

# Freedom to Invest

## Navigating Climate Risks in Agriculture

Unlocking Financial Benefits through Enhanced  
Farm Resilience and Sector Transparency

January 2025



# Climate risks are financial risks for everyone involved in agriculture, including farmers, food companies, financial institutions, and investors.

Due to how much our food system depends on nature and ecosystems, climate change poses enormous threats and costs to the entire industry. Farmers are facing more severe and erratic weather patterns and longer-term conditions, such as severe droughts attributed to climate change, that can lead to lower productivity, profits, and asset values. In 2023, weather-related disasters caused **\$21.9 billion** in crop and rangeland losses in the United States.

By 2030, profitability for the world's largest livestock producers could decline as a direct impact of climate change, with North American companies hit hardest, experiencing an **average decrease in profit margins of 11%**. Meanwhile, food and agricultural companies face market transition and business risks associated with regulatory changes, as well as shifting preferences from consumers who increasingly expect more environmental responsibility and investors who are seeking decision-useful information so they can consider all investment risks and opportunities.

Governments, financial institutions, and companies are taking action to address these risks. In 2023, nearly **100% of S&P 500 and 93% of Russell 1000 companies** voluntarily published corporate responsibility reports. Many companies with operations in Europe, but that source from U.S. farms and ranches, will begin complying with reporting requirements under the European Union's **Corporate Sustainability Reporting Directive (CSRD)** in 2025. It is estimated that **50,000 EU and 10,400 non-EU companies** will fall under its scope by 2029. Thirty countries, representing **57%** of global GDP, are expected to roll out similar disclosure standards by 2025 via adoption of the International Sustainability Standards Board (ISSB) standards. In addition to the EU, a number of major financial markets, including **the United Kingdom**, Japan, **Brazil**, **Hong Kong** and **Australia** are mandating climate-related financial disclosure in different forms. Banks are paying closer attention to climate risks and **counting** them among their top emerging risks. The Farm Credit System's **young, beginning and small farmer program** and the U.S. Department of Agriculture (USDA) Farm Service Agency's **conservation loan program** provide examples of lenders expanding or adjusting their loan offerings to build farm resilience.

Food and agricultural companies, which [contribute 25-30% of global GHG emissions](#), are not immune from these changing requirements and trends. The message is clear: transparency and resilient agriculture practices are integral to strengthening supply chains, protecting farmers from water, nature, and climate risks, and ensuring the sector's long-term productivity and profitability.

This report explores how embracing sustainability, paired with strong disclosure, presents emerging opportunities for all food chain actors in the United States. By addressing climate risks, food and agricultural companies and banks can enhance their competitiveness and attract investments that can financially support farmers as they tackle extreme weather challenges. Climate risk disclosure serves as a diagnostic tool, enabling companies, banks and insurers to identify where investments, incentives, and operational changes are necessary to support farmers facing climate-related challenges. With this insight, the food companies and the farms they source from cannot only enhance their resilience but also tap into new economic and financial opportunities.





# 1

## Pathway to Enhancing Resilience and Unlocking Economic Benefits

Agriculture finds itself at the crossroads of crisis and opportunity. The [2022 IPCC](#) report paints a stark picture. By 2050, 10% of global cropland and rangeland will become unsuitable for production due to global warming—a figure that could soar beyond 30% by 2100. NASA predicts that global corn yields could drop [24%](#) by the end of the century due to rising temperatures and shifting rainfall patterns; other projections see corn yields declining [20-40%](#) across the Corn Belt by the end of the century due to changes in rainfall and temperature. The USDA predicts that climate change could lead to a [\\$256 million](#) decrease in corn and soybean exports by 2035. These impacts are already visible. U.S. agricultural exports have been in [decline](#) since 2022, from \$196 billion to \$178 billion in 2023, and are expected to decrease to \$169 billion in 2025, partly [driven](#) by climate-induced production shortages in essential crops such as corn, wheat, and cotton. By 2050, production reduction due to climate change is projected to [increase](#) the prices of major crops, including 26% for corn, 30% for soybeans, 26% for wheat, and 3.1% for rice.

The impact of climate change is also felt at the grocery store. Extreme weather events are [driving](#) the prices of major food crops such as cocoa, olive oil, rice, soybeans, and potatoes to record highs in 2024, [following](#) earlier increases due to supply chain disruptions caused by the Covid-19 pandemic and the war in Ukraine and compounded by economy-wide [inflationary pressures](#).

There are opportunities to be seized as well: as the climate shifts, certain areas are no longer viable for some crops, while [others are becoming favorable locations](#) for different varieties. Taking action to adapt to these changes and “[climate-proofing](#)” agriculture through the integration of sustainable practices will help bolster farms’ financial resilience. Meanwhile, the growing emphasis on sustainability in the food system is also generating new market opportunities. A survey of 9,000 consumers found that [86%](#) want food products that are socially and environmentally responsible. [Another study](#) notes that 60% buy products from companies that are environmentally responsible. The market for products advertised as “sustainable” in the U.S. has grown by [10%](#) in the last five years, outperforming the growth of conventional products.

Supply-side transformation is necessary to address these growing threats and opportunities, and companies agree that sustainability provides a valuable lens into complex problems. In a [survey](#) of 350 global food companies, 99% of companies reported revenue growth as a result of their investments in resilient agriculture practices the three years preceding the survey, and 98% reported a reduction in costs. The long-term benefits are clear: embracing sustainability opens the door to opportunities for growth, resiliency, and efficiency.

**Sustainability plays a crucial role in enhancing resilience and efficiency.** Sustainable agriculture enables farmers to address climate challenges while ensuring the long-term productivity and profitability of their land. Together, these practices not only mitigate climate risks but also create a more resilient and adaptable food system. There are [various terms](#) for these practices, such as climate-smart agriculture, regenerative farming, and ecological farming, but we use “sustainable or resilient farming or agriculture” as an umbrella term as these approaches often share [similar methods](#).

**Practices** such as no-till farming, cover crops, extended rotations, and perennial crops can prevent erosion, improve soil health, provide nutrients, suppress weeds, enhance water retention, and disrupt pest cycles. These practices can **boost** crop resilience to variable rainfall and help stabilize farm income. **Research** discovered that long-term no-tillage improved soil quality in the U.S., leading to stable yields during extreme weather.

**Another study** highlighted that higher soil organic matter, which is built through sustainable farming, can protect corn yields and reduce crop insurance payouts during droughts in the U.S. A **2022 study** also confirmed that improved soil quality through sustainable farming can lead to both higher yield and stability. Together, these studies underscore the role of these agricultural approaches in building resilience against extreme weather events.

**Sustainability helps farmers expand markets and increase profits.** While there are upfront costs and risks, several studies demonstrate the economic benefits of adopting resilient farming practices. BCG found that these practices could result in a **15-25% 10-year return on investment (ROI) and a 120% profit increase in the longer term** driven by reduced resource inputs and labor costs and crop diversification despite the short decline in profit during the transition period. Another BCG report found that regenerative farming methods can expect a **60% profit increase** mainly due to reduced costs once a steady state of implementation is in place. Farmers also **acknowledge** the advantages and cite economic benefits, including enhanced productivity and alignment with market needs, as a key reason for their shift to sustainable farming.

**Sustainability helps farmers diversify their income streams,** tapping into new opportunities such as distributed energy generation and carbon credits. Installing solar photovoltaic systems on farms can **slash energy bills to nearly zero** and enable farmers to **sell excess energy back to the grid or earn energy credits**. Solar panels also **provide a protective shield** against extreme heat and drought as shade for some crops, creating dual benefits. Utility-scale solar development on farmland has generated controversy in specific areas. Some farmers, however, find a **compromise** by leasing out less productive land for solar development and using the rest for crops. Technologies like agrivoltaics offer additional options for maintaining farmland and generating solar power at the same time.



Carbon markets and food companies' supply chain programs for upstream suppliers are also creating additional revenue streams. Farmers adopting practices, such as no-till, strip-till, cover cropping, or more efficient nitrogen fertilizer usage, can [turn their emission reductions into carbon credits](#), which can be traded in the [voluntary carbon market](#). In California, carbon credits from livestock and rice cultivation projects can be traded in the state's Cap-and-Trade program, a [compliance market](#) regulated by the California Air Resources Board (CARB).

Food companies are also increasingly financing mitigation activities directly within their own value chains, which will provide additional finance for implementation of sustainable agriculture practices. For example, in Missouri, soybean farmers have been [incentivized](#) with a premium by Archer Daniels Midland to meet stringent EU standards. [Danone](#) and [Mars](#) have sourcing programs aimed at helping farmers invest in higher environmental standards. Illinois corn and soybean farmers receive technical assistance and incentives to transition to regenerative farming by PepsiCo through [Precision Conservation Management](#) program. Nestlé aims at sourcing [50% of its raw materials](#) from partners using sustainable farming practices by 2030 and supports those partners through several programs. Other companies such as Unilever, Pannonia Bio and Cargill run similar programs. It should be noted, despite these efforts, that an investment gap still exists, and financial tools need to be scaled up by [15 times](#) to transition to a sustainable food system, underscoring the vital role and opportunities for major players in climate finance.

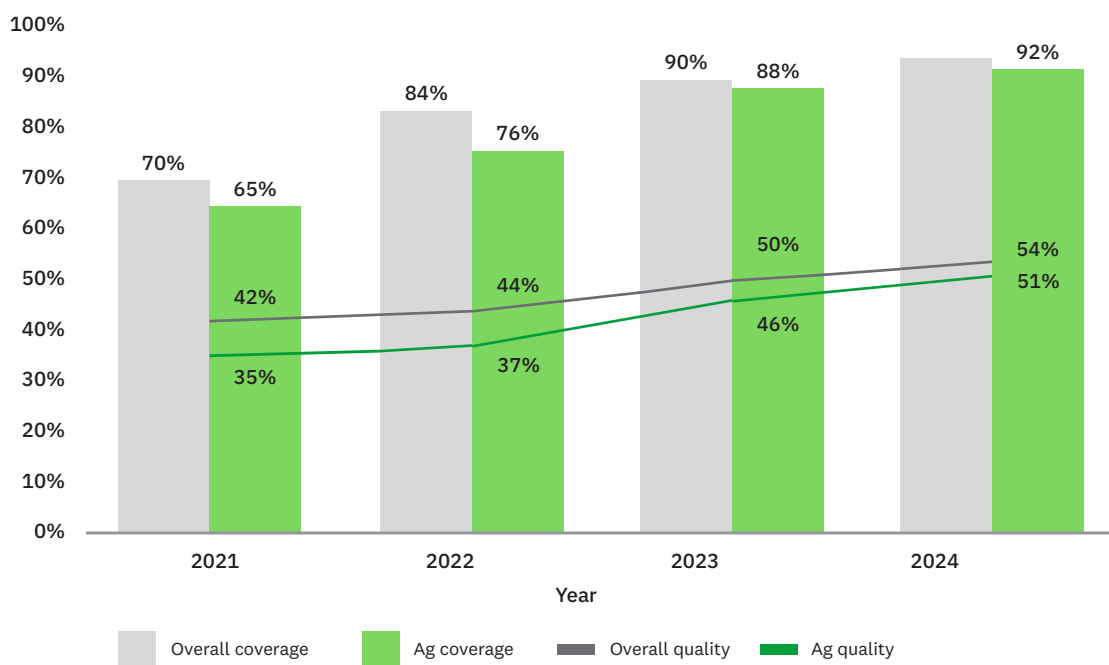
Despite the researched and proven benefits of these approaches to managing soil health, water use, and crop rotation and planting, the transformation on the farm requires significant upfront investment that farmers cannot undertake single-handedly. Achieving this will demand [wide collaboration throughout the supply chain](#), alongside partnership with governments, companies, and investors. The USDA has invested [\\$3.1 billion](#) in [140 climate-smart commodity projects](#), and the Inflation Reduction Act allocated [an additional \\$19.5 billion](#) to USDA conservation programs. These initiatives seek to [ensure](#) that all projects provide meaningful benefits to small and underserved farmers. [Several USDA programs](#) are assisting farmers in introducing renewable energy, addressing wildfire, and managing other risks on farms. These programs provide essential funding to implement sustainable solutions, ensuring that the upfront costs do not become a barrier to progress. [Farmers Business Network](#) was one of the first to offer innovative agricultural loans that incentivize conservation practices. More recently, [CoBank](#), offered an interest rate reduction on its operating lines of credit based on certain environmental criteria, recognizing the business value of agricultural conservation.

Embracing sustainable farming is a strategic decision for both food companies and farmers, as it can unlock opportunities such as enhanced resilience, revenue growth, and market expansion. While [90% of farmers](#) are aware of resilient farming practices, and many are making changes where possible, it has been challenging for them to adopt these practices at full scale. The examples discussed above illustrate how embracing these practices across the food system can serve as an effective strategy to address climate challenges by engaging all food chain actors while simultaneously providing economic benefits.

## 2

## Climate-Related Financial Risk Disclosure: A Diagnostic Tool for the Food and Agricultural Sectors

Climate disclosure allows investors to gain insight into how a company and its board are addressing climate risks within their business model and strategic outlook. In particular, the information on GHG emissions serves as a starting point for assessing companies' transition risk, or the risk of emission-intensive assets losing value in the transition to a clean, low-carbon economy. By 2025, large corporations will be subject to climate-related reporting under the CSRD, which is currently estimated to cover nearly **50,000 EU and 10,400 non-EU companies** doing business in Europe by 2029. More than **30 countries representing 57% of the world's GDP** are in the process of introducing similar climate disclosure requirements via adoption of the ISSB standards. While these rules do not mandate that companies set climate targets, they aim to make companies more transparent about their operational readiness to manage climate-related risks. Other regulations, such as the EU's **Corporate Sustainability Due Diligence Directive (CSDDD)** and the **Regulation on Deforestation-free Products (EUDR)**, go beyond disclosure and require companies to integrate due diligence into their actual compliance policies, mandating that companies identify, prevent, and mitigate adverse impacts.



**Figure 1** Coverage and quality of climate disclosure against TCFD recommendations comparison between overall industries and agricultural sector (Based on data from EY Global Climate Risk Barometer [2021](#), [2022](#), [2023](#), [2024](#))

The market is also making a shift toward transparency. According to the EY Global Climate Risk Barometer, the agricultural sector (agriculture, food and forest products) has seen a steady increase in both the quality and coverage of climate disclosures. Figure 1 illustrates that the agricultural sector has made significant strides in climate disclosure, with coverage—a percentage score based on the number of the **Task Force on Climate-related Financial Disclosures (TCFD)** recommendations addressed in a company's reporting—increasing from 65% to 92%, and quality of disclosure rising from 35% to 51% between 2021 and 2024.

This rapid adoption and improvement reflect an increasing awareness of disclosure's significance to stakeholders. In fact, a study found that [over half of the 100 major food companies](#) are already disclosing scope 3 emissions from their suppliers. Investors have made clear that responsible business practices are inclusive of the food industry. More than 30 investors [called on](#) U.S. food and agricultural companies to disclose GHG emissions across their value chain. Others, representing more than \$8.7 trillion in asset under management (AUM), have [committed](#) to eliminate agriculture-driven deforestation risks in their portfolios by 2025. Additionally, the importance of nature-related reporting has gained global attention, with investors and companies beginning to publish disclosures aligned with the [Taskforce on Nature-related Financial Disclosures](#) (TNFD) recommendations. The growing movement toward transparency is clear: given the growing risks from extreme weather and nature loss to companies and investors, transparency about those risks is now a business imperative.

While opponents of mandatory climate disclosure have characterized reporting regulations as an additional burden on the agricultural sector, disclosure is a powerful tool to help companies navigate the complexities of understanding and addressing climate risk. More than just a compliance exercise, climate disclosure regulations provide a standardized way for companies to assess their downstream and upstream value chains for risk and improve efficiency and resiliency. Forward-looking companies are capitalizing on these opportunities. Meanwhile, the transition toward transparency will be shouldered primarily by large companies, not by farmers.

### **Implications for Companies: Costs and Benefits of Climate Disclosure**

One of the key concerns raised by opponents of climate disclosure is the cost. The Securities and Exchange Commission (SEC) acknowledged in the cost-benefit analysis for its climate disclosure rule that annual compliance costs could range from [less than \\$197,000 to over \\$739,000](#) averaged over the first 10 years of compliance, depending on the company. However, some studies argue that the costs are [minimal](#) or emphasize that the [benefits far outweigh them](#). Also, [an ERM survey](#), commissioned by Ceres and Persefoni, found that institutional investors spend an average of \$1.37 million annually to collect, analyze, and report climate data for decision-making. This highlights the importance investors place on obtaining this information, and the substantial cost of not understanding the impact of physical and transition risks. It highlights the benefits of standardizing climate-related financial information, which can significantly lower research, data, and due diligence costs across the financial sector. Under the current status quo, investors have had to spend considerable resources to access the data they need.

As many large companies already voluntarily report climate risk and sustainability information—though such voluntary reports often lack standardization and comparability—and many others are preparing to do so in compliance with regulations in Europe, California, and elsewhere, these estimated costs may have already been internalized at many companies. There are various elements to climate reporting requirements, such as governance and oversight of climate risks and the material impact of these risks on the company's business, risk management processes, and targets and goals, and not all companies report on every component. Only the largest companies that meet several thresholds will report on all elements and bear the full costs.



There are many studies demonstrating that climate disclosure brings considerable benefits that outweigh the costs. Companies with robust climate disclosure are more attractive to investors, who are [willing to pay a premium](#) in the market. These companies may enjoy enhanced access to capital, lower costs, higher market value, and better credit ratings. Morgan Stanley reported that [80%](#) of companies view sustainability as a key driver of future revenue, while McKinsey found that companies with stronger responsible business priorities are twice as likely to grow revenues by [over 10%](#). Several researchers ([Ng and Rezaee 2018](#), [Flammer et al. 2021](#), [Vestrelli et al. 2024](#)) identified a positive correlation between strong climate disclosure and company value, as well as lower costs of equity.

## Implications for Farmers: Challenges and Opportunities

There are concerns that the impact of climate disclosure may trickle down to farmers. Concerns over costs, along with the consistency and reliability of scope 3 data, led to the removal of a scope 3 reporting requirement from the SEC climate disclosure rule. However, it is worth noting that the rule as proposed applied to public companies only and had no provision mandating direct reporting from farmers. Following the rule's proposal in 2022, SEC Chair Gary Gensler repeatedly emphasized that the rule would not burden farmers with excessive reporting demands, and that regulatory obligations will fall on large companies. This discussion is now moot. The final rule that excludes scope 3 requirements entirely is currently stayed pending the outcome of litigation, and will likely be reversed or significantly modified by the SEC under the incoming administration if it survives litigation.



Large companies that are still likely to report scope 3 emissions under other regulations, such as California [SB 253](#) and the EU CSRD, often rely on reasonable [estimates and averages](#) for their emissions reporting, without seeking detailed data from all suppliers. For large agribusinesses that act as [key suppliers](#) to big corporations and comprise 75 to 80% of their supply chain, some additional data collection may be requested by partners in the supply chain. However, small farms were never subject to mandatory reporting requirements in any jurisdiction, and it is unlikely that they will be required to provide burdensome primary data to the large companies they supply. Key suppliers may be asked to provide basic information such as utility costs, fertilizer usage, or farming practices through a [questionnaire](#). This approach helps companies improve the accuracy of their emissions data.

Large companies are stepping up to provide technical and financial support to their suppliers. For instance, [Unilever's Supplier Climate Programme](#), which collects scope 3 emissions data, offers tools and resources to help suppliers improve their reporting practices. Participants in the program rapidly grew [from 35 in 2022 to over 100 in 2023](#), reflecting the success of this collaborative effort. Danone runs [representative farms](#) worldwide that monitor primary GHG emissions daily. This data enhances the precision of Danone's overall emissions modeling by extrapolating primary data from these representative farms to other farms in the company's value chain that employ similar practices. Ben & Jerry's, through its "[Mootopia](#)" project, supports 15 farms in the U.S. and the Netherlands in monitoring and reducing GHG emissions while generating surplus energy that can be sold back to the grid. [With the data from the pilot farms](#), Ben & Jerry's uses the [Cool Farm Tool](#) to report its GHG emissions. [Pizza Hut](#) has been working with Dairy Farmers of America and supporting dairy suppliers to measure farm-level emission data through the [Farmers Assuring Responsible Management and Environmental Stewardship](#) (FARM ES). Cargill has also been proactive, [introducing a Gold Standard-approved beef methodology](#) that allows producers to track methane emissions and participate in carbon markets at the same time.

For both companies and farmers, embracing transparency through climate disclosure is a strategic move that can unlock new market opportunities and improve access to capital. As the work on strengthening supply chains and bolstering agricultural resilience and food security continue to shape the future of food systems, the companies that lead the way in climate reporting will be best positioned to thrive in this evolving landscape. Forward-thinking farmers who stay ahead of climate disclosure trends will also be better equipped to form strategic partnerships with companies that are looking to meet higher standards. By aligning with corporate responsible business practices, these farmers can access new markets one step ahead, particularly in regions where similar disclosure requirements are being introduced.

### 3

## The importance of understanding climate-related financial risks for financial institutions

Since 1980, extreme weather disasters have caused **over \$1 trillion in damages**, with the agricultural sector disproportionately **affected**, including damage to field crops from lack of rainfall and heat. Research suggests that a 1°C rise in global temperatures could lead to a **12% reduction in world GDP**, with the U.S. economy potentially losing **1-4% of its GDP annually** by the end of the century. As negative impacts continue to escalate, financial institutions are considering these risks in their decision processes. In 2020, **91%** of chief risk officers at banks identified climate as one of the top emerging risks. A survey of 46 banks reveals that **15%** reported experiencing increased risk from extreme weather. **A 2019 survey** of 20 banks and seven other financial institutions revealed that 55% of mainstream financial institutions are currently adopting a strategic approach to climate risk, with 95% planning to implement such an approach in the future. Banks are **vulnerable** to physical risks that pose a **dual threat** by jeopardizing borrowers' operation and depreciating the value of collateral, which can exacerbate the bank's risk of credit losses. In 2021, Ceres found that the annual **value at risk** from physical climate impacts on just the syndicated loan portfolios of major U.S. banks could approach **10%**. If these risks go unaddressed within financial institutions, the consequences could ripple through the whole economy. It is evident that financial institutions **need effective climate risk management strategies** to safeguard against future losses as a step towards transitioning to low carbon portfolios.





## Climate risks for agricultural finance

Since agriculture faces direct physical impacts from climate change, financial institutions that work closely with the agricultural sector also **face increased risks**. Half of all U.S. agricultural loans are held by lenders whose portfolios are composed of at least **25%** farming operation or real estate loans. Many of these lenders face correlated risks due to their loan concentrations in specific regions or related agricultural businesses. A 2021 study found that rising temperatures were responsible for **19% of the \$27 billion in crop insurance payouts** between 1991 and 2017. More recently, it was found that the average Kansas farm **lost about \$66,000 net farm income** for every 1°C of warming. Without adaptation, the USDA estimates that the cost of the crop insurance program could **increase by more than a third** by mid-century. A 2022 survey revealed that **87% of 167 agricultural finance institutions** believe climate change poses material risks to farms and ranches.

U.S. farm sector debt continues to **rise**, approaching levels last seen during the **1980s farm crisis** that impacted agricultural communities and lenders. Farmland, valued at **approximately \$2.5 trillion**, is increasingly vulnerable to impacts from extreme weather. If farmers cannot repay loans due to climate-related challenges, lenders and insurers will face significant financial losses. **Environmental Defense Fund** warns that this could impair loan portfolios and destabilize financial institutions that are essential to supporting agriculture and crop insurance is not sufficient to protect farmers or lenders entirely from climate risks. The **Center for American Progress** has already noted that with the farm economy likely to be hit by severe climate stress, public finances could be further strained as the federal government steps in to stabilize the sector. Declines in productivity due to extreme weather are far more severe when farmers operate with slim margins. These examples show how the financial burdens farmers already bear could be compounded by climate challenges, especially when declining productivity leaves them with minimal margins.

The American Farm Bureau Federation estimates that natural disasters caused **\$21.5 billion in agricultural losses** last year alone, and crop insurance payouts have increased **over 500%** in the last two decades, accompanied by a significant **increase** in total liabilities. This not only affects farmers, who rely on insurance to protect their revenues but also taxpayers, who currently cover about **60% of the federal crop insurance program**. As warming temperatures continue to drive extreme weather events, the cost of crop insurance programs is **more likely to soar**, making the coverage needed for farmers more expensive. Moreover, if commodity prices rise in the future, the value of insured crops will increase, resulting in higher insurance premiums and payouts. This creates a vicious cycle where farmers become more dependent on public subsidies, and taxpayers are left footing an increasingly large bill.

Integrating climate risk and value associated with climate resilience into agricultural finance is not just about the matter of sustainability—it is about economic and financial prudence. Neglecting to incorporate these risks into agricultural finance would be a costly mistake for both food supply chain actors and the broader economy. **The majority of agricultural lenders** said that agricultural conservation practices are very important, and they need more information about the financial impact of these practices on the farm. By integrating climate risk in their decision-making processes, financial institutions can play a key role in shaping a more resilient agricultural system, protecting farmers, taxpayers, and the economy as a whole.



## Conclusion

The future of the food system hinges on its ability to adapt to the growing challenges posed by the changing climate. Identifying, disclosing, and managing water, nature and climate risks is essential for unlocking economic and financial opportunities, enhancing resilience, and ensuring long-term agricultural productivity. It is important to acknowledge that the move toward more sustainable and transparent practices is complex and may demand initial investments, as well as considerable time and effort for across the agricultural system. Nevertheless, the benefits should also be considered, as they outweigh the associated costs in the long term. Companies and farmers stand to gain from embracing innovative practices that will create stronger, more resilient value chains, while helping mitigate long-term risk. For agricultural financial institutions, equipping themselves with the tools to assess and manage climate risks will not only protect their portfolios but also support necessary innovation across the food system. Together, these efforts will drive a more resilient and productive future for the food and agriculture industries and the global community they serve.

### About Freedom to Invest

Freedom to Invest supports investors and businesses in protecting their long-standing rights to invest and operate responsibly, ensuring long-term value and a more stable, resilient economy. The initiative is at the forefront of defeating state and federal legislation that seeks to ban responsible business practices, where investors and companies consider all financial risks and opportunities in decision-making.

This report was produced by Ceres for the Freedom to Invest initiative.

#### Lead Authors:

Meryl Richards, Program Director, Food and Forests, Ceres

Eunyoung Lee, Senior Associate, Ceres Accelerator for Sustainable Capital Markets, Ceres

Thanks also to the colleagues at Ceres for their invaluable contributions to this report, including Jim Coburn, Andrew Collier, Heather Green, John Kostyack, Jake Rascoff, Tom Riesenber, and Steven Rothstein.