WHITE PAPER

# Advancing Organic to Mitigate Climate Change

SINCE 1985
Organic trade association

## Executive Summary

Climate change poses an existential threat to our world, and bold policy solutions are needed to mitigate the impacts and help farmers and communities adapt to the changing climate. Organic agriculture presents a growing opportunity to mitigate climate change while creating economic, environmental, and health benefits for all food system participants. Organic agriculture mitigates climate change by reducing direct and indirect sources of greenhouse gas emissions, and acting as a carbon sink via soil carbon sequestration. Organic agriculture helps adapt to climate change by promoting soil health, biodiversity and resilient agroecosystems. Public and private efforts to support organic as a climate mitigation tool exist, but need stronger federal support to maximize benefits. This paper identifies specific recommendations to support organic farmers, and encourage transition to organic farming as a key strategy for climate change mitigation and adaptation in the agriculture sector.

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## CHAPTER 1 Threats of Climate Change and the Benefits of Organic

**Climate change poses an existential threat to our world, and bold policy solutions are needed to mitigate the impacts and help farmers and communities adapt to the changing climate. According to the International Panel on Climate Change, the global average temperature increased by 1.8°F from 1901 to 2016, and current trends indicate the planet is likely to warm 2.7 °F between 2030 and 2052 if drastic mitigation steps are not taken.[1] This warming will have significant consequences for communities, economies, and ecosystems. Already we are seeing severe negative impacts to infrastructure and human wellbeing caused by extreme weather events such as flooding, drought, extreme heat, wild fires, ocean acidification, and other natural disasters.[2]**

The predominant cause of climate change is anthropogenic (human-caused) emissions of greenhouse gases: carbon dioxide, nitrous oxide and methane. Carbon dioxide emissions from fossil fuel combustion are the primary contributor to climate change, mainly due to the impacts of the electric power and transportation sectors.[3] Agriculture is a contributor to climate change, representing almost 10% of all greenhouse gas emissions in the United States (Figure 1).[3] Agriculture also contributes indirectly to greenhouse gas emissions in the electric power sector by driving the demand for manufacturing fossil fuel-based ammonia fertilizer.

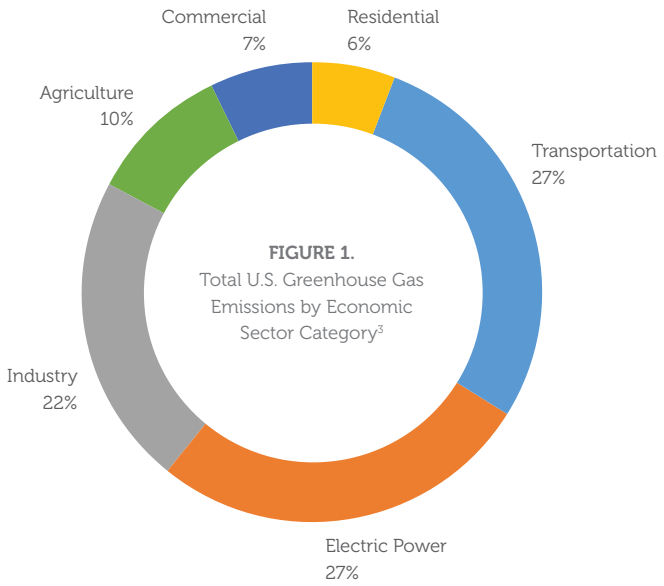


**FIGURE 1.**
Total U.S. Greenhouse Gas Emissions by Economic Sector Category[3]

Organic agriculture is distinct from conventional farming systems in its role in climate change. Whereas agriculture overall is a significant contributor to climate change and highly susceptible to its damaging impacts, organic agriculture is uniquely positioned to improve agricultural practices and outcomes that can help farmers mitigate and adapt to climate change. Organic agriculture is a USDA-certified system of crop and livestock production using cultural, biological, and mechanical practices that foster the cycling of resources while promoting ecological balance, and conserving biodiversity.

Organic production can help agriculture mitigate climate change by reducing direct and indirect sources of greenhouse gas emissions, and acting as a carbon sink via soil carbon sequestration. Organic agriculture helps farms and ranches adapt to climate change by promoting soil health, biodiversity and resilient agroecosystems. Long-term studies of organic farms have shown that organic production emits 18% less global warming potential than other farming systems.[4]

**1.1 Organic reduces emissions of carbon dioxide by avoiding fossil fuel-based fertilizers** The production, transport and use of fossil fuel-based fertilizers and pesticides are the main uses of energy in agriculture, and are significant contributors to greenhouse gas emissions, particularly carbon dioxide.[5] Synthetic fossil fuel-based nitrogen fertilizers are significant sources of both indirect and direct greenhouse gas emissions. Indirect emissions are primarily due to fuel burned in transportation and energy used during the Haber Bosch process, which creates ammonia used as synthetic fertilizer. The direct emissions come from the release of nitrous oxide from on-farm applications of synthetic fertilizer application, as further described in the next section.

The manufacture of synthetic nitrogen fertilizer alone comprises as much as 10% of direct global agricultural emissions, representing a 37% increase since 2001.[6, 7] Fossil fuel-based fertilizers are entirely prohibited in organic production. Organic production's contribution to greenhouse gas emissions is significantly reduced by completely eliminating the energy demanded for manufacturing fossil-fuel based inputs. Abstaining from synthetic nitrogen fertilizer requires organic farmers to avoid the primary direct and indirect emissions of greenhouse gasses from manufacturing and applying these inputs. The elimination of synthetic nitrogen fertilizers could lower direct global agricultural greenhouse gas emissions by about 20%.[6]

**1.2 Organic reduces emissions of nitrous oxide by avoiding soil applications of synthetic nitrogen**

Organic farming practices can help curb nitrogen pollution by preventing the creation of new reactive nitrogen. Most nitrogen is found in the air as N2, and cannot be used by plants or other living things, and does not contribute to climate change. However, when that nitrogen goes through a chemical process called fixation, it becomes reactive. Reactive nitrogen is needed for plant and animal growth, but it also can cause a host of environmental problems, including climate change through its nitrous oxide form. More and more of the benign, unreactive nitrogen on earth is getting transformed into the reactive form, primarily through the creation of synthetic fertilizer.

Synthetic fertilizer application on conventional crops, particularly for corn and soybeans, is one of the leading sources of direct greenhouse gas emissions in agriculture. While all farming can release nitrous oxide at some level, synthetic nitrogen applied to soils increases nitrous oxide emissions at the site of the application.[3] Nitrous oxide is an extremely potent greenhouse gas, estimated to have around 300 times more global warming potential than carbon dioxide because of how long it remains in the atmosphere.[8] This source of nitrous oxide emissions accounts for 77.8% of total nitrous oxide emissions in the United States.[3]

### Organic 101

A voluntary process, organic **certification** is defined by USDA in consultation with organic stakeholders and is monitored and enforced by the National Organic Program (NOP). Organic certification is designed to certify every step of the organic supply chain in strict accordance with federal regulations, making organic the most comprehensively regulated and closely monitored food production system in the U.S. All certified organic farms and businesses must adhere to the same strict practices regardless of size.

Organic **crops** are grown without the use of toxic pesticides, synthetic nitrogen fertilizers, genetic engineering, sewage sludge, or irradiation. To control pests, diseases, and weeds, organic farmers rely on hand weeding, mulches, cover crops, crop rotation, and dense planting. Additionally, the land must be managed without prohibited materials for at least three years to quality for organic certification.

Organic **animals** must be raised without the use of antibiotics or synthetic growth hormones. Organic farmers must provide animals with 100% organic feed and safe, clean, cage-free living conditions. In addition, organic farmers must provide their animals with year-round access to the outdoors and pasture.

Organic **foods** have minimal processing and are made without artificial ingredients, colors, or synthetic preservatives. The use of GMOs is expressly prohibited in certified organic products. Organic food must be processed in an operation that has been certified to organic standards and which has taken special steps to ensure that organic ingredients are not commingled with non-organic or other prohibited materials.

Organic farming also slows the growing over-abundance of reactive nitrogen on our planet, such as nitrous oxide, by minimizing the introduction of reactive nitrogen into our global pool through the application of synthetic fertilizer. Instead, the majority of reactive nitrogen on organic farms comes from recycled sources like compost, or a small amount of new reactive nitrogen from nitrogen-fixing bacteria in the roots of cover crops or other legumes. A 2020 study shows that across all food groups, organic production uses around 50% less new reactive nitrogen in comparison with conventional production.[9] Not only does organic add significantly less to the global pool of reactive nitrogen, it also helps cycle potential nitrogen waste pollution back into food production by using manure and food waste as fertilizer.[9]

**1.3 Organic sequesters carbon by promoting soil health** Organic production methods utilize a suite of soil management practices to build soil health and crop fertility in lieu of artificial fertilizers. The four key organic farming techniques that improve soil health outcomes are cover cropping, crop rotation, using organic soil amendment, and tillage.[10] Organic farms may also integrate livestock. These practices increase soil health and help farms store more carbon in the soil than other conventional and chemical-intensive farming methods.[11, 12, 13, 14, 15, 16]

**Cover Crops:** Cover crops enhance soil health by protecting soil from erosion and nutrient losses while providing weed suppression. Cover crops are also often a critical source of nutrients for cash crops through nitrogen fixation and green manure.

**Crop Rotation:** Crop rotation is the practice of alternating the annual crops grown on a specific field in a planned pattern or sequence in successive crop years so that the crops of the same species of family are not grown repeatedly without interruption on the same field. Cover rotations break pest and weed cycles, help cycle nutrients, and reduce economic risks associated with single cropping strategies. Organic farms tend to have longer and more complex crop rotations than their conventional counterparts, which lead to higher on-farm diversity and greater soil health outcomes.

**Organic Amendments:** In addition to managing soil and plant fertility through cultivation and crop rotation strategies, organic farms may also apply plant and animal materials. Organic amendments such as compost and manure can enhance nutrient content in soils and increase soil carbon sequestration capacity.

**Tillage:** Tillage is a mechanical and physical weed control technique commonly used by organic farmers in place of chemical herbicides. Although tillage has been critized for releasing carbon dioxide from the soil, shallow non-inversion tillage practices in organic systems actually reduce greenhouse gas emissions while simultaneously increasing soil organic carbon, providing a viable greenhouse gas mitigation strategy in comparison to conventional no-till systems that rely on chemical herbicides.[17, 18] Even when organic full-till is compared to conventional no-till, organic still sequesters more carbon than conventional.[16] The suite of soil fertility management practices used by organic farmers in combination with tillage leads to greater increases in soil organic carbon.

**Livestock Integration:** Organic livestock operations can build soil health through integrated grazing practices. Large-scale livestock production is criticized for contributing to green-house gas emissions because it results in the release of huge amounts of methane.

However, organic ruminant livestock are required to be on pasture during the grazing season. Well-managed pastures can improve soil quality and store carbon, which would otherwise contribute to climate change as carbon dioxide and methane in our atmosphere.[19, 20] This is especially true when livestock are incorporated into organic crop rotations because the manure from animals can reduce reliance on synthetic nitrogen fertilizer, which is energy intensive to produce and releases carbon dioxide into the atmosphere. The organic livestock production benefits are in stark contrast to conventional concentrated animal feeding operations that depend on conventional corn and soy, are reliant on energy intensive synthetic nitrogen, and manure storage facilities that release more greenhouse gases.

Researchers at the National Soil Project at Northeastern University, in collaboration with The Organic Center, have shown that soils from organic farms sequester 26% more carbon than soils from non-organic farms.[17] The research compared over 1,000 soil samples from organic and agricultural soils to understand how organic compares to average agricultural management practices that influence components of soil organic carbon. The study was the first to compare the amount of total sequestered soil organic carbon between agricultural systems on such a wide-scale basis, and found significantly greater amounts of these substances in organic systems.[21, 22]

**1.4 Organic protects biodiversity and beneficial organisms** Biodiversity is key to agricultural systems' ability to adapt to a changing climate by supporting the abundance and richness of beneficial insects such as pollinators and pest predators. A far-reaching meta-analysis shows that organic farms have 30% more species than conventional farms.[23] Other research shows that organic production increases beneficial insect biodiversity without increasing pest insect diversity.[24] Organic farming supports soil biodiversity, as well. Soil organic carbon found in organic farms provides important building blocks for beneficial microorganisms in the soil that are vital to decomposition and nutrient cycling.[25]

Organic farms also provide critical support to pollinators, predominantly bees, relied on by 75% of all crops grown for human consumption. Pollinator health and population numbers are declining at alarming rates for various reasons, including chemical-intensive farming practices. Organic agriculture, however, can provide critical solutions that not only decrease risks to pollinators, but actively support the growth and health of pollinator populations. A number of studies have demonstrated that organic farms support up to 50% more pollinators than conventional farms.[23, 26, 27] Organic practices benefit pollinators by avoiding toxic chemicals, providing diverse habitat, and providing abundant food sources for pollinators.[28]

**1.5 Organic increases resiliency of agricultural systems** Soils high in organic matter support healthy crops, are less susceptible to drought, and foster a diversity of organisms vital to soil health. Organically managed soils have greater biological activity, greater soil stability, more biomass and higher diversity than conventionally managed soils.[11] Organic managed soils also tend to have higher water-holding capacity, porosity, and aggregate stability than conventionally managed soils, which can protect against yield losses in extreme weather events such as droughts and flooding.[29, 30, 31] These resiliency factors mean that organic may fare better as our planet continues to experience extreme weather events resulting from climate change. The appeal of organic is that its benefits are not limited to one operation or plot of land. The entire community benefits from improved water dynamics, increased biodiversity, and increased adaptability when faced with an uncertain future.

Although organic production is generally less productive than intensive conventional operations in the short-term, studies show that organic has higher yields in extreme weather events (like drought and/or excessive rainfall).[29, 32] A 2020 study shows that even with lower yields, greenhouse gas emissions for organic production were so much lower than conventional production that even on a per unit basis of production comparison, organic's global warming potential was lower.[33] Furthermore, the yield gap between organic and conventional production continues to shrink as organic production practices are better understood and researched. The magnitude of the yield gap varies by crop type and management practices, and in some cases the yields in organic are equal or greater than conventional counterparts. Organic farming systems have long-term environmental conservation values while simultaneously supporting positive economic and human health outcomes.

### The science says organic farms:

Emit **18% less global warming potential** than other farming systems

Use around **50% less new reactive nitrogen**, a potent greenhouse gas

Have **30% more species** and support up to **50% more pollinators** than conventional farms

Have **greater biological activity, greater soil stability, more biomass and higher diversity**, and sequester **26% more carbon** than soils from non-organic farms

## Benefits of organic beyond climate change mitigation and adaptation

### Organic Protects Human Health

Studies consistently demonstrate that organic can make a significant difference in your exposure levels to harmful pesticides and other chemicals. For example, eating an organic diet for a week was shown to reduce total pesticide metabolite levels by up to 96% with an average reduction of 50%.[34] Organic milk products and organic meat products are shown to contain significantly less or unwanted residues of pesticides, antibiotics and other chemicals.[35, 36] The prohibition of the most toxic agricultural chemicals in organic farming not only benefit consumers and the environment, but also reduces farmer and farmworker exposure and improves occupational health.[37] Avoiding pesticide exposure reduces health risks associated with cancer, neurodegenerative disorders and poor reproductive health.[38]

### Organic Drives Rural Development

Organic farms provide opportunities to make farming economically viable. Between 2012 and 2017, the number of organic farms grew by 39%, while the total number of farms in the U.S. shrank by 3%.[39] During that same time period, organic farm income nearly doubled while the income of all U.S. farms remained stagnant. Younger farmers gravitate to organic as well — the average age of organic farmers is six years younger than that of the national average of all farmers.[39] Organic hotspots— counties with high levels of organic agricultural activity whose neighboring counties also have a high level of organic activity — boost median household incomes by an average of $2,000, and reduce poverty levels by an average of 1.3 percentage points.[40] In total, 225 counties across the U.S. are identified as organic hotspots.[40]

### Organic is the Fastest Growing Sector of Agriculture

The $55 billion-a-year organic industry is a bright spot in the U.S. farm economy supported by more than 28,000 certified organic operations nationwide. U.S. organic food sales continue to grow at a rate more than double the rate of the overall U.S. food market, and organic now accounts for nearly 6% of all food sales. Over 8% of all dairy products and 15% of all fresh produce sold in the U.S. are certified organic. When viewed as a commodity class, organic is the fourth largest food and feed commodity in the United States.[41] The organic industry is just as diverse as the U.S. economy as a whole, with many small- and medium-sized farms and businesses participating in the program as well as large farms and food companies. Over the past decade, innovation in the sector has proven that organic production can be scaled up to meet increasing consumer demand while adhering to stringent standards and practices that protect the planet.

## CHAPTER 2 Opportunities for Policy Responses to Support Organic

**This chapter outlines broad programmatic areas where policy responses can be effective in supporting the organic sector. Addressing these areas will enhance the ability for organic to continue to be a solution to climate change by giving producers the tools and resources needed to transition to and stay in organic production. As organic production grows, so does its impact on climate change mitigation and adaptation.**

**2.1 Research** Research in organic production can accelerate the growth of the industry and thus expand organic's ability to mitigate climate change. There is a range of topics where research is needed to improve the efficiency of organic production practices and maximize climate change mitigation. Long-term studies at scale are needed to determine the most effective carbon sequestration techniques in organic systems. Such research can evaluate the relative impacts of different organic management practices on soil health outcomes and identify which practices are most efficient and effective depending on each farm's unique circumstance. Right now, organic research is too general to tailor to every soil type, crop type, or region of operation.

Proper measurement tools for evaluating soil health outcomes are essential for connecting research on farming practices with soil health benefits. Soil tests are important for farmers to understand what crops are best suited to their land, and for measuring conservation outcomes. Unfortunately, soil testing can be expensive. Highly qualified individuals must use expensive equipment in multiple locations on a plot to gather actionable amounts of information. Improved technology and better understanding of what constitutes a representative sample would drastically reduce the cost of soil testing, improve practices, increase climate change mitigation, and facilitate market growth.

The span of other research topics important for advancing organic is broad. Research on production practices must be site-specific to accommodate unique variation in climate, soil types, and other factors. Research and development in organic seed breeding is critical so that seeds can grow successfully in organically managed agricultural systems. Research in effective and organic-compliant controls for diseases, weeds, and pests is crucial for organic farmers to be productive under organic management practices, especially as climate change shifts pests' reproductive cycles and regional presence. The need for research is limitless as organic production continues to improve based on science-based evidence and data.

**2.2 Technical Assistance** The technical assistance infrastructure that exists for conventional agriculture does not exist for organic producers. Since the advent of synthetic inputs, the agricultural market has developed towards mono-cropping and increasing chemical use. As a result, fewer resources have been devoted to organic production systems. The skill set for building soil health and controlling weeds without chemical inputs is starkly different than conventional farming, and therefore requires unique and diverse skillset. This has created a challenging environment for organic farmers and those in the process of transitioning to organic production who need technical services.[42] Organic producers who seek technical assistance at conventionally oriented extension services face a lack of knowledge on organic systems and even bias against organic farming practices.[43] The 2019 report "U.S. Organic Grain: How to Keep it Growing" identified this lack of professional support as a major barrier to growing the organic grain sector.

The rules and regulations for organic can be complicated for people unfamiliar with the system and require a different understanding of farming practices. There is a steep learning curve for transitioning from conventional to organic production practices. Organic farmers utilize systems-based practices that combine natural ecological processes and management techniques to build soil health and reduce pests, processes that can take years to fully mature. Grasping the fundamentals of organic production systems requires a different base of knowledge and implementation of different techniques compared to conventional farming practices. Techniques like cover cropping, crop rotations, rotational grazing, non-chemical nutrient inputs, and preventive pest control are critical concepts that require specialized technical assistance not available at the same level as for conventional farmers.[44] Farmers need more robust access to technical support from agricultural professionals trained in organic production methods and organic compliance regulations.

Regional differences in soil, weather, and ecosystems often do not match the limited organic assistance that has been developed. For example, practices that are suited to California, where most organic technical assistance has been developed, are not necessarily suited to a farm in Iowa. This points to knowledge gaps in publicly available information and assistance. It is critical that technical assistance is regionalized to accommodate site-specific conditions.


**General Mills Partners with Montana Organic Farmer on Limited Edition Annie's Mac & Cheese**

A great example of the innovation that is happening between food companies and farmers is a recent partnership between General Mills and Montana farmer Nate Powell-Palm on a limited-edition production of certified organic Annie's Mac & Cheese that incorporates crops grown using regenerative practices that improve soil health. In 2018, General Mills started purchasing certified organic yellow peas and durum wheat to incorporate into the elbow pasta in their popular Annie's Mac & Cheese line. Not only are these crops key to soil fertility on Nate's farm but they also provide a healthy and nutritious protein source for consumers. The launch was so successful that General Mills is now sourcing complete crop rotations from single origin farms in Montana for use in their Mac & Cheese and Bunny Grahams.[48]

Organic farmers utilize systems-based practices that combine natural ecological processes and management techniques to build soil health and reduce pests.

**2.3 Financial Risk Management** The financial risk taken on by new or transitioning organic farm operators or landowners can be a significant barrier to adopting sustainable agricultural and conservation practices. Organic certification requires farms to be under 36 months of organic management since the last application of a prohibited substance. During this transition period, farms can experience lower yields as soils adjust to organic management practices. Organic production methods can also incur higher costs, primarily due to labor and feed costs, compared to conventional agriculture.[45] Additionally, during the required three-year transition period, the farmer is unable to enjoy the price premium organic products demand. These factors can result in a costly experience for transitioning farmers. Farmers need support to overcome the barrier of transition costs.

Organic farmers also lack access to appropriate risk management tools such as crop insurance that accommodate the crop diversity and intensive management of organic systems. This is a key area for further policy development so that organic practices are protected and not discouraged by the administration of federal crop insurance programs. Additionally, organic farmers must pay certification and inspection fees to maintain third-party organic certification. Operations in remote areas may face disproportionally high fees.

Conservation practices can also take years to show a return on investment. If farmers are able to successfully transition to organic, the benefits are typically beyond conventional farming levels, and are better adapted to the rapidly changing climate. Improved soil health, biodiversity, increased diversity of pollinators, and increased yields are better suited to withstanding the increasingly common, and extreme, weather patterns climate change is exacerbating. Organic is particularly resilient in the face of extreme weather, reporting higher yields than their conventional counterparts in drought conditions due to the healthier soil they have cultivated.[29] In this way, organic production can be a form of risk management for farmers in and of itself when done successfully.[46]

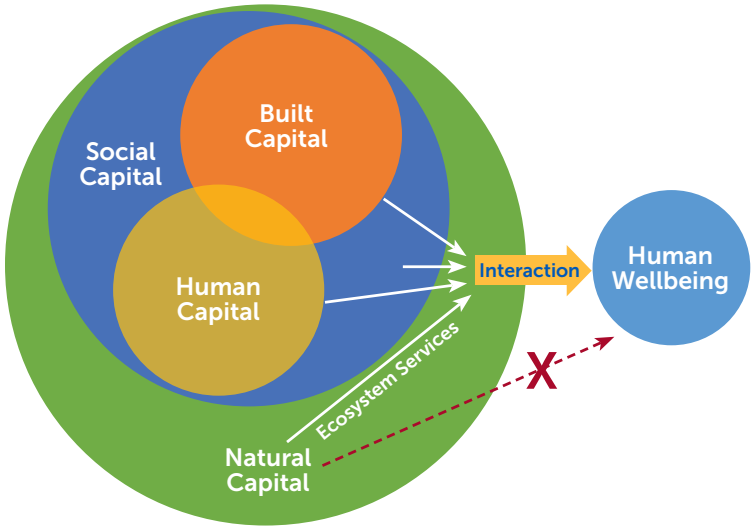


FIGURE 3.
THEORY OF ECOSYSTEM SERVICES[51]

To calculate the amount of reward or payment for a given ecosystem service outcome, agriculture needs proper measurement tools and metrics. Efforts to support agricultural climate change mitigation in carbon markets or through government programs require better information. Further government investment is needed to develop accurate and adaptable tools for measuring and quantifying ecosystem services. Uncertainty in quantifying ecosystem services, and the cost of monitoring them have resulted in most conservation programs being process- and not outcome-based. However, measuring outcomes is a critical tool for measuring success, calculating payments for farmers, and setting meaningful targets for continuous improvement. Better understanding of organic's contributions to ecosystems is needed for policymakers to make informed decisions. With proper measurement tools, policies can be put in place to incentivize specific quantities of carbon capture and other positive outcomes achieved through organic agriculture.

**2.4 Market Infrastructure Development** Successful organic production requires market access, local processing infrastructure, and market stability. For organic farms practicing diverse crop rotations and cover cropping, it can be challenging to market the full range of crop types produced on a farm. The organic market would benefit from improved market infrastructure and development, particularly around minor rotational crops such as oats, yellow peas, and others that are critical for soil health building but are not the primary cash crops. Cover and rotation crops are important for carbon sequestration and organic farm production due to the benefits they have for soil health, suppressing weeds, nitrogen fixing, biodiversity, and climate change mitigation.[44, 47]

Small markets may exist for these minor crops, but it can be challenging for organic producers to access those markets. Expanding the market infrastructure for soil-building crops will incentivize all farmers to implement conservation practices. Better partnerships and connections need to be established by food companies and farmers to create food-grade markets for these soil-building crops in both organic and conventional systems. Additionally, it is important that market and infrastructure development policies recognize that organic is a distinct supply chain that requires certified organic handlers to process these crops. For example, while the production capacity and market demand for domestically produced organic grains are high, the processing infrastructure has not kept pace, and farmers face challenges in finding local grain mills to process organic.

**2.5 Ecosystem Service Incentives** Organic production is clearly linked to improvements in soil health, biodiversity, water quality and other environmental and human health benefits. The continual improvement of a farm's natural resources through organic practices is valuable not only to the farmer's own productivity, but to the planet. However, these values and benefits are not being captured by the market nor returned to farmers responsible for providing those benefits. The concept of incentivizing organic production through payment for ecosystem services, including carbon sequestration, is an area ripe for policy development. Despite the importance of cover crops to carbon sequestration and overall soil health, cover crops are only utilized on 4% of total farmed acreage, according to the latest available data, while organic acreage is about a half-percent of overall U.S. farming acreage.[39, 49] The potential is great for expanding these carbon sequestration practices.

The Millennium Ecosystem Assessment defines ecosystem services as the "benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth."[50] The theory behind ecosystem services is that social capital, including built and human capital, interacts with natural capital through ecosystem services to produce human well-being (Figure 3).[51] Researchers estimate that the global value of ecosystem services provided to humans exceeds $139.54 trillion per year (updated to 2018 dollars), far exceeding the World Bank estimate of the world's total GDP, which was $85 trillion in 2018.[51, 52] One way governments have addressed market failure to capture value created through ecosystem services is through the creation of carbon markets, but to date these markets have not accurately captured agriculture's contribution to climate change mitigation.

Policies designed to support farming practices with positive environmental outcomes have been growing at the federal, state, and private levels. Typically utilizing public-private partnerships, these programs use a combination of expertise, education, financial incentives, grants, and market-access to improve agriculture's ability to mitigate and adapt to climate change. Innovative efforts at the state and private level may provide a roadmap for the federal government to create new, or enhance, existing programs to support the growing organic market. Regardless, the federal government provides significant investment to agricultural conservation efforts, and is projected to spend upwards of $60 billion in support of U.S. agriculture in 2020.[53]

## CHAPTER 3 Existing Policy Responses to Climate Change and Agriculture

**3.1 Federal Programs** The goal of many federal programs is to encourage conservation behaviors that benefit crop yields while increasing ecosystem services. This creates a positive feedback loop for farmers: as the land improves, so does the farm. Several policies and departments have implemented programs with the aim of climate change mitigation through carbon sequestration. To date, methane and nitrous oxide emissions have received far less attention from policymakers, although conservation programs tend to reduce those emissions as corollary benefits to explicit conservation goals.

**2018 Farm Bill** The Agriculture Improvement Act of 2018, H.R. 2, is commonly referred to as the "farm bill." It reauthorizes agricultural funding through FY 2023 and addresses commodity support, conservation, trade and international food aid, nutrition assistance, farm credit, rural development, research and extension activities, forestry, energy, horticulture, crop insurance, livestock, agriculture and food defense, and historically underserved producers. The 2018 Farm Bill made some progress on improving agriculture conservation. Disincentives for using cover crops were removed, while encouraging conservation planting on marginal lands that are ideal for increasing carbon sequestration and biodiversity. The bill includes $25 million for a Soil Health Demonstration Trial that will pay farmers to adopt and experiment with crop and soil management practices that build soil carbon, as well as establish procedures and methods for measuring outcomes.[54]

**United States Department of Agriculture** USDA is a major component of federal responses to climate change and agriculture. Several agencies within USDA provide funds, technical assistance, and incentives for farmers to adopt better conservation practices on their farms.

**USDA Natural Resources Conservation Service** The Natural Resources Conservation Service (NRCS) is the primary federal agency that works with private landowners to conserve, maintain, and improve natural resources. NRCS emphasizes voluntary, conservation through technical assistance, partnerships, incentive-based programs, and cooperative problem solving with communities.

**NRCS Conservation Reserve Program** From offices that span the country, the Farm Service Agency (FSA) administers several programs to support farmers, including the Conservation Reserve Program (CRP). The program is aimed at conservation, in which farmers agree to remove environmentally sensitive land from agricultural production, and plant species that will improve environmental health and quality. For instance, CRP can provide organic farmers with assistance to establish natural borders around organically farmed land that improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. The practice also has been shown to improve certain crop yields due to the habitat it provides to pollinators, like honeybees.[55]

**NRCS Conservation Effects Assessment Project** The Conservation Effects Assessment Project (CEAP) is an effort by NRCS that attempts to quantify the effects conservation activities have. CEAP has over 60 collaborators from other federal agencies, land grant universities, non-profits, and private operators.[56] In terms of cropland, CEAP samples "representative fields" and extrapolates that data to estimate impacts on various conservation outcomes and other cropland.

**NRCS Soil Survey** The NRCS Soil Survey is a comprehensive evaluation of soil type across the United States with almost 100% of the country's counties represented.[57] The data has been compiled in a relatively user-friendly web-based platform that allows the public to review the soil types and samples across the country. This is a remarkable achievement but its usefulness is variable. Soil data can be out of date and inconsistent in terms of what was measured and reported. Better utilizing the soil data and web tool could help develop regional resources, down to the granular level provided in the survey.

**USDA Agricultural Research Service** The Agricultural Research Service (ARS) is a scientific research agency that seeks solutions to agricultural problems from field to table.[58] ARS research initiatives include the Integrated Farming Systems Project. The project's aim is to "study the farm as a comprehensive system" through different activities like comparing manure application methods, quantifying various agricultural emissions, and predicting carbon footprints.[59] For instance, the project has found that grass-based dairy production is a viable option for organic milk producers, particularly through the use of rotational grazing.[60]

**USDA National Institute of Food and Agriculture** The National Institute of Food and Agriculture (NIFA) takes an integrated approach to food and agricultural science. Recognizing the growing organic market, NIFA supports two major organic initiatives: the Organic Agriculture Research and Extension Initiative (OREI) and the Organic Transitions program (ORG). The 2018 Farm Bill increases funding for OREI from $20 million a year to $50 million by 2023.[61]

**USDA National Agroforestry Center** Agroforestry intentionally combines agriculture and forestry to create integrated and sustainable land-use systems to take advantage of the interactive benefits of combining trees and shrubs with crops and/or livestock. Since trees and other deep-rooted plants store carbon at higher rates, this is a significant program for combating climate change through agriculture.[62] NAC works in conjunction with USDA's Forest Service Deputy Areas, Research and Development and State and Private Forestry, and NRCS.[63] Activities in 2018 sought to "understand and quantify the ecosystem services that agroforestry systems can provide, such as water quality, pollinator habitat, and soil health."[64]

**USDA Climate Hubs** Climate hubs collaborate across USDA's agencies to deliver timely and authoritative tools and information to agricultural producers and professionals.[65] Climate Hubs are part of USDA's response to increased concerns about agricultural resiliency to changing climates and extreme weather events. Climate Hubs develop "science-based, region-specific information and technologies to provide access to assistance" to implement solutions.[65] Climate Hubs are located across 10 regional hubs including the Caribbean.[66]

**National Academy of Sciences Board on Agriculture and Natural Resources** The Board on Agriculture and Natural Resources (BANR) is the major program unit of the National Academies of Sciences, Engineering, and Medicine responsible for organizing and overseeing studies on agriculture, forestry, fisheries, wildlife, and the use of land, water, and other natural resources.[67]

One relevant study, "Toward Sustainable Agricultural Systems in the 21st Century," makes recommendations to help farming systems shift away from exclusively emphasizing low costs and high production and toward developing a more holistic perspective of how farms provide benefits to society, similar to the whole farm concept organic agriculture utilizes.[68] The report recognizes the vital role on-farm experimentation by private actors has for improving sustainability. It also recognizes that present-day mainstream agricultural production will require new thinking about farming practices and how they interact with the natural environment.[68]

### 3.2 State Programs

Many states have implemented programs designed to support sustainable practices for both organic and conventional producers, and several are included here as examples. California has created the "Climate Smart Agriculture Initiative," which is designed to reduce greenhouse gas outputs while conserving water and improving soil health. Pennsylvania recently passed legislation that utilizes a private-public partnership model to reduce barriers to transitioning to organic and to encourage new and beginning farmers to thrive in the marketplace.

**California's Climate Smart Agriculture Initiative** California, the nation's leader in organic agriculture, has embraced a number of "Climate Smart" agricultural programs that are designed to both mitigate climate change and adapt to the new reality climate change is creating. Climate Smart Agriculture uses existing paradigms in federal conservation programs to build off of and enhance conservation outcomes. These programs include the Healthy Soils Initiative, the Sustainable Agricultural Lands Conservation Program, the Alternative Manure Management Program, and the State Water Efficiency and Enhancement Program.

**CA Healthy Soils Initiative** The California Healthy Soils Initiative (CHSI) was first implemented in 2017. CHSI is designed to mitigate all three major agricultural emissions: carbon dioxide, nitrous oxide, and methane. The program provides financial assistance through grants for compost use, a practice already used by many organic farmers. It considers distribution, application rates, pathogens, monitoring, life-cycle concerns, technical assistance, and consequences of increased use of compost on ecosystems.[69] It is a heavily researched and carefully designed program.

CHSI is complex in its implementation and administration. However, the complex nature of the program's incentives is what makes CHSI an excellent option for climate change mitigation. Use of compost reduces methane emissions by diverting waste from landfills and returning those nutrients to the soil. The program differs between places of application (annual crops, tree crops, rangeland) and types of compost (conventional, organic; low nitrogen, high nitrogen). Further research should be done for regional differences in soil. California's initiative addresses this need by requiring soil samples to be taken and results delivered to the program administration, creating a feedback loop that can be used to improve the incentives and practices included in CHSI.

**CCOF's Roadmap to an Organic California**

In 2019, California Certified Organic Farmers (CCOF) published the report "Roadmap to an Organic California," a comprehensive review of peer-reviewed science about organic's benefits and provided policy recommendations to use organic to sequester carbon, decrease economic insecurities, and improve health.[72, 73] Their recommendations recognize the negative effects climate change is having on the organic industry, and seek to fully integrate organic into California's climate strategy. This proposed integration features greater water-use efficiency, technical assistance, research, and conservation of agricultural land.

**CA Sustainable Agricultural Lands Conservation Program** The Sustainable Agricultural Lands Conservation Program (SALC) is a grant program that operates within California's Strategic Growth Council's Affordable Housing and Sustainable Communities Program. SALC invests in agricultural conservation easements and strategies for the development of agricultural land to reduce GHG emissions to create a more resilient agricultural sector. The program is funded by cap and trade dollars to invest in disadvantaged communities that are disproportionately impacted by pollution and climate change.

**CA Alternative Manure Management Program** The Alternative Manure Management Program (AMMP) provides grants to non-digester manure management practices, which result in lower GHG emissions. The program funds projects that utilize pasture-based management, solid separation or conversion from flushing manure to scraping the waste into a drying or composting effort. The 58 projects funded by AMMP have reduced GHG emissions by an estimated 716,800 metric tons of CO2 over five years, or the equivalent of removing roughly 167,000 cars from the road.[70]

**CA State Water Efficiency and Enhancement Program** The State Water Efficiency and Enhancement Program (SWEEP) is a competitive grant program awarded to agricultural operations that are planning on implementing irrigation systems that reduce GHGs and conserve water. Components eligible for grants include soil moisture monitoring, low-pressure irrigation systems, variable frequency drives, renewable energy installations, drip systems, and systems that reduce energy use. SWEEP projects are estimated to have saved 50,000 Olympic-sized swimming pools of water annually and reduced GHG emissions by equivalent of removing 16,770 cars from the road.[71]

**Pennsylvania's 2019 Farm Bill** In terms of organic production and climate change mitigation, Pennsylvania's 2019 farm bill is one of the most comprehensive bills ever passed in the U.S. Pennsylvania, ranking third in the nation in organic commodity sales, projects this will make them the number one organic agricultural producing state in the country.[74] In an innovative approach to organic transition, Pennsylvania has collaborated with the Rodale Institute to provide farmers with technical assistance free of charge. Additionally, the bill exempts landowners from paying taxes on land being transferred to new and beginning farmers, enhances efforts to improve access to local markets, and seeks to improve local economies through investment in specialty crop production and market infrastructure.[74]

**PA Preferred Organic Initiative** Pennsylvania's Preferred Organic Initiative, part of its PA Preferred Program, was provided $1.6 million in funding to expand the local organic industry and develop local markets that reduce food miles and connect farmers to their communities.[75] The PA Preferred program is a state maintained brand that informs consumers the product is locally made, while providing a resource for processors and producers to source agricultural products locally grown and processed in Pennsylvania.[76] The program is free to Pennsylvania's farm-based businesses, creating added value to local products.

**PA Organic Farm Consulting with the Rodale Institute** Recognizing farmer desires to transition to organic production and the gap in state offered services, Pennsylvania partnered with the Rodale Institute to provide on-farm consulting to Pennsylvania producers. Provided free to Pennsylvania and Midwest farmers, services include developing organic system plans, certification assistance, crop rotation planning, and benchmark soil analysis, among other resources for vital organic practices that conventional extension services haven't provided.[77]

**PA Conservation Excellence Grant Program** The Conservation Excellence Grant Program provides financial and technical assistance to agricultural operations in high-priority locations through grants, loans, tax credits, or a combination of the three. Administered by the State Conservation Commission, grants range up to $250,000 with an overall goal of improving the Chesapeake Bay Watershed through various conservation practices including cover crops, streamside buffers, streambank restoration, nutrient and manure management plans, among others. The grant covers project costs including design, planning, construction and installation, labor, equipment, and post-implementation inspections.[78]

**PA Dairy Investment Program** Pennsylvania's Dairy Investment Program provides investment for organic transition, research and development, value-added processing, and marketing grants.[79] A joint operation, the program is administered by the Department of Community and Economic Development and the Department of Agriculture under the supervision of the Commonwealth Financing Authority. The program requires a 15% funding match from its grantees, and organic transition grantees are limited to $50,000 in benefits.

**3.3 Non-Governmental Organizations** Many of the largest environmental organizations have dedicated campaigns to reducing agriculture's impact on climate change including the National Wildlife Federation, Natural Resources Defense Council, The Nature Conservancy, Sierra Club and the World Wildlife Fund. For example, the Environmental Defense Fund's (EDF) campaign to reduce fertilizer use and improve farming practices of U.S. commodity crops has already generated changes on over 3.5 million acres of corn.[80] EDF has collaborated with large food companies and retailers to secure commitments in their farmer supply chains to reduce fertilizer loss, improve soil health, and implement conservation practices such as cover cropping on 34 million acres of land, with the goal of securing commitments on 45 million acres (half of U.S. corn acreage) by 2022.

**European Approach to Climate Change Mitigation**

The European Union is advancing an ambitious plan to address climate change. The European Green Deal, published in 2019, sets out to make Europe the first climate-neutral continent by 2050. On May 20, 2020, the European Commission released its Farm to Fork Strategy and Biodiversity Strategy, which are at the heart of the overall European Green Deal. A primary focus of the strategy is to protect biodiversity while building a more sustainable food system, including reducing the use of pesticides and active promotion of organic farming. Specifically, the European Commission is recommending actions to halve the use of chemical pesticides and to reach at least 25% of agricultural land in organic production by 2030. The strategies will be followed up by different action plans, including an EU Action Plan for Organic that will direct resources for organic development from 2021 to 2026.

Sequestering more carbon through improved soil health has become the central rallying point in many NGO campaigns seeking to address agriculture's impact on climate change. Recently, new NGOs have formed that are entirely dedicated to the importance of regenerative agriculture and sequestering more carbon in the soil. Organizations such as the Carbon Underground, Carbon180, the Regenerative Organic Alliance, Project Drawdown, MAD Agriculture, Land Core, and Savory Institute are leading the conversation.

Increased focus from NGOs has driven the private sector to take action and has influenced lawmakers in the nation's capital. The pressure for change has even driven the largest membership-based organizations representing farmers, the American Farm Bureau Federation and the National Farmers Union, to acknowledge that climate change is having devastating impacts on agriculture and that farmers must be part of the solution.[81] New dialogues have started among large agricultural commodity groups on climate change through forums such as the U.S. Farmers and Ranchers Alliance and the Farm Foundation.

**3.4 Private Sector Models** Many businesses have implemented innovative programs and initiatives that support climate change mitigation while strengthening their own supply chains and brand identities. Soil health is a particular focus for many companies, and some have resulted in programs that pay farmers directly for sequestering carbon in their soil. Sustainability efforts touch the entire value chain, with some companies requiring more sustainable packaging, buying local goods when available, avoiding plastic, using more renewable energy, and reducing food waste. Other companies offset their carbon footprint by planting and protecting carbon sinks in the developing world, providing sustainable livelihoods to disadvantaged communities.


Anheuser-Busch is incentivizing transition to organic production through transition premiums, transition grants, long-term contracts, and technical assistance for its supply chain participants for Michelob ULTRA Pure Gold, the first major beer brand to be USDA certified organic. The innovative Contract for Change program provides financial incentives and technical support for farmers who are ready to transition to organic. Under the program, Anheuser-Busch signs long-term, full-rotation contracts with transitioning farmers to purchase barley at a premium during the three-year transition period and through the first year of organic production. Anheuser-Busch collaborated with the California Certified Organic Farmers (CCOF) Foundation to offer grants to help farmers transition to certified organic production. Anheuser-Busch collaborated with the Organic Trade Association-sponsored Organic Agronomy Training Service (OATS) to provide the needed technical training for their staff agronomists, and contracted farmers to succeed in organic production. OATS is an innovative technical assistance training program funded by the Organic Trade Association's industry-invested GRO Organic voluntary research, promotion, and education program. Partnerships across organizations, sectors, and supply chain participants create public goods while allowing private businesses to strengthen their own supply chains.

In the non-food sector, the Global Organic Textiles Standard (GOTS) is using a private voluntary add-on certification label to incentivize organic production of raw materials. The GOTS certification standard stipulates requirements throughout the supply chain for both ecology and labor conditions in textile and apparel manufacturing using organically produced raw materials. The market incentive for GOTS certified goods drives demand for climate-friendly organic production of important fiber crops such as cotton, flax, and hemp. Over 7,700 facilities worldwide are certified to the GOTS standard. The recently revised GOTS standards version 6.0 includes specific requirements for certified production and processing facilities to collect information on sources of greenhouse gas emissions and identifying means of reducing them.

More Organic Trade Association member spotlights on climate change initiatives at OTA.com/climate.

**3.5 Public-Private Partnerships** Public-private partnerships (PPP) are an increasingly common tool the federal government is using to work with industry to address various issues the public faces. As illustrated, the government utilizes many PPPs in the agricultural community, recognizing their efficacy in the diverse agricultural industry. Broadly, PPPs utilize multiple stakeholders to address common problems that help prevent mismatches between the needs of industry and the general populace. In PPPs, the public and private sectors share risk and expertise to produce a public policy outcome.[82] Some criticize public-private partnerships because they question the efficiency and oversight of some contracts and arrangements. However, the benefits of public-private partnership can far outweigh what each party can achieve individually. For instance, PPPs have been shown to improve food security in rural areas.[83] Public investment increases legitimacy, minimizes risk, and helps private groups achieve mutual goals. Private sector participation helps the public sector enhance economic opportunities, provide focus on actionable outcomes, and improve efficiency.[84] Policy tools used in PPPs range from direct cooperation between government and private entities, to more indirect economic tools like subsidies, tax breaks, and grants, among others.[85]

The Foundation for Food and Agriculture Research (FFAR) facilitates public-private partnerships by matching USDA grants with industry participants. Through FFAR, Stonyfield collaborated with USDA and various research and private organizations to develop a software platform called OpenTEAM (Open Technology Ecosystem for Agricultural Management). OpenTEAM is a free resource that helps farmers measure and quantify ecosystem services like soil health through carbon-measurement, digital records, remote sensing, predictive data, and economic decision-making tools. OpenTEAM's quantitative resources support adaptive soil health management for farms of all scales, geographies and production systems. Another program receiving funding through FFAR is the Ecosystem Services Market Consortium (ESMC). The Consortium is the most recent attempt by the private sector to create a market that would pay farmers for the ecosystem services they provide through carbon and water quality credits, which would be bought and sold in an open market, similar to the EU's and California's carbon markets but without direct government oversight.

**3.6 Carbon Markets** Policy efforts to address climate change through carbon markets have not fully engaged the potential carbon reductions associated with best agricultural practices. For example, while California's Cap-and-Trade Program, the European Union's Emissions Trading System, and the Regional Greenhouse Gas Initiative (RGGI) all include agriculture as one of their target areas, they have not allowed organic farmers to fully capture the value their carbon sequestration has generated. The reasons for this are complex but include political pressures, the difficulty of measuring soil carbon at the farm level, and failures of previous efforts to create carbon markets in agriculture. From 2003 to 2010, the Chicago Climate Exchange attempted to create a market for farms to trade credits based on the carbon they stored. The market reached a peak of $7.50 per ton of CO2 in 2008 before its eventual collapse in 2010 when prices fell to zero. The failure of this market, which included several major organizations such as DuPont, Ford, Motorola, the University of Minnesota, the University of California, the National Farmers Union, and the Iowa Farm Bureau, is largely attributed to the lack of a strong enforcement structure beyond the goodwill of the corporations involved in the market.[86] More recently, agriculture and land use have begun to enter carbon market policies with California using some proceeds from their market to fund their Healthy Soils Initiative, the European Union is in the process of implementing land use, change, and forestry into account, and RGGI has a provision for anaerobic digesters that destroy methane that would otherwise be released into the atmosphere.[87, 88, 89]

Organic farmers utilize systems-based practices that combine natural ecological processes and management techniques to build soil health and reduce pests.

Preliminary analysis of carbon sequestration value left uncaptured suggests that significant value is lost to organic producers. Using the price of carbon per ton in California's carbon market, we can estimate the value of carbon stored in organic farms. Based on the average of $16.68 per ton of carbon price paid in May 2020, on average, organic producers store about $12,000 more carbon than if they were farming conventionally (Table 1).[90, 91, 92] Based on this estimate, organic planted acreage provided over $110 million in uncaptured value in 2019. If all planted acreage as of August 1, 2019, converted to organic production, it would provide over $33 billion in ecosystem services via carbon sequestration alone. Other ecosystem services are challenging to capture quantitatively, and more research is necessary to create agreed upon methodologies.

The success of carbon markets in the European Union and California have, to date, not provided producers the opportunity to profit from environmental practices in the way other industries have been able to. This exclusion discourages farmers from engaging in climate mitigation practices while ignoring a sector that creates 10% of the United States' overall contribution to GHG emissions.[3] This oversight is particularly challenging for the organic sector, as organic practices are designed to improve the land being worked, while others are not held to the same standards.

Ideally, a marketplace designed to reward ecosystem services would have science-based standards that reward verifiable outcomes aimed towards decarbonizing the agricultural economy, including strong oversight and enforcement to ensure compliance. Carbon markets without strong, science-based standards are not projected to meet necessary goals to curb climate change over the coming decades.[93, 94] Additionally, disparate markets reduce economic benefits and without strong oversight, consistent standards, and agreed upon methodologies, actors providing public goods in the form of ecosystem services will continue to be unable to capture the value they are creating. Further, aligning market conditions will spur innovation as producers and companies seek to maximize ecosystem services due to the tangible benefits they earn in the marketplace.

**TABLE 1. ESTIMATED CARBON SEQUESTRATION VALUE.** Compiled and calculated by the author.[90, 91, 92]

| Carbon Market Price | Average paid per ton of carbon | Average value of Soil Organic Carbon (SOC) per organic farm | Total Value of additional SOC in Organic acreage |
|---|---|---|---|
| EU May 2020 average | $16.68 | $14,243 | $137,303,394 |
| CA May 2020 average | $6.68 | $11,885 | $114,568,315 |
| EU estimated 2021 low price | $27.72 | $19,748 | $190,375,723 |
| EU estimated 2021 high price | $33.26 | $ 23,695 | $228,427,790 |

A marketplace designed to reward ecosystem services would have science-based standards that reward verifiable outcomes aimed towards decarbonizing the agricultural economy.

To ensure equity in the marketplace, barriers to many small- and mid-size organic producers should be addressed as well. Many smaller producers can't afford the cost and complexity to verify carbon sequestration at a level of accuracy that would allow them to access carbon markets. Support for programs to regionally bundle growers, perhaps in a co-op format, with similar practices could be helpful to allow more organic farmers to access these programs. Alternatively, other affordable data collection solutions that lower the barrier to carbon market verification requirements are worth exploring, either to develop existing testing methods or to explore new metrics that accurately reflect carbon captured by organic producers. Additionally, considering the higher baselines of soil organic matter already achieved on many organic farms, producers who have been acting in the best interest of the climate would be put at a competitive disadvantage if credits were issued due to improvements over a baseline measurement. Policymakers should develop a way to value the results organic farmers have already achieved and maintain.

Given the many benefits that organic farming contributes to environmental health and sustainability, policies that support organic farmers and encourage transition to organic farming should be considered by policymakers as a key strategy for climate change mitigation in the agriculture sector. More robust investment in organic will  support proven climate friendly practices in agriculture while helping farmers adapt to the impacts of climate change.

## CHAPTER 4 Top Policy Recommendations to Support Organic as a Solution to Climate Change

**4.1 Elevate Organic as a Key Voice in Climate Smart Agriculture Policy** Many climate smart agriculture policies are being developed to broadly address agriculture's impact. While not spectiifc to organic farming systems, many organic farmers would benefit from these policy solutions. Collectively, organic businesses and farms have decades of experience in sustainable agricultural practices and systems as well as expertise in third-party cetification, oversight, transparency, and standard setting. Policymakers should not only lean on organic as a resource in developing climate smart agriculture policies, but also elevate the organic sector as a key voice that must be given a seat at the table in broader policy discussions related to agriculture and climate change. Policies that are developed should be inclusive of organic and recognize the benefits organic agriculture has to mitigating climate change.

**4.2 Incentivize Transitioning to Organic Production** **Recommendation: Establish a national program to support transitioning organic farmers with specific focus on reducing financial risks, improving market infrastructure development, and increasing access to land.**

Despite the promising economic benefits of transitioning to organic production, less than one percent of U.S. farmland is certified organic today. Many farmers face steep challenges and barriers when seeking to transition to organic production. The arduous three-year transition process is important to becoming a successful organic farmer but there is little federal support to help farmers through this transition, whether it is providing agronomic and technical assistance, access to credit and loans, accessing markets for diverse crops in organic rotations, or adequate tools to manage on-farm risk. Despite these challenges, there is no single federal program at USDA to assist farmers with managing the process of transitioning to organic.

Given the long-term economic and environmental benefits organic agriculture provides, Congress should wisely invest in establishing a federal program to evaluate and address the various barriers associated with transitioning to organic across production systems, scales, and geographic regions.

The federal government can support the organic transition process for new, beginning, and current farmers by expanding existing financial risk management programs offered by the USDA Risk Management Agency and Farm Service Agency to make them more accessible to organic and transitioning farmers.

Improved access to land, credit and capital, investment in distribution systems and infrastructure, and facilitating more market connections between buyers and sellers for the organic market will also create opportunities to expand organic production. The government should adopt policies that encourage organic transition in a way that does not distort markets but rather facilitates producer and handler choice in response to market signals.  Providing market and infrastructure development grants for minor rotational crops that improve soil health will allow farmers to capitalize and earn additional income on crops that are primarily used in organic systems for soil fertility. Additionally, incentivizing purchases of organic food in existing federal procurement programs will help establish new markets for organic farmers while providing healthy food to Americans.

Younger farmers gravitate to organic—the average age of organic farmers is six years younger than that of the national average of all farmers. Many young farmers struggle with access to land, and have to farm on land they do not own but rather farm under a lease. When transitioning previously farmed land to organic production, it can take more than a decade to rebuild soil health and gain stronger yields. Many new farmers are reluctant to make this long-term investment when they are uncertain whether they will gain ownership of the land. The government should conduct a report that analyzes the impacts of short- and long-term land leases on the adoption of sustainability and conservation practices, and consider providing tax credits for landowners who have long-term leases under organic production.

**4.3 Competitive Grant Program for Technical Services to Organic and Transitioning Farmers** **Recommendation: Develop a competitive grant program to provide technical services to organic and transitioning farmers to create better access to information about organic production methods that sequester greenhouse gasses and improve crop yields.**

There is a massive shortage in many areas of the country in agronomists and extension agents trained in organic system and production methods. This lack of technical assistance severely undercuts organic farmers' success as well as acts as a significant barrier to farmers seeking to transition to organic production. A competitive grant program for technical services should be developed to ease transition to organic agriculture, and provide technical assistance to farmers seeking to implement conservation practices. Technical assistance is needed across all production system types, scales, and geographic regions. Current extension services do not fully meet the technical needs of producers. Some private responses have already begun, like the Organic Agronomy Training Service (OATS) funded through the Generate Results and Opportunity for Organic program (GRO), although this is just in a pilot phase and only available to grain producers. A future program for organic technical assistance could be modeled or expanded using the existing NRCS public-private technical assistance providers program where industry funds a portion of the salary for providers and USDA matches that funding to cover half the salary of a technical specialist.

**4.4 Federal Healthy Soils Pilot Program** Another opportunity for agriculture would be a healthy soils program based on existing programs at USDA's Natural Resource Conservation Service (NRCS) and the California Healthy Soils Initiative (CHSI). First implemented in 2017, CHSI is a program designed to mitigate all three major agricultural emissions: carbon dioxide, nitrous oxide, and methane. The program provides financial assistance through grants for compost use, a practice already used by many organic farmers. It considers distribution, application rates, pathogens, monitoring, life-cycle concerns, technical assistance, and consequences of increased use of compost on ecosystems.[89] It is a heavily researched and carefully designed program that creates a continuous feedback loop from the projects it funds to continually improve the program's design and incentives. A federal program would be remiss to not include this step due to differences in soil types. A federal grant program designed in this way would reward farmers for the ecosystem services they provide while improving future climate change mitigation options, simultaneously.

## CHAPTER 5 Looking Ahead

Congress has taken a renewed interest in climate policy the past couple of years and momentum is gaining for more federal action on addressing the climate crisis. Recent public opinion polls have shown the majority of Americans believe more action must be taken by the federal government to address and reduce the impacts of climate change. Many Democrats have supported "A Green New Deal," stating that bold, transformative action is needed to reimagine the U.S. economy to prevent the most devastating impacts of climate change from coming to fruition. In the 116th Congress, the House of Representatives established a bipartisan Select Committee on the Climate Crisis to investigate and propose recommendations to substantially reduce pollution and greenhouse gas emissions in all aspects of the U.S. economy.[95] The Senate Democrats have also established a Special Committee on the Climate Crisis to provide policy recommendations for Congressional action.

Both committees are providing recommendations to address agriculture's impact on climate change. Legislation has been introduced in the House and Senate to help farmers adapt to climate change while providing incentives to reduce agriculture's impact on climate emissions. Representative Chellie Pingree recently introduced H.R. 5861, the Agriculture Resilience Act and Senators Debbie Stabenow and Mike Braun have introduced S. 3894, the Growing Climate Solutions Act, a bipartisan bill to establish voluntary carbon credit markets for farmers.

**POLICIES MUST**

- ADVANCE ORGANIC AGRICULTURE
- BE SCIENCE-BASED, DATA-DRIVEN AND VERIFIABLE
- FOCUS ON OUTCOMES AND CONTINUOUS IMPROVEMENT
- PROMOTE SOIL HEALTH AND CARBON SEQUESTRATION
- LOWER THE USE OF FOSSIL-FUEL BASED CHEMICALS
- PROVIDE SOLUTIONS FOR MITIGATION AND ADAPTATION
- INCENTIVIZE FARMERS AND BUSINESSES
- DECARBONIZE THE ECONOMY
- FOSTER AGRICULTURAL DIVERSITY AND INNOVATION
- ADDRESS EQUITY AND INCLUSION

## Principles for evaluating climate policies

**The challenges for U.S. agriculture in reducing its carbon footprint and serving as a climate mitigation tool while also adapting to the impacts of a changing climate are immense and go beyond organic. As policymakers consider solutions, the Organic Trade Association will evaluate opportunities for engagement in climate policy guided by the following core principles:**

**1. Advances organic agriculture:** Any policy that addresses the role of climate change in food and agriculture must advance the opportunity for organic agriculture to be a climate change solution and allow organic to be successful. Policies must not directly conflict with or undermine organic.

**2. Science-based, data-driven and verifiable**: Policy solutions should be based on and supported by science and data. Data collection and life-cycle analysis are critical to evaluating emissions and improving outcomes. Tools for conducting data collection and life-cycle analysis should be best in class and subject to continual improvement with support from USDA and experts across science, industry, and agriculture. Strong verification measures are needed to meaningfully reduce agriculture's impact on climate change.

**3. Focuses on outcomes and continuous improvement:** Policies should reward the outcomes of good agricultural practices, including emissions reduction and improvements to soil health and soil carbon sequestration. Improving outcomes in agriculture is not a linear process with a clear end-point, but rather a system of continuous improvement that achieves specific positive outcomes over time.

**4. Improves soil health**: Improving soil health is an important and central component in addressing agriculture's role in climate change. Policies should include provisions for advancing soil health and carbon sequestration.

**5. Reduces use of fossil-fuel based chemicals:** Chemical fertilizers and pesticides are a key source of greenhouse gas emissions in agriculture. Therefore, minimizing the use and eliminating the dependency on fossil-fuel based inputs is an important tenant of climate policy. In particularly, policies should prioritize reductions in synthetic nitrogen fertilizers due to their outsized role in accumulation of greenhouse gasses.

**6. Includes both mitigation and adaptation:** Resources should be provided to not only mitigate the impacts of climate change but also help the agricultural sector adapt to a changing climate. The impacts of human caused climate change are already being felt in our food and agriculture system, some of which will cause irreversible harm.

**7. Incentivizes farmers and businesses:** Farmers are struggling and should not bear the sole burden of making transformational changes. Federal, state and local governments and private sector programs should provide tools and resources for farmers and businesses to achieve outcomes. Good conservation practices that mitigate climate change should be rewarded by market-based incentives, and farmers should receive financial payments for ecosystem services.

**8. Decarbonizes economy:** The global scientific consensus is clear. To reverse the most serious damage to our planet caused by manmade climate change, greenhouse gas emissions have to reach net-zero by 2050. Policies that increase greenhouse gas emissions or rollback progress in decarbonizing the economy and reducing emissions should be opposed.

**9. Encourages agricultural diversity and innovation:** Mitigating agriculture's impact on climate change will require innovative thinking and whole systems approaches that embrace diversity. It is important that policies do not encourage reductionism and discourage diversity in agriculture. Policies should not only accommodate diversity and innovation in farming systems, but also provide incentives for increasing diversity in cropping systems.

**10. Advances equity and inclusion:** Policies should address the environmental and economic inequities that arise from climate change, and include mechanisms to support disadvantaged communities in adapting to climate change.

## Conclusion

U.S. communities, economies, and ecosystems are under threat from climate change. The organic sector has been a leading pioneer in advancing sustainable, climate-friendly agricultural practices for decades, and represents the best option in agriculture to mitigate climate change and adapt to its effects, while still delivering a suite of other benefits to people and the planet. Federal policies can help advance organic as a key solution through policies that encourage the adoption of organic practices and maximize benefits for mitigating climate change. The Organic Trade Association and our members stand ready to engage and support federal lawmakers in advancing these recommendations.

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## Authors

Ben Knuth, Organic Trade Association, Policy Associate

Megan DeBates, Organic Trade Association, Director of Legislative Affairs and Coalitions

Johanna Mirenda, Organic Trade Association, Farm Policy Director

Jessica Shade, Ph. D., The Organic Center, Director of Science Programs

## Contact

Organic Trade Association
The Hall of the States
444 N. Capitol St. NW, Suite 445A
Washington, D.C. 2001
202-403-8520 · info@ota.com


## About the Organic Trade Association

The Organic Trade Association (OTA) is the membership-based business association for organic agriculture and products in North America. OTA is the leading voice for the organic trade in the United States, representing over 9,500 organic businesses across 50 states. Its members include growers, shippers, processors, certifiers, farmers' associations, distributors, importers, exporters, consultants, retailers and others. Organic products represented include organic foods, ingredients and beverages, as well as organic fibers, personal care products, pet foods, nutritional supplements, household cleaners and flowers. OTA's Board of Directors is democratically elected by its members.

OTA's member organic businesses work together through networking, advocacy, and other initiatives to encourage and protect organic farming practices, and to share messages about the positive environmental and nutritional attributes of organic products with consumers, the media, and policymakers.


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## Methods

The authors developed policy recommendations based on scientific and policy research and outreach. Policy and research discussions included producers, business leaders, policy experts, and scientific experts on organic farming and climate change. Stakeholder discussions began in late 2019 with an initial report shown to OTA's Farmers Advisory Committee and culminating in a series of workshops held with OTA's Board of Directors. The culmination of that work are these policies which seek to advance organic agriculture as part of the mitigation and adaptation strategies society must undertake to withstand climate change.