration will open in mid-October. Watch **chsinc.com/owner-events** for access to more information and to register.

Nicole Berg splits her time between her family's Paterson, Wash., farm and advocating for agriculture throughout the U.S.

SEE MORE: Nicole Berg offers more thoughts on ag leadership in a video at chsinc.com/c.

Ag Ambassador

"We live and breathe agriculture," says Nicole Berg, Washington farmer, industry leader and cooperative owner.

The fourth-generation farmer and former president of the National Association of Wheat Growers speaks up for agriculture in a big way, hitting the road to represent ag interests in state and federal policy discussions on topics ranging from the farm bill to pesticide regulations and taxation. She serves on the Federal Crop Insurance Corporation board and spent years as a conservation district leader.

Shaping policy is a group effort, Berg says. "No one person can do policy, but a team of agricultural people? We sure can."

Berg and her father and two brothers run a farming operation that covers 9,000 acres of irrigated cropland, pulling water from the Columbia River six miles away, and 11,000 dryland acres. They grow primarily hard red winter wheat and soft white spring wheat, plus field and sweet corn, peas, green beans, alfalfa and grass seed. Berg Farms is a longtime member of CHS Primeland, based in Lewiston, Idaho.

"We grow more than 300 crops in the Pacific Northwest and most of the wheat grown in Washington is exported to the Asia Pacific, so we know it's important to keep our minds open to the possibilities that could happen in agriculture," says Berg.

"The average American is five generations removed from the farm, so there's a lack of understanding about what farmers actually do," she says, "and half of Congress has never voted on a farm bill.

"I tell younger folks we need their voices. I know it feels like there's so much to do on the farm and they can't get away, but we all have to prioritize telling agriculture's story, so we're not always playing defense. Getting more people involved will help us create a bigger offense."

— Cynthia Clanton

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C TOMORROW

High-Tech R&D Center Advances Crop Solutions

CHS has opened a new state-of-the-art facility to help speed development of agronomic solutions and products for farmer-owners and customers.

The Crop Science Research and Development Center at Randolph, Minn., includes a greenhouse that will allow researchers to simulate up to six growing environments at once to replicate conditions across multiple agricultural regions. Brian Kuehl, CHS director of product development for crop protection, says the facility will elevate the company's research and development capabilities.

The center was built using advanced materials for durability, enhanced thermal efficiency and improved light. It allows in more than 90% of natural sunlight to provide a real-world testing environment, says Alissa Geske, head of greenhouse research for CHS.

"The greenhouse was built with sustainability in mind," Kuehl says. "It will speed up product development and evaluation at lower cost, which benefits growers. We will be able to run trials year-round instead of relying on just the growing season."

CHS research at the center will focus on improving and developing new crop protection and nutrition products, biostimulants, seed treatments and more, Kuehl adds.

Conducting research in a controlled environment is a game-changer, says Geske.

"When we relied on outdoor field trials, the weather wasn't always conducive for disease development, for example," she says. "In the greenhouse, that's not an issue. It will streamline our research to bring the best products to market quickly so we can help our owners and customers meet their goals."

— Matthew Wilde