Ceres

Cultivating Resilience

A Primer on Corporate Investment in Agricultural Supply Chains

September 2025

About Ceres

Ceres is a nonprofit advocacy organization working to accelerate the transition to a cleaner, more just, and sustainable world. United under a shared vision, our powerful networks of investors and companies are proving sustainability is the bottom line—changing markets and sectors from the inside out. For more information, visit ceres.org.

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Ceres Reports on resilient agriculture investment and innovation

A sustainable and resilient agriculture industry is possible but requires investment to reduce risk and finance the transition—both to scale agricultural practices grounded in centuries of traditional knowledge and advance emerging solutions that are not yet market-ready. This report complements and builds on our previous analyses.

Cultivating Innovation: Practical Solutions for Companies to Reduce Agriculture Emissions highlights the ways that food companies can advance emerging technologies, for example by investing venture capital, conducting in-house R&D, and advocating for public research funding.

Unlocking Opportunity: Addressing Livestock Methane to Build Resilient Food Systems analyzes the financial case for corporate action on methane pollution from agriculture and how different parts of the food value can reap benefits from methane action—from operational efficiency to expanded market reach.

Climate Transition Plans in the U.S. Food Sector: Addressing Risks to Farmers and Farmworkers outlines the business case for ensuring that the climate transition in the food and agricultural sector is fair and equitable for farmers and farmworkers.

Introduction

A new era of doing business in the U.S. food and agriculture industry is here.

Extreme weather conditions caused by a warming planet, including heat waves, droughts, and floods, are reducing crop and pasture productivity. Earlier springs and shorter winters are increasing pest populations on crops and the prevalence of parasites and diseases to livestock.

As long-standing assumptions about weather patterns and growing seasons breakdown, the very stability of food supply and the profitability of farmers and food companies is in jeopardy.

Yet, within these challenges lies an opportunity to drive innovation, build resilience, and create a sustainable and profitable U.S. food and agriculture sector that contributes to solving climate change. Agricultural practices and innovative technologies are available, including those that can help the industry address weather and climate risk by reducing greenhouse gas emissions, sequestering carbon, and increasing the stability of U.S. agriculture.

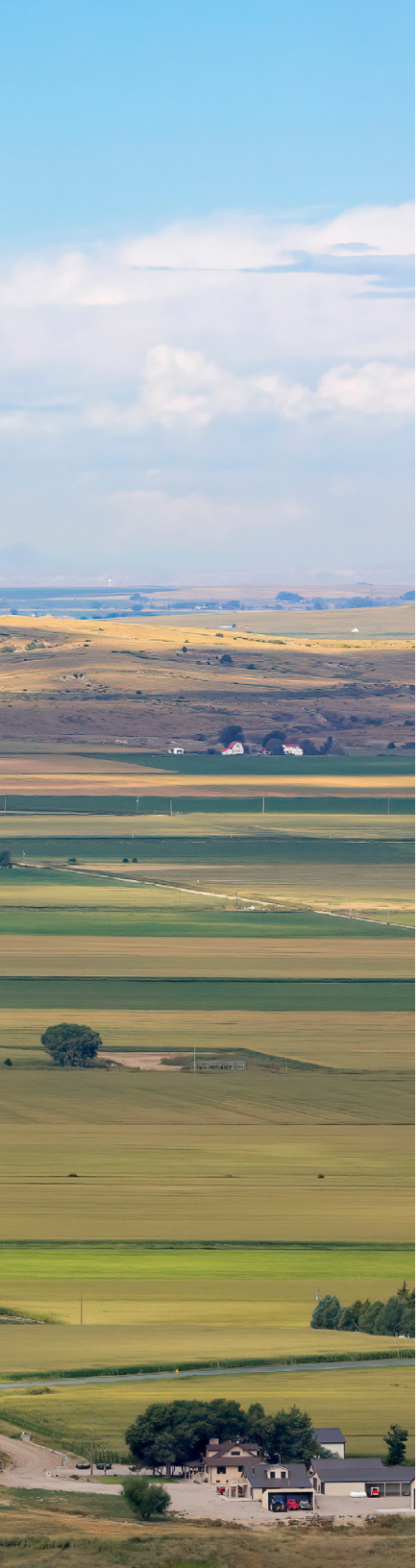
Many food companies are already acting. Our latest analysis finds that 22 of the 50 of the largest food companies operating in North America, including General Mills, PepsiCo, and Hershey, are providing financial and technical assistance to agricultural producers in their supply chains to adopt practices that lower emissions and increase resilience. Private sector actors lead at least 50 active or planned efforts in the U.S. to support farmers' adoption of sustainable agricultural practices.

22 of the 50 largest food companies in North America — including General Mills, PepsiCo, and Hershey — support producers with financial and technical assistance to reduce emissions and boost resilience.

However, these efforts will need to grow considerably to reach the scale needed. In 2021, less than 10% of U.S. farmers were taking part in company-led regenerative agriculture programs. No-till farming is practiced on only 39% of corn and soybean acres, and cover crops make up a mere 7% of Midwestern farmland. Adoption of sustainable solutions in livestock systems is even lower.

Based on interviews with more than 20 major companies across the food and agriculture sector, as well as project implementers and NGO partners, this report maps out the opportunities and barriers to scaling sustainable and resilient agricultural practices in corporate supply chains.

Food and agriculture companies and financial institutions have key roles to play—both to increase resilience and reduce risk across the industry. In doing so, companies can also preserve brand value, create new market opportunities, and reap returns from investments in a lower-emissions agricultural system.



KEY FINDINGS

Our analysis of model corporate programs and investment and discussions with industry players reveal key findings for companies and financial institutions:

1/ Regional participation is essential

Most companies draw from the same supply sheds, which means that working together can unlock shared solutions. Recent Deloitte analysis finds that companies that engage in pre-competitive collaborations and external partnerships were significantly more likely to achieve revenue growth above 5%. This points to a clear opportunity for the food industry to work together on more advanced approaches to supply chain investment. Traders or mills, food manufacturers, and retailers with shared supply chains are increasingly teaming up on supply chain investments, such as a regenerative wheat pilot in North Carolina by Bartlett, Kellanova, and Ahold Delhaize.

2/ Lower barriers to entry would increase participation

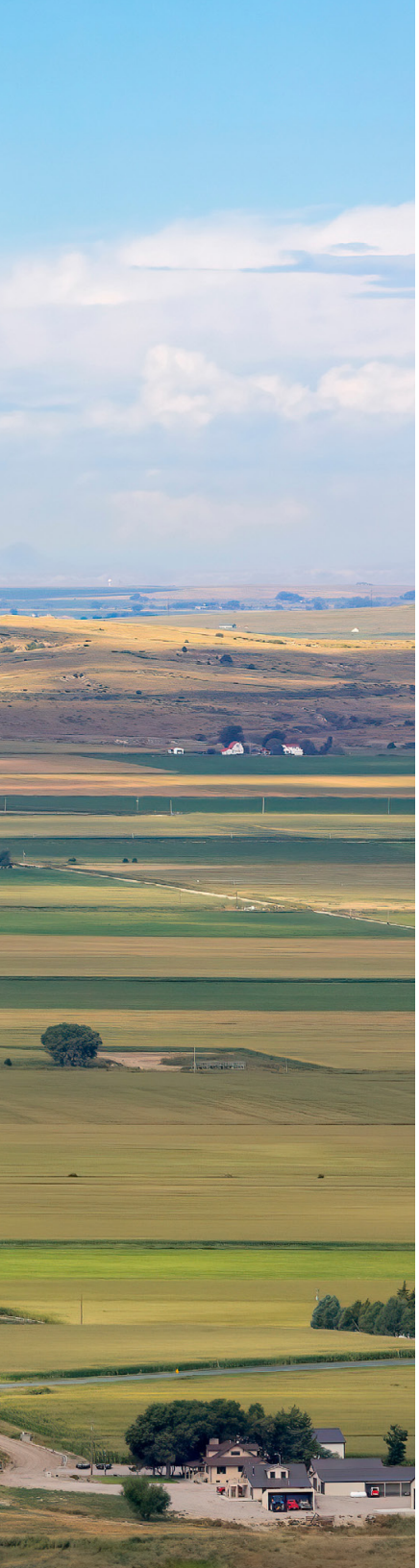
Most supply chain programs are financed by larger companies with substantial sustainability teams and budgets that focus on "hero ingredients"—commodities that make up a significant proportion of their sourcing. Co-investing in existing programs would help companies that want to move beyond hero ingredients and bring onboard companies that are willing to invest in sustainability but don't have the resources to set up and administer their own programs. Initiatives and organizations such as Soil and Water Outcomes Fund and Practical Farmers of Iowa that provide comprehensive support for supply chain investments could be an avenue for companies that don't want to start their own programs.

3/ Carbon accounting changes could enable co-investment

Companies are overpaying for measurement, monitoring, reporting, and verification (MMRV) that help them understand how their farm investments translate into measurable results, such as emission reductions or water quality improvements. Current greenhouse gas accounting rules discourage collaboration, forcing companies to duplicate verification efforts, rather than sharing resources or data. This creates inefficiencies, with farmers often audited multiple times and companies hesitant to invest in shared supply shed improvements they can't fully count toward their targets. As a solution, many are turning to an approach known as within value chain mitigation—or insetting—which enables collaborative, regional investments in shared sourcing regions, but reporting standards for these interventions are still evolving.

4/ More financial institutions are needed at the table

Food and agriculture companies cannot finance the scaling of sustainable and resilient agriculture alone—especially given uncertainty around public funding programs. Mobilizing private capital will require both integrating climate risks into agricultural lending and targeting investments towards sustainable practices. Yet only 29% of ag finance institutions have set climate goals, and just 15% of regenerative ag pilots include financial partners. Still, lenders and investors are showing growing interest, with players like CoBank and fintech startups piloting sustainability-linked loans, and institutional investors, including Fidelity, Agriculture Capital, and corporate venture arms, backing ag-tech innovators and farmland investment strategies.



A shifting landscape

The landscape for climate action by companies in the U.S. is changing, and food and agriculture companies are no exception. A variety of factors are creating new pressures on companies that are changing how sustainability is integrated into their business practices. Yet despite headwinds, companies interviewed by Ceres see the value of investing in supply chain resilience.

Benefits

Supply chain resilience. Ensuring long-term viability of agricultural supply chains—and therefore corporate performance—is a near-universal priority among the companies interviewed by Ceres. According to one interviewee, "Our focus is positioning our entire enterprise for the long haul."

Brand value. Companies are working with their suppliers and partners to meet the emission reduction targets that they have set for their supply chains, which are important to maintaining brand value, especially for those with meat- and dairy-intensive supply chains that face growing reputation risk.

Cost savings and revenue growth. A 2024 study by Deloitte and NYU Stern School of Business found that most food and agriculture companies reported at least 2% cost reduction and 2% revenue growth from their sustainability strategies. Some companies interviewed by Ceres cited the potential for capturing additional market share with sustainable brands.

New regulatory requirements. Many food companies based and operating in the U.S. are subject to disclosure rules in the EU, other national jurisdictions, and states such as New York and California. This regulation, along with shareholder expectations for transition plans, provides sustainability teams with new validation to make the case for climate action internally. For instance, disclosure-driven scenario analysis can uncover exposure to physical risk and highlight the value of investments to improve sustainability and resilience.

Challenges

Market instability. Increased commodity prices have cut into food companies' profit margins at a time when inflation and economic uncertainty are dampening consumer spending, making it harder for companies to charge more for products with sustainable attributes.

Tariff uncertainty. Food companies are scrambling to adapt to the impacts of new tariffs, which could further raise prices for packaging or raw ingredients and cut off export markets. This could cause companies to defer sustainability investments.

New regulatory requirements. For some companies, especially those with smaller sustainability teams, new regulatory and investor expectations can shift resources towards accounting and compliance rather than taking action.

Increased scrutiny of corporate climate action. Companies currently find themselves caught between intense scrutiny of greenwashing on one side and backlash against climate action on the other, leading some companies to conclude that it is preferable to say as little as possible about their climate ambitions. This hampers companies' ability to capitalize on potential improvements to brand value or increased market share from their sustainability investments.

Models of collaborative investment and financial innovation: Selected Company-Backed Initiatives Supporting Sustainable and Resilient Agriculture

Name	Companies Involved	U.S. Locations	Commodities	Agricultural practices	Incentive	Technical assistance and implementation	Other sources of finance	MMRV
ADM re:generations	ADM J.M. Smucker Co. PepsiCo, Nestlé, Procter & Gamble, and Carlsberg also support the program	AL, FL, GA, IA, IL, IN, KS, KY, MI, MN, MO, MS, NC, ND, NE, OH, OK, PA, SC, TX, WA, WI	Corn, soybeans, wheat, canola, peanuts	Cover crops, reduced tillage, nutrient management, nitrogen use efficiency	Payment for practice change or price premium based on emissions scoring (varies by state)	7 NGOs and conservation districts provide technical assistance and support data collection, including Practical Farmers of Iowa, American Farmland Trust, and Ducks Unlimited	USDA Advancing Markets for Producers Program	Gradable
Bunge & Nutrien regenerative agriculture program	Bunge, Nutrien	IA, IN, OH, IL, NE, KA	Soybeans, corn, wheat	Cover crops, reduced tillage, nutrient management, enhanced fertilizer efficiency, crop rotation diversification	Price premium	Nutrien provides crop consulting services through the Agrible platform	N/A	Agrible
Ecosystem Service Marketplace Consortium (ESMC) Eco-Harvest Program	General Mills, Cargill, Nestlé, Syngenta, Danone, Kimberly-Clark, McDonald's, Ahold Delhaize, Target, Nestlé, Hormel, and other companies participate in projects. Includes multiple projects with different combinations of companies	Pilots or market-ready projects in all U.S. states except for NV, AZ, UT, VT, NH, ME, CT, MA, and RI	Corn, soy, wheat, oats as primary crops	Cover crops, reduced tillage, nutrient management	Payment for environmental outcome	ESMC provides quantification and certification tools; ESMC member organizations such as Pheasants Forever and The Nature Conservancy provide on-the-ground support to producers	ESMC also receives financial support from the Foundation for Food and Agricultural Research (FFAR) and other nonprofit partners	ESMC provides soil sampling and MMRV
Farm-to-Shelf Regenerative Agriculture Pilot	Ahold Delhaize USA, Kellanova, Barlett	NC, NY, MI	Wheat	Regenerative agriculture practices	Unclear; initial pilot is focusing on farmers that already practice regenerative agriculture	Barlett's certified crop advisors provide technical assistance	None	CropForce
Giant Clean Water Partnership	Maryland and Virginia Milk Producers Cooperative Association (MVDA), Giant Food, Maola	MD, VA	Dairy	Vary by farm but include riparian buffer plantings, manure injection and solid separation, anaerobic digesters	Grants for installation of plantings or manure treatment systems	MVDA works with farmers to identify sustainability needs; Alliance for the Chesapeake Bay helps develop conservation plans and implement practices	Alliance for the Chesapeake Bay and Sustainable Chesapeake leverage public funding, e.g. from the State of Maryland	Alliance for the Chesapeake Bay monitors progress and reports to companies
Practical Farmers of Iowa Cover Crop Cost Share Program	PepsiCo, Cargill, Bayer	IA, NE	Corn, soybeans	Cover crops, reduced tillage, diverse crop rotation, nutrient management	Payment for practice change	Practical Farmers of Iowa provides producers with agronomic assistance and promotes shared learning	USDA Advancing Markets for Producers Program via Field to Market	Practical Farmers of Iowa conducts MRMV
Practical Farmers of Iowa N Rate Risk Protection Program	PepsiCo, Unilever	IL, IA, MN, MO, NE, SD	Corn	Nitrogen reduction	Financial guarantee	Practical Farmers of Iowa implements the program and provides agronomic assistance	USDA Advancing Markets for Producers Program via Field to Market	Practical Farmers of Iowa conducts MMRV

Models of collaborative investment and financial innovation: Selected Company-Backed Initiatives Supporting Sustainable and Resilient Agriculture

Precision Conservation Management PepsiCo Regenerative Ag Incentive	PepsiCo	IL, NE, KY	Corn, oats	Cover crops, reduced tillage, nitrogen reduction	Payment for practice change	Precision Conservation Management implements the program and provides agronomic assistance	USDA Advancing Markets for Producers Program via Field to Market	Precision Conservation Management conducts MMRV
Regenerative Agriculture Financing Operating Line	Farmers Business Network	Farmers in all 50 states are eligible, but recruitment is focused in the midwest	Corn, soybeans, wheat	Reduced and no-till, live roots in the soil for a min of 70% of the year, nitrogen use efficiency, other conservation practices	Loan interest rebate on a 1-year operating credit line	EDF developed the environmental eligibility requirements for the program	USDA Advancing Markets for Producers Program via Field to Market	Gradable
Soil and Water Outcomes Fund	PepsiCo, Cargill, McCormick, Barlett, Ingredion, Mars Petcare, CocaCola, Lifeline Foods, The Andersons, Target, Valent Biosciences, Kent Corporation	GA, IA, IL, IN, KS, KY, LA, MI, MN, MO, NC, ND, NE, NY, OH, SC, SD, TN, WI		Reduced tillage, cover crops, extended crop rotations	Payment for practice change	The program is managed and implemented by AgOutcomes, a subsidiary of the Iowa Soybean Association	USDA Advancing Markets for Producers Program	AgOutcomes conducts MMRV
Southern Plains Grassland Program	Burger King, Cargill, Sysco	CO, KS, NM, OK, TX	Beef	Rotational grazing, improvements to infrastructure, control of invasive vegetation	Grants to ranching organizations and nonprofit partners to support implementation of conservation practices	Partners such as Ducks Unlimited, Osage Nation, and Pheasants Forever provide implementation support to landowners	Walmart Foundation, USDA Natural Resources Conservation Service and U.S. Fish and Wildlife Service	National Fish and Wildlife Foundation provides grants and monitors outcomes
Starbucks Dairy Cost Share	Starbucks, dairy cooperatives	Primarily CA	Dairy	Vary by farm; have included manure digesters, cover crops, electric tractors, water use reduction	Cost share	Technical assistance provided primarily by dairy coops	N/A	Sustainable Environmental Consultants and SCS Global Services support MMRV
Sustainable Dairy PA	Land O' Lake, The Hershey Company	PA	Dairy	Riparian forest buffers, nutrient management, reduced tillage, manure management	Grants for practice implementation	Alliance for the Chesapeake Bay	Also received funding from EPA	Alliance for the Chesapeake Bay monitors progress and reports to companies
Sustainable Food Lab and North Dakota State University Trusted Advisor Partnership	General Mills, AB Inbev, Unilever, King Arthur Baking, PepsiCo, The Hershey Company	ND	Wheat, corn, soy, sugarbeets, and other crops	Cover crops, nutrient management and precision application, reduced and no-till	Farmers receive a payment for practice change; independent crop advisors also receive a per-acre payment	Provides training in soil health practices for certified crop advisors along with financial incentives for farmers	Grants from Walmart Foundation, USDA Regional Conservation Partnership, and National Fish and Wildlife Foundation	Regrow
Truterra Carbon Program	Campbells, Ingredion, Nestlé, Purina, Primient, Roquette, Bel brands. Truterra is a wholly-owned subsidiary of Land O'Lakes	AL, AR, GA, IA, IL, IN, KS, KY, LA, MD, MI, MN, MO, MS, ND, NE, OH, OK, PA, SD, TN, TX, WI	Corn, soybeans, wheat	Cover crops, reduced tillage	Payment for environmental outcome	Truterra works with agricultural retailers to provide technical support	In addition to its commercially-supported carbon program, Truterra operates programs funded by USDA	Truterra Insights Engine data platform

Row Crops

KEY POINTS

- Supply chain initiatives for row crops are by far the most developed compared to other commodities.
- Choosing the right partners is key. Successful models pair cost-share programs or performance-based payments with technical assistance, peer learning, and implementation through cooperatives or local nonprofits.
- Emerging financial tools like yield guarantees and land loans with preferential terms for adopters of sustainable practices are creating new pathways for scaling impact.

Action overview

Supply chain initiatives for row crops are by far the most developed compared to other commodities. Substantial investments have been made by both the public and private sectors to scale practices such as no-till, nutrient management, and cover cropping. Yet, most row crop farmers are not yet involved in supply chain sustainability initiatives, mostly because they have never been approached or don't know how to get involved. With additional finance and effective outreach to farmers, there is tremendous potential to scale practices that can reduce emissions, sequester carbon, improve water quality, and increase the resilience of supply chains for key commodities like corn, wheat, and soybeans.

Structuring effective incentives

According to a 2022 survey of over 500 U.S. row crop farmers, uncertainty around the return on investment, risk associated with unstable markets, lack of technical guidance, and lack of time or labor are some of the largest barriers to adoption of sustainable practices. Practices that reduce nitrogen fertilizer application or use novel fertilizer products face an additional challenge because nutrient management changes involve perceived risk of yield loss.

For example, split nitrogen application can reduce environmental nitrogen losses, but if the second application is hindered by weather conditions, yields may be impacted. For crop rotations, demand for the rotational crop and infrastructure for processing create barriers to adoption. For instance, experts interviewed for this report were concerned about reduced soy plantings in 2025 due to low demand, and the potential nitrogen loss implications of losing soy from corn-soy rotations.

The cereal industry in the U.S. is so competitive and mature that companies are looking for ways to differentiate. If you can improve the sustainability of a product and gain even a small bump in market share it has an impact. I believe this will gain even more significance with the next generation of consumers."

Nick Martin
Vice President of Corporate Sustainability
Post Holdings

Lessons from numerous pilot projects documented by the Midwest Row Crop Collaborative provide insight into what drives participation and creates value for farmers in supply chains.

For example, market-based premiums and performance-based incentives can help accelerate adoption with consistent funding and supply chain coordination, and farmers prefer per-acre payments over per-bushel so that compensation is not dependent on yield. Cost-share programs blending public and private funding—a common model across many supply chains—create a more stable support structure for all program participants but require significant administrative capacity. Finally, farmer-to-farmer engagement is a powerful driver of practice adoption, especially when paired with localized technical assistance.

Example initiatives

Some companies work with project implementers such as Soil and Water Outcomes Fund, Practical Farmers of Iowa, and Precision Conservation Management that provide comprehensive services for farmer incentive programs, including program administration, measurement monitoring, reporting and verification (MMRV), in-person technical assistance, and peer learning networks for farmers to lower the risk of adopting new farming practices.

Practical Farmers of Iowa offers an N rate risk reduction program, which pays farmers $35 per acre if a yield loss occurs from reducing their typical nitrogen rate. The program is free to farmers and funded by PepsiCo and a USDA Advancing Markets for Producers (formerly Climate-Smart Commodities) grant. PepsiCo and Unilever also partner with Practical Farmers of Iowa to support farmers in their supply chains to implement cover crops through a cover crop cost share program. For both programs, Practical Farmers of Iowa measures outcomes that the companies can use towards their emission reduction targets.

PepsiCo, **Cargill**, **McCormick**, **Mars Petcare**, **Bartlett**, **Ingredion**, and **Coca Cola** invested in the Soil and Water Outcomes Fund (SWOF), which provides financial incentives to help farmers adopt practices such as reduced tillage, cover cropping, and crop rotations. SWOF administers the program and conducts monitoring, reporting, and verification and companies purchase verified carbon and water outcomes through offtake agreements.

Other companies are implementing their own programs, using web-based platforms for MMRV. Major grain traders such as Cargill, Bunge, and ADM all provide incentives to all of their corn and soybean producers to support them in adopting regenerative and nutrient management practices.

Cargill's RegenConnect program, which focuses primarily on tillage and cover cropping practices, provides farmers a payment per metric ton for carbon sequestered, as verified by the Regrow MMRV platform. The program currently has about 1,500 farmers enrolled under 3-year contracts for crops including corn, soybeans, cotton, sunflower, flax, canola, and sorghum.

ADM's re:generations program provides a variety of incentives that vary by state, crop, and agricultural practice. Some incentives have been funded through USDA's Advancing Markets for Producers program. Eligible practices include cover crops, nitrogen use efficiency, and no-till. ADM uses the Gradable platform, a partnership with Farmers Business Network, for data collection and payments.

Collaborative pilot programs have also emerged between food manufacturers, retailers, and sometimes millers or processors.

Ahold Delhaize USA funds several supplier collaborations focused on GHG emissions reduction. In 2024, the company partnered with snack company Kellanova and Bartlett, to reduce emissions from wheat farming in its value chain by supporting farmers in growing regenerative wheat

in Eastern North Carolina. Starting this year, the regeneratively-grown wheat from these farms will be milled with conventional grain at a Bartlett facility and manufactured into crackers by Kellanova in North Carolina, then sold at local Ahold Delhaize USA brands. The pilot works with farmers who have already implemented regenerative agricultural practices to create a cohort of experienced farmers who can help teach and facilitate the transition for new farmers. An additional benefit of the pilot are the insights on soil management and crop production that help improve farm and supply chain resilience, which they can use to better inform their sustainability initiatives down the line.

Ahold Delhaize is also collaborating with General Mills to address emissions within their shared value chain, investing together in farmers who are part of their priority supply sheds that grow key ingredients such as wheat and oats. These farmers receive technical support and compensation to help them implement regenerative practices through Ecosystem Services Market Consortium (ESMC)'s Eco-Harvest Program. The non-profit oversees the measurement of climate outcomes, with an independent certifier to verify GHG reductions and soil carbon sequestration.

In addition to supply chain investments by food and agriculture companies, a number of new financial products are emerging that provide low-interest capital to farmers that adopt sustainable practices.

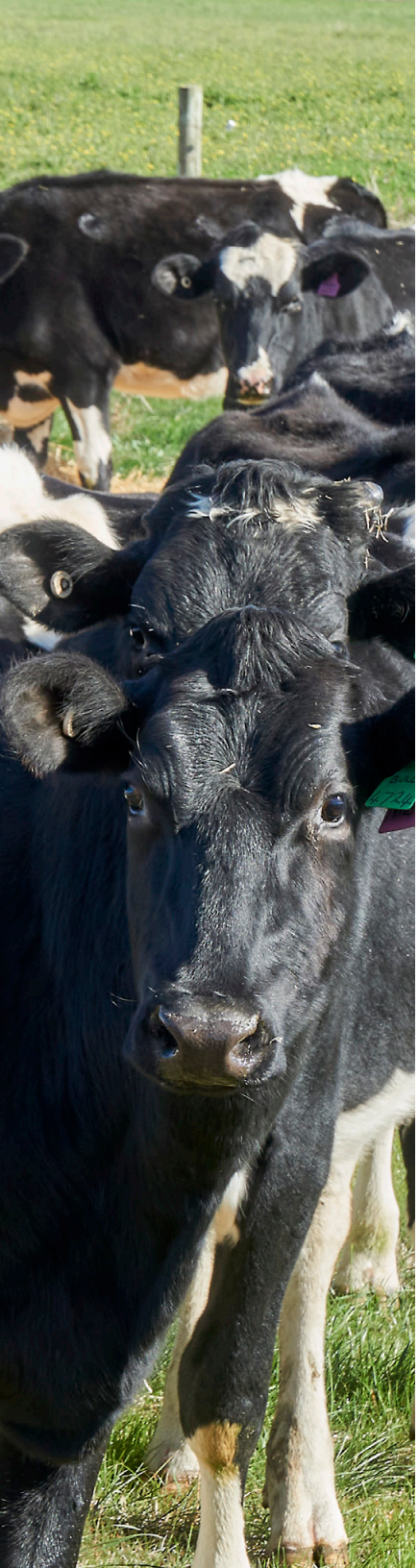
Farmers Business Network provides a Regenerative Agriculture Operating Line that provides farmers a 0.5% interest payment rebate on their loan for adopting nutrient management and other practices. Building on this program, Farmers Business Network is now piloting a Regenerative Agriculture Financing Land Loan with 20 farmers and funding from the Walton Family Foundation. The pilot program will provide farmers who adopt regenerative practices and meet nitrogen balance requirements with discounted interest rates—ranging from 0.25% to 0.5%—on newly financed land for seven years.

Fractal Agriculture, Mad Agriculture and Dirt Capital Partners are all providing low-interest capital to regenerative farmers through land, equipment, and operating loans or equity loans on existing land assets.

Dairy

KEY POINTS

- **The dairy sector is mobilizing funding and partnerships to scale sustainability practices through cooperatives and corporate partners.**
- **Manure solutions for reducing methane are proven but need upfront investment, while feed additives require ongoing incentives.**
- **Co-op-led models show how trusted partnerships can support farm sustainability and supply chain benefits.**



Action overview

The dairy industry is well-primed to support the transition to climate-smart practices and has already begun to provide financial support beyond what farmers can access from government programs. Six national dairy organizations formed the U.S. Dairy Net Zero Initiative, which—supported by corporate partners and cooperatives—is advancing research, pilots, and market development to scale dairy sustainability practices.

Structuring effective incentives

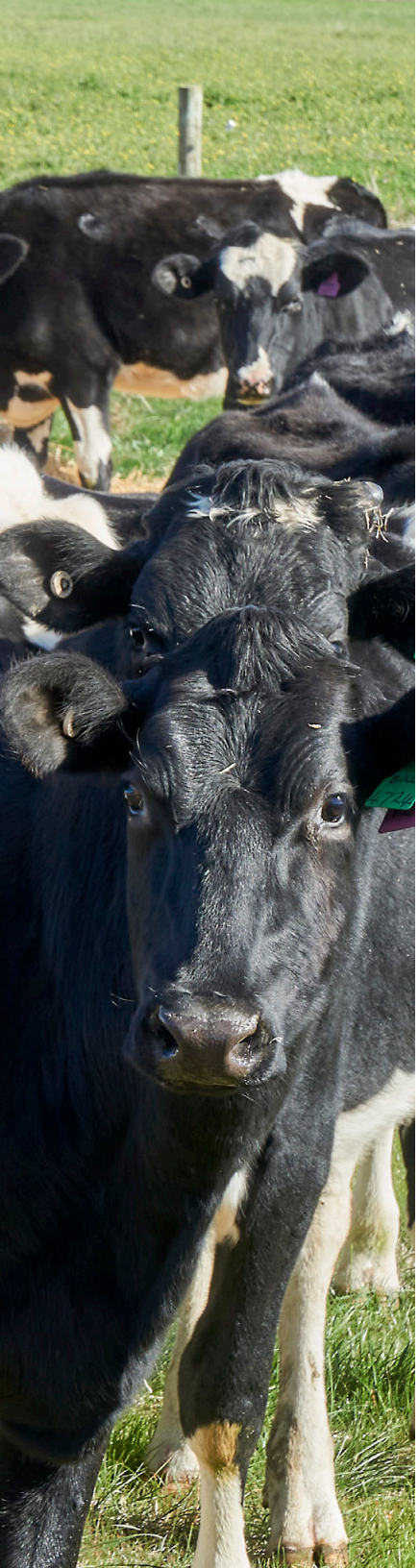
Several options exist—summarized in resources from Ceres and EDF—for reducing methane emissions from manure, ranging from anaerobic digesters and cap and flare to solid-liquid separation and composting systems. Pasteurization and acidification of manure during storage can also be effective in reducing methane emissions.

Most improved manure management approaches require substantial up-front investment, as well as ongoing maintenance, labor, and energy costs. While anaerobic digesters, where animal manure is broken down by microbes in airtight containers, are not economical for smaller farms, they are an increasingly attractive investment for larger farms. Solids from the digester can be used as bedding, and the liquid can be used as fertilizer. The biogas can meet the farm's fuel needs or sold.

Renewable natural gas from anaerobic digesters is now included in California's Low Carbon Fuel Standard (LCFS) market and has a comparatively low carbon intensity score. Fuel companies operating in California can purchase renewable fuels and emission reduction credits from anywhere in the country, driving demand for renewable natural gas from dairies in the Midwest.

Incentive programs for feed additives and other solutions that farmers can adopt to reduce enteric methane emissions are more nascent and may require a slightly different approach. While feed additives require little up-front investment, they do require an ongoing cost. Few dairy farmers are willing to bear the cost of such products without some kind of incentive or compensation, and most dairy farmers recently interviewed by EDF and Deloitte felt that there were insufficient incentives to adopt feed additives.

Several initiatives—notably the Enteric Methane R&D Accelerator and the Greener Cattle Initiative—are trying to develop lower cost solutions, with support from companies and industry groups. In the meantime, surveys of dairy farmers in the U.S. indicate a preference for price premiums as an incentive for adoption of enteric methane solutions.



Example initiatives

Dairy cooperatives will play a critical role in dairy sustainability efforts because of their close relationship to both farmers and downstream companies like food manufacturers and retailers. Cooperatives are well-positioned to channel funding and provide technical support because of the trust that farmers have in their cooperatives.

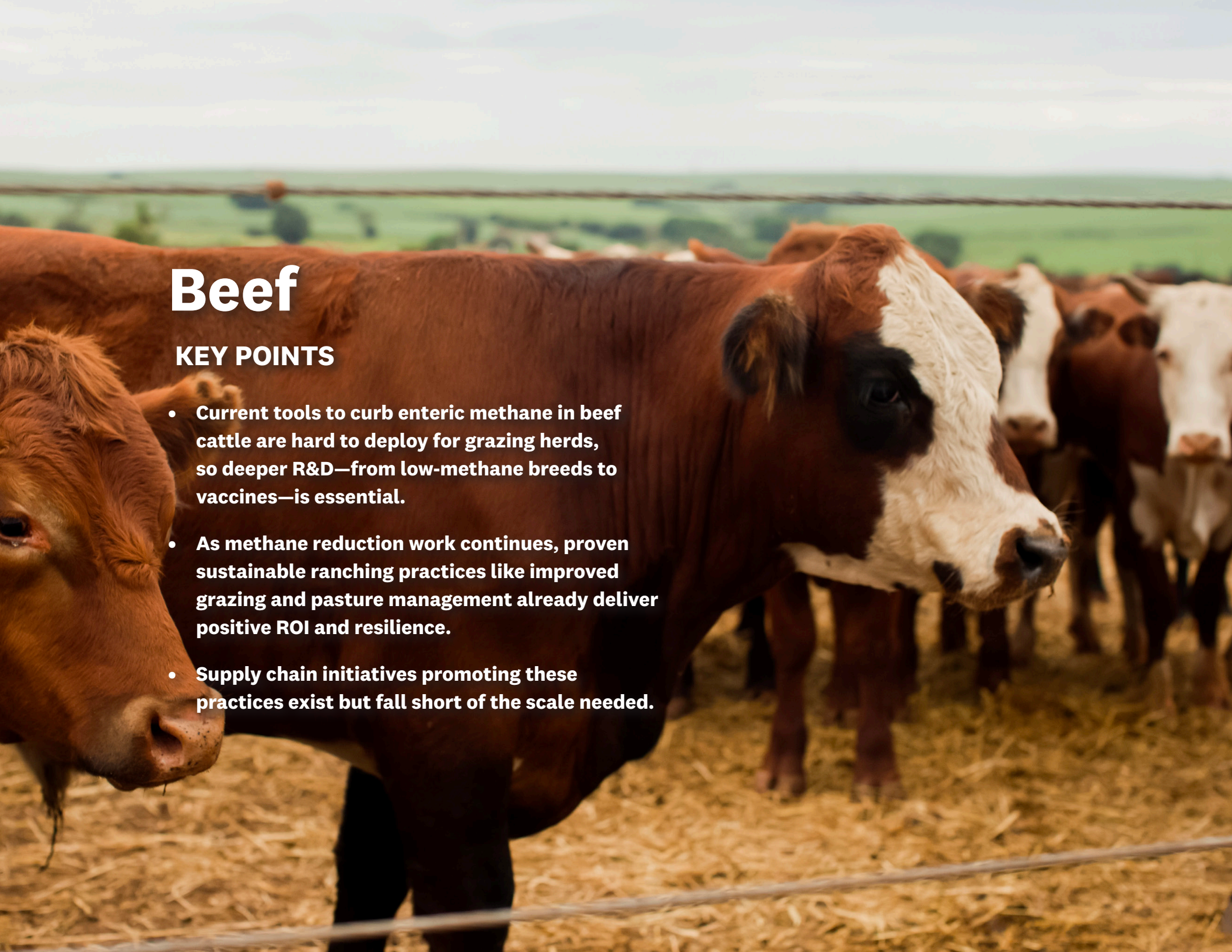
Many supply chain programs follow a common model to incentivize climate-smart dairy production: a dairy cooperative works with a local nonprofit organization that provides technical support and access to grant financing from private and government sources, while one or more downstream companies provides financial support to achieve climate and water goals within their supply chains.

Hershey is partnering with Land O'Lakes and the Alliance for the Chesapeake Bay through Sustainable Dairy PA to implement practices that help reduce GHG emissions and improve water quality on farms owned by Land O'Lakes cooperative members who supply milk to Hershey. Most of the milk Hershey sources for its chocolate is produced within a 100-mile radius of its Hershey, Pennsylvania manufacturing plant. The project is financially supported by Hershey and grant funding secured by the Alliance from the EPA and National Fish and Wildlife Foundation in 2021 and 2023.

Maryland and Virginia Milk Producers (MVDA) is also working with the Alliance for the Chesapeake Bay and Sustainable Chesapeake to pilot manure injection—where manure used to fertilize feed crops is placed below the soil surface rather than spread on top—and advanced solid separation technologies—which reduce methane emissions from manure storage lagoons—on farms in the Chesapeake Bay Watershed. The partnership is supported by funding from Giant Food Stores and the Maryland Department of Agriculture.

Several companies with significant dairy supply chains, such as **Danone** and **Bel Group**, have provided direct payments and price premiums to European farmers that use 3-NOP—a methane-reducing feed additive marketed under the brand name Bovaer.

Ben & Jerry's, **Clover Sonoma**, and **Straus Family Creamery** are piloting a feed additive based on red seaweed (Asparagopsis). Other companies interviewed by Ceres are considering direct payments to farmers who use feed additives as well, but the current cost—one company estimated $125-$135 per metric tonne CO_2e—may be prohibitive for companies with smaller sustainability budgets, pointing to a need to make reducing costs a priority.



Beef

KEY POINTS

- **Current tools to curb enteric methane in beef cattle are hard to deploy for grazing herds, so deeper R&D—from low-methane breeds to vaccines—is essential.**
- **As methane reduction work continues, proven sustainable ranching practices like improved grazing and pasture management already deliver positive ROI and resilience.**
- **Supply chain initiatives promoting these practices exist but fall short of the scale needed.**

Action overview

While enteric methane from beef production is the largest source of greenhouse gas emissions in the agricultural industry, viable options for reducing these emissions are still limited. Some feed additives for reducing methane are available or awaiting regulatory approval. However, their use is limited until additives are available that can be added to drinking water or salt links since grazing cattle typically don't get daily centralized feedings.

Effectively reducing agricultural GHG emissions in the U.S. will depend on further research and development to bring more technologies to market, such as low-methane breeds of cattle and methane-inhibiting vaccines.

Structuring effective incentives

As methane-reducing technologies come to market, they will require robust financial incentives unless they simultaneously provide productivity benefits. Surveys conducted by EDF found that beef producers consider methane reduction a much lower priority than dairy producers, but price premiums or direct payments could motivate some farmers to adopt technologies such as feed additives.

As research continues into enteric methane solutions, programs that support ranchers in implementing practices, such as improved grazing and pasture management, that improve productivity, reduce costs, conserve water, and improve soil health, have potentially positive ROI, and can be adopted now. Water is a particular concern at a time when the U.S. beef herd is at a historic low due to droughts.

Ranchers are strongly motivated to manage their land and water resources responsibly to ensure long-term ranch viability. Support for adoption of sustainable and resilient ranching practices should address barriers, such as the installation cost for fencing and watering systemswater systems, and provide technical support to alleviate challenges such as labor constraints and suitable water sources.

Example initiatives

Supply chain initiatives to scale climate resilient and regenerative beef production practices are underway, but nowhere near the scale needed to address the industry's contribution to emissions in the U.S. Most existing projects focus on the soil carbon sequestration benefits of grazing practices.

The **Southern Plains Grassland Program** is a partnership between Cargill, Burger King, and Sysco, with support from Walmart Foundation, USDA Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, and National Fish and Wildlife Foundation. While not strictly a rancher incentive program, National Fish and Wildlife Foundation provides grants to local nonprofits to help ranchers in Colorado, Kansas, Nebraska, New Mexico, Oklahoma, and Texas improve grazing practices, restore grassland habitats, and remove invasive species, in partnership with local nonprofit organizations.

In 2021, **Tyson** began a climate-smart beef program that incentivized farmers and ranchers to adopt sustainable practices across the entire production process, from feed production to cattle finishing. Producers are required to be BeefCARE certified,

and feedlots must be Progressive Beef certified. In partnership with EDF, Deloitte, and Adams Land & Cattle, the company developed a data collection and modeling program that calculates the carbon intensity of beef sourced from ranchers enrolled in the program on a per-head basis. The program was initially intended to provide a branded product—called Brazen—to consumers as a "climate-smart" beef option. However, Tyson was sued by Environmental Working Group (EWG) in late 2024 for both its net-zero target and climate-smart beef product, which EWG alleged were misleading claims. The program—now called reduced carbon intensity beef—continues, but Tyson no longer markets Brazen Beef. JBS was similarly sued in 2024 over its own net-zero targets, highlighting the particularly intense scrutiny surrounding meat companies' climate initiatives.

Companies that source beef and those that produce feed and animal nutrition products are also investing in research and development of products that can reduce methane emissions.

JBS and Cargill invested in developing feed additives or other methane-reducing solutions. JBS also partnered with DSM to provide 3-NOP to confined cattle in Europe, with plans to expand the practice to the U.S.

Key levers for enabling greater investment in a sustainable and resilient agriculture industry

Lower barriers to entry

Most current supply chain sustainability programs are financed by larger companies with substantial sustainability teams and budgets. For many, especially food manufacturers and retailers, these investments often focus on "hero ingredients"—commodities that make up a large proportion of their sourcing and scope 3 emissions and appear prominently in their products or on store shelves, such as dairy for Danone or oats for General Mills. For these companies, the clear business case for investing in supply chain sustainability initiatives is clear, and they have the resources to identify partners, set up programs, and cover the costs of financial incentives paid to producers, along with any administrative costs.

However, these companies aren't the only ones that want to take advantage of these initiatives for tackling risk and protecting long-term productivity.

In our interviews, Ceres discussed obstacles and opportunities for action with several companies that have smaller sustainability teams and budgets and diversified sourcing without "hero ingredients," as well as larger companies that cited the potential for getting more companies involved in improving the resilience of shared supply chains. According to one interviewee, "There's a long tail of large companies, especially in the animal agriculture sector that haven't yet done anything or are just starting. These companies could add more incentives to the pile."

Co-investing in existing supply chain programs with organizations like Practical Farmers of Iowa can expand the reach of programs, create efficiencies, and enable participation by companies that don't have the resources to run their own programs.

Some of these companies may be able and willing to invest in supply chain sustainability initiatives, but do not have the resources to set up and administer their own programs, making it difficult to justify a large investment for a single commodity, given their diversified sourcing. Co-investing in existing programs would create efficiencies and help channel more finance towards climate-smart agricultural practices.

Given the importance of local, trusted partners to enroll and liaise with farmers, the goal should not be to create large national programs, but to enable matchmaking between companies and initiatives in their supply sheds that could enroll more farmers with additional financial support. This gives companies the opportunity to learn best practices from their peers and leverage relationships with NGOs, helping them identify other initiatives that may overlap with their supply chains. Investors can emphasize the importance of such investments in their engagements with portfolio companies.

Many food manufacturers also identified retailers and restaurants as important financial partners in providing incentives for climate-smart agricultural practices. This is especially true of dairy and meat supply chains,

where the supply chains between producers and retailers are shorter than with row crops (although some collaborations around row crops exist as well). These collaborations help companies further upstream scale their programs, while also enabling retailers and restaurants to reduce their own supply chain emissions.

As one retailer put it: "Our hope is that by working with [food manufacturers] we can build up really strong programs and then we can invite other supply chain actors to join us."

Accounting that enables co-investment

One company representative interviewed by Ceres put it bluntly: "everyone is overpaying for MMRV." Measurement, monitoring, reporting, and verification (MMRV) is an important part of supply chain investments because it allows companies to understand how their support for practice changes on farms translates into emission reductions or water quality improvements that the company can claim towards its goals.

However, the current system of corporate GHG accounting does not incentivize companies to jointly invest in MMRV. This is because current accounting rules only allow a company to count an on-farm emission reduction or carbon removal in its GHG inventory if the company has traceability to that farm—that is, if the company can verify that it purchased the bushels of grain associated with that emission reduction.

Ensuring traceability is difficult and expensive and discourages companies from making investments that benefit entire geographic areas or supply sheds because they may not be able to "claim" the full benefits of that intervention—essentially creating a stranded asset.

To overcome measurement and verification challenges that can create inefficiencies and slow investment, companies are exploring within value chain mitigation, which supports collective action in shared sourcing regions—though clear reporting standards are still emerging.

Further complicating matters, it is difficult to allocate emission reductions or carbon removals when different crops in rotation have different purchasers, such as corn and soybeans. Beyond the complications around traceability, data collection by companies operating independently creates inefficiencies. Some farmers may be audited several times throughout the year by different companies seeking to collect data on similar metrics.

As a possible solution to collaborate with other players in the supply chain on traceability and financing sustainable farming practices, companies without direct connections to farmers are increasingly looking to adopt an approach known as within value chain mitigation (sometimes also called insetting or scope 3 interventions) in their supply sheds . Within value chain mitigation commonly refers to activities that reduce emissions or increase carbon removals within a region the company sources from—but not necessarily associated with the specific batch or shipment of commodities that entered the company's supply chain in a given year.

Organizations such as AgOutcomes and Ecosystem Services Market Consortium run within value chain program for companies and farmers, creating efficiencies in MMRV and reducing transaction costs, allowing more resources to go to the farmers themselves. These organizations define the program requirements, provide technical assistance to the farmer, collect primary project data, and quantify, monitor, and verify project results.

Guidance on reporting within value chain mitigation continues to evolve. The SBTi's Corporate Net Zero Standard is being updated and the next version of the Greenhouse Gas Protocol's Land Sector and Removals Guidance is expected later in 2025. Currently, the Land Sector and Removals Guidance and Corporate Net Zero Standard make it challenging for companies to report and substantiate within value chain mitigation towards target progress. SBTi's Corporate Net Zero Standard does not allow emission reductions from insetting to be counted towards targets. But the organization is considering a more flexible approach in the version currently out for consultation, even introducing a potential supply shed approach for scope 3 emission reductions.

Bring more financial institutions to the table

Food and agriculture companies will be unable to finance the transition to sustainable and resilient agriculture alone, even if complemented by public investment. And in an environment where federal funding for programs such as the Partnership for Climate-Smart Commodities (renamed the Advancing Markets for Producers program) is uncertain, there is a need for more private capital to flow towards the development of new and emerging solutions and support for ready-to-deploy practices and solutions.

From mitigating portfolio risk to backing agtech innovation, financial players—from mainstream lenders to institutional investors and venture capital—have strong incentives to invest in efforts that help farmers adopt more resilient practices.

Ideally, scaling resilient agriculture will involve both integrating climate risks into existing financial decision-making—and increasing investment in projects and programs that support farmers in adopting more resilient practices.

Both approaches are relatively nascent in the U.S. According to surveys by EDF, only 29% of agricultural finance institutions have set climate change goals for their agricultural portfolios or plan to do so. While the lack of a sustainable finance taxonomy or voluntary market standard in the U.S., make it difficult to measure the state of sustainability-related investment by banks to the agriculture industry, only 15% of the regenerative agriculture pilot programs in the U.S. include financial institutions of any size.

Yet there is strong interest from borrowers for financial products that can support practices like crop rotation, improved grazing, reduced tillage, and precision farming technology.

Incentivizing sustainable practices will benefit lenders by reducing portfolio risk, as it can support farmers' loan repayment capacity by bolstering their resilience against extreme weather events and supporting the longevity of

their farms. There is a large opportunity for mainstream agricultural lenders to develop new financial products or adjust existing products to support farmers in adopting sustainable practices.

For example, CoBank—one of the largest private agricultural lenders in the U.S.—in 2024 originated its first sustainability-linked loan to Heartland Co-op with a supporting grant from nonprofit Great Outdoors Foundation. The loan will allow the farmer cooperative to expand its support to members for adoption of sustainable practices.

Meanwhile, fintech startups like Farmers Business Network and Growers Edge are developing innovative financing models, often leveraging philanthropic investments (such as with Farmers Business Network's Land Loan) to provide farmers with more favorable terms.

Institutional investors can play a critical role in shaping climate strategies or climate-aligned asset allocations. In fact, investors are increasingly seeking opportunities to invest in climate and nature-based solutions. Currently about half of the largest North American investors mention climate solutions and some sort of investments in green bonds or green assets in their climate-aligned investment plans.

Responsible stewardship of public equity investments is one critical avenue. It is consistent with investors' fiduciary duty to ensure the long-term viability of agricultural supply chains. Investors can and have been engaging companies about their action plans to meet their climate, nature and water targets, including how they support agricultural producers and engage in collective action at the landscape level.

Private equity, venture capital, real assets, and fixed income are also key pieces of the financing puzzle. Companies like ADM, Tyson and Cargill are investing venture capital in startups such as Farmer's Business Network, Athian, and Regrow that provide financial and technical services to farmers transitioning to sustainable agriculture or participating in supply chain programs.

Asset managers are also providing financing. Fidelity Investments, for example, maintains an agricultural productivity fund and invested in Farmer's Business Network. Meanwhile, Agriculture Capital, an arm of Equilibrium Capital Management that invests in sustainable farmland and food infrastructure, operates agricultural funds with non-concessionary returns that attract capital from state pension funds, among others.

Many agricultural investment opportunities still rely on concessional capital from philanthropic or public sources either to provide more favorable terms to farmers in agricultural lending or reduce risk exposure for commercial investors. As such offerings mature, they will be important models to demonstrate commercial viability of finance for sustainable and resilient agriculture, especially if they are able to reduce reliance on grant and concessional capital over time.