



U.S. DEPARTMENT OF AGRICULTURE

CLIMATE-SMART AGRICULTURE AND FORESTRY STRATEGY: 90-DAY PROGRESS REPORT



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A Message from Secretary Vilsack

Dear Reader,

As we face the global challenge of climate change, there has never been a more important and exciting opportunity for leadership from American agriculture and forestry. America's producers and forest owners have long been at the forefront of stewardship of our lands, promoting wildlife habitat, biodiversity, and clean air and water – while also sequestering carbon to combat climate change. Today, they are on the front lines, experiencing the impacts of climate change as shifting weather patterns and increasingly frequent and severe storms, floods, drought, and wildfire wreak havoc and cause billions of dollars in damages. At the same time, scientists tell us that our powerful nature-based carbon sink—our farms and forests—could begin to degrade if we do not take action. With the right tools and partnerships, American agriculture and forestry can lead the world in solutions that will increase climate resilience, sequester carbon, enhance agricultural productivity, and maintain critical environmental benefits.

At this pivotal time, President Biden has called upon USDA to develop a strategy for climate-smart agriculture and forestry as part of a whole-of-government effort to addressing the climate crisis. Central to USDA's approach is the concept that to be effective, whatever we do must work for farmers, ranchers, and landowners. We must pursue strategies that create new markets for rural Americans and build wealth that stays in rural communities.

Over the past months, USDA has heard the views of Tribes and stakeholders across agriculture and forestry on how USDA should develop its climate smart agriculture and forestry strategy. This report reflects some of those initial conversations, and in the coming months we look forward to continuing to work with you to develop and implement our

approach. It will be multi-pronged and centered on voluntary incentives that benefit producers and landowners. We will look across climate science and research, forest health, outreach and education, existing programs, and new and emerging markets to advance climate-smart agriculture and forestry. All of this must be done in partnership with landowners, producers, state and local governments, Tribes, and other stakeholders across agriculture and forestry.

Equity and justice will play a guiding role in our work. We recognize that to tap the potential within agriculture and forestry, we need to reach all producers and landowners. As we build our strategy, we will ensure that socially disadvantaged producers have a seat at the table and reap the benefits of these programs. We will also prioritize actions that provide tangible, near-term benefits for low-income communities and communities of color.

I am confident that in partnership with our country's agriculture and forestry stakeholders, we can develop a strategy that is a win-win for our producers in building climate resilience, mitigating emissions, and conserving our natural resources. I look forward to continuing to work alongside you as we move forward.

Sincerely,



Secretary Tom Vilsack

Introduction

On January 27, 2021, President Joe Biden signed [Executive Order 14008 Tackling the Climate Crisis at Home and Abroad](#). This Executive Order directs Federal agencies to coordinate a Governmentwide approach to combat the climate crisis. Recognizing the important role that agriculture and forestry will play in climate change mitigation and resilience, the Executive Order tasked the U.S. Secretary of Agriculture to deliver a report with recommendations for a climate-smart agriculture and forestry (CSAF) strategy. In developing this strategy, the Secretary was directed to consider CSAF practices that decrease wildfire risk fueled by climate change, source sustainable bioproducts and fuels, and result in conservation actions that provide measurable carbon reductions and sequestration.

The U.S. Department of Agriculture (USDA) welcomes the President's focus on developing a climate-smart agricultural and forestry strategy that employs proven conservation practices to achieve enhanced productivity and economic sustainability for U.S. agriculture and forestry; improved ecological, social, and economic resilience to climate change; increased carbon sequestration; and reduced greenhouse gas (GHG) emissions. Climate-smart practices include activities that store carbon and improve resilience and soil health, such as reduced and no-till, cover crops, and prescribed grazing; reduce GHG emissions, including methane and nitrous oxide, using practices such as ruminant feed management, manure management, and fertilizer management; improve on-farm energy efficiency, such as improved irrigation efficiency, reduced fuel use, and energy conservation; and improve forest management to increase forest resilience and health.

The Department also is committed to implementing a CSAF strategy that furthers equity, environmental, and racial justice, and is accessible to and will benefit all farmers, landowners, land managers, Tribes, and communities — particularly low-income

communities and communities of color. The USDA's climate smart strategy builds on the administration's whole-of-government approach to tackling the climate crisis, including its America the Beautiful conservation campaign, which focuses on locally-led conservation activities that employ nature-based climate solutions, including on working lands.

Outreach Strategy

The Executive Order directed the Secretary to collect input from Tribes, farmers, ranchers, forest owners, conservation groups, firefighters, and other communities and organizations as part of its strategy development. In line with this directive, USDA published a [Federal Register Notice](#) to collect input on how to best develop and implement CSAF strategies. The Department's efforts focused on opportunities within existing USDA programs, potential new policies, and ways that USDA can support emerging markets to provide CSAF solutions. Within these broad categories, USDA requested specific input on agriculture and forestry carbon benefits; biofuels, wood, and other bioproducts; renewable energy technologies; addressing catastrophic wildfire; and achieving environmental justice. This Federal Register Notice was issued on March 16 and closed on April 29, 2021. USDA received over 2,700 comments in response to the Federal Register Notice.

USDA also hosted a series of 10 stakeholder listening sessions to provide a forum for feedback and discussion around CSAF strategy development and implementation. Participants included farmer organizations, commodity groups, livestock producer groups, environmental organizations, forestry representatives, agriculture businesses and technology companies, environmental market organizations, renewable energy organizations, Tribal organizations, and organizations representing socially disadvantaged communities. Over 260 participants attended these listening sessions and provided USDA with feedback on a CSAF strategy.

Preliminary takeaways from outreach

This report takes note of the broad array of perspectives raised during these initial outreach activities. Initial feedback underscored a broad range of ongoing work and the need for USDA to learn from existing initiatives, leverage current programs and networks, forge new relationships with community and private-sector partners, and continue to build on the efforts of producers, land managers, Tribes, and other groups to conserve America's natural resources and address climate change.

While a wide range of ideas and comments were shared with USDA, several common themes emerged. Respondents valued the Department's efforts to assert a leadership role in combating climate change within the sector and welcomed the opportunity to partner with USDA on this work. USDA was urged to seek approaches that integrate climate, environmental, and equity and justice goals. Feedback indicated that the CSAF strategy should recognize and account for co-benefits that CSAF practices provide beyond reducing GHGs, including protecting habitat, improving air, water, and soil quality, and building resilience. USDA also heard the need to remain attentive to potential adverse impacts of a CSAF strategy, particularly on already burdened communities, and to engage directly with community members.

Another main theme was that a "one-size-fits-all" policy or program will not work for all producers and land managers and that a CSAF strategy needs to be place-based, flexible, and locally led. Feedback cited the effectiveness but oversubscription of USDA's existing programs and initiatives and raised the need for increasing investment in or modifying these programs and providing adequate technical assistance. Early discussions offered ideas for new and innovative programs and technologies focused on securing climate benefits, including the roles that USDA can play in supporting private, voluntary environmental markets. USDA was encouraged to continue to support and enhance the entire value chain of established and emerging industries,

enabling the United States to remain competitive in a global economy.

The Department will synthesize the wide array of comments received from the Federal Register Notice and listening sessions. This feedback, and ongoing engagement with Tribes and stakeholders, will help guide USDA's CSAF strategy development and implementation moving forward.

Recommendations for a USDA Climate-Smart Agriculture and Forestry Strategy

A successful CSAF strategy will rely on a multi-pronged approach. This will allow USDA to meet multiple objectives and provide a unified strategy across USDA's agencies and offices to address diverse needs and opportunities throughout the agriculture and forestry sectors. Below are seven recommended elements of a CSAF strategy:

1. Prepare USDA to quantify, track, and report the benefits of CSAF activities

USDA will take the following actions to quantify and assess efforts to expand climate-smart practices and technologies, including:

- **Identify promising CSAF practices.** USDA will continue working to identify and define a suite of practices and technologies that deliver on climate outcomes, including GHG emission reductions, carbon sequestration, climate adaptation and resilience, and other co-benefits that are appropriate for large-scale adoption. This may include practices for which there is strong scientific evidence of emissions reductions and carbon benefits, as well as those that are well-defined within existing USDA, Natural Resources Conservation Service (NRCS) Conservation Practice Standards. USDA will continue to identify a suite of CSAF practices and technologies that will be the primary programmatic focus of its CSAF strategy.

- **Develop or enhance tools to assist farmers, ranchers, and foresters in quantifying benefits of CSAF practices.** USDA will develop or enhance methods and tools for quantifying the GHG benefits and other co-benefits of promising CSAF practices and ensure that they are consistent and scientifically sound. These methods and tools should accurately capture real reductions but also be simple and flexible enough to cover the broad range of contexts in which they will be applied to facilitate streamlined reporting by producers and landowners.
- **Track implementation and quantify benefits of CSAF practices at the national scale.** USDA will establish specific goals and benchmarks for encouraging and tracking progress on CSAF practice adoption. USDA will consult with government and outside experts to develop and conduct timely surveys of the adoption rates of CSAF practices and to track progress on their implementation. In addition, the Department will work with the Environmental Protection Agency to use this information when updating the Inventory of U.S. Greenhouse Gas Emissions and Sinks and ensure that it accurately reflects the benefits of CSAF actions.
- **Support research and data collection for quantification, monitoring and verification of carbon benefits.** The Executive Order directs USDA to encourage CSAF practices that “result in additional, measurable, and verifiable carbon reductions and sequestration.” USDA recognizes that carbon measurement, monitoring and verification present challenges in the agricultural and forestry sectors due to variability among land types and practices and the limited soil carbon data collection and testing—particularly in regard to

agricultural practices. Soil carbon data collection is typically limited or rare, and the use of satellite and other newly available technologies that can help estimate soil carbon is not routinely or consistently used or applied. Moreover, there is no common platform in which soil carbon data can be made accessible for supplemental analysis. Improved soil carbon data is critical to help refine quantification tools and models for estimating and verifying benefits of CSAF practices. As part of this effort, USDA will increase data collection and field testing of carbon sequestration benefits associated with CSAF practices to help calibrate and/or validate methods and tools used to quantify GHG benefits for CSAF practices.

USDA and other government scientists are aware that these shortcomings apply broadly across all land and ocean carbon contexts. The Biden administration is launching a science-based review to address these issues by investing in improved carbon data collection and synthesis techniques that can confirm additional, measurable, and verifiable carbon reductions and sequestration across a variety of land types and practices. The administration and USDA are committed to advancing CSAF practices and will invest substantial resources in this effort. USDA officials will work closely with scientists and practitioners from across the Federal Government and the private sector to elevate carbon measurement and verification capabilities on a continuous improvement basis.

2. Develop a CSAF strategy that works for all farmers, ranchers, forest land-owners, and communities

The Executive Order directs USDA to undertake robust actions to mitigate climate change while building resilience to the impacts of climate change that have already manifested and are continuing to intensify. This requires a CSAF

strategy that will further equity and environmental justice and is inclusive of Tribes, farmers, ranchers, forest owners, public land users and communities, and land managers of different sizes and operation systems, including organic and conventional producers. USDA recognizes that Black and Indigenous farmers and ranchers have been innovators in regenerative agriculture and will ensure that their leadership helps shape its CSAF strategy.

The history of systemic discrimination against Black farmers has been well documented, including a 2003 U.S. Commission on Civil Rights report which found discrimination in the processing of Black farm loan applications, and a more recent study finding that Black farmers suffer disproportionately higher rates of foreclosure than any other race. The CSAF strategy must establish the support systems that enable Black farmers and other socially disadvantaged producers to take advantage of the opportunities that climate-smart practices provide. Only with the establishment of such systems will USDA be able to address the cumulative effect of discrimination and break the cycles that are holding these producers back. USDA is also committed to securing environmental justice and spurring economic opportunity for communities, including socially disadvantaged farmers, ranchers, forest owners, producers, and Tribes. USDA will pay particular attention to ensure that Tribes and stakeholders are meaningfully consulted and substantively engaged throughout this process. To advance environmental justice and equity, USDA should take the following actions:

- **Strengthen consultation and engagement with Tribes and socially disadvantaged communities and producers.** Meaningful and substantive consultation and engagement with socially disadvantaged communities is a priority for USDA, with a focus on supporting communities and Tribes in achieving success on their terms. USDA is reaching out to representatives from socially disadvantaged communities, as well as historically underserved

producers and forest landowners, including limited resource, beginning, socially disadvantaged, and veteran farmers, ranchers, and forest owners, to identify ways to ensure that the benefits of the CSAF strategy are distributed equitably. While these first steps are critical in shaping a just and equitable CSAF strategy, they will only be the beginning of the Department's efforts to consult Tribes and engage stakeholders, including those in both urban and rural areas. In engaging in this outreach, USDA will consider specific community needs, including translation services and internet access.

- **Identify opportunities for broader inclusivity within USDA programs.** The Department is committed to providing opportunities equitably and will pay special attention to barriers that may preclude full participation. Specific areas to investigate may include impacts of farm size and land tenancy on participation; distributional effects of promoting certain CSAF practices; efficiency-equity tradeoffs; and the particular needs of small-scale, family-owned, specialty crop, and socially disadvantaged producers and forest landowners. Likewise, many opportunities exist in rural and urban forests, including ensuring access to urban and suburban greenspaces, building equity through forest legacies, and engaging in meaningful shared stewardship and co-management with Tribes and communities.
- **Remove barriers to participation and adoption.** To ensure its programs are widely accessible by all farmers, forest owners, and Tribes, USDA will identify and remove barriers to entry in existing programs and build enabling provisions into the design of its new programs from the start, with an emphasis on addressing systemic discrimination.

- **Recognize and include early adopters.** While USDA seeks to expand voluntary adoption of CSAF practices, it recognizes that innovative farmers, ranchers, and forest landowners may have already adopted many of these practices on their own. Recognizing how critical early adopters are to championing new conservation practices, USDA should provide options within its programs to ensure that early adopters are included and not disadvantaged by their initial commitment to using environmentally sound practices.
- **Target education and outreach.** Programs must be complemented by education and intentional outreach to maximize the uptake of CSAF practices. Targeted education and outreach efforts are critical for building trust with Tribes, socially disadvantaged producers, and forest landowners, demonstrating long-term economic and environmental benefits, and ensuring that all communities are aware of and able to take advantage of available programs and support. Recommendation 4 below expands on the importance of education and outreach.
- **Design the CSAF strategy to advance environmental justice.** The CSAF strategy should support the Department’s goal to reduce overall emissions and help achieve healthy communities in line with the Biden-Harris administration’s vision for tackling the climate crisis and addressing the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities as laid out in the Executive Order.

3. Leverage existing USDA programs to support CSAF strategies

USDA has a wide range of programs that provide cost share and financial assistance for on-farm and forest conservation. USDA’s CSAF strategy should strengthen the ability of these programs to deliver climate benefits alongside other environmental benefits. Many of these programs already include funding and technical assistance for practices that have carbon benefits, including cover crops, precision agriculture, manure management, and forest restoration. They can also help reduce risks from extreme weather and other climate change impacts. Opportunities to leverage existing programs include:

- **Identify and prioritize climate risks, adaptation opportunities, and carbon benefits of USDA programs.** Evaluation of the carbon benefits and explicit consideration of climate risks and adaptation would strengthen programs such as the Environmental Quality Incentives Program (EQIP), which provides agricultural producers and forest landowners with financial resources and one-on-one assistance to plan and implement conservation practices; the Conservation Stewardship Program (CSP), which incentivizes enhanced environmental stewardship; the Agricultural Conservation Easement Program (ACEP), which helps landowners, land trusts, and other entities protect, restore, and enhance wetlands, grasslands, and working farms and ranches through conservation easements; and the Conservation Reserve Program (CRP), which provides annual rental payments to farmers enrolled in the program who agree to remove environmentally sensitive land from agricultural production while planting species that improve environmental health and quality. Promoting carbon and climate adaptation practices and projects as a priority for

funding in these programs, as well as in competitive grant programs such as the Conservation Innovation Grants (CIG) and Regional Conservation Partnership Program (RCPP), will spur on-the-ground innovation and learning. USDA has already begun this work through the CRP by introducing a new Climate-Smart Practice Incentive that will increase signups for the program while providing the opportunity to demonstrate “proof of concept” regarding CRP-related increases in carbon sequestration and reduced GHG emissions.

- **Keep forests as forests while building climate resilience through forest conservation programs.** The Forest Legacy Program (FLP) is a critical tool that advances climate goals by encouraging the protection of privately owned forest lands through conservation easements or land purchases. Other forest conservation programs, such as the Community Forest Program (CFP), Forest Stewardship Program (FSP), Sustainable Forestry African American Land Retention Program (SFLR), and Urban and Community Forestry (UCF) Program, should explicitly incorporate forest carbon and climate impacts into decision-making to ensure that mitigation and adaptation considerations more clearly influence forest management and project design decisions.
- **Reduce food loss and waste. USDA is committed to reducing food loss and waste to meet the national goal of a 50-percent reduction by 2030.** Reducing food loss and waste reduces the methane emissions associated with food scraps decomposing in landfills and conserves resources that may otherwise contribute to GHG emissions. USDA should continue working across government and with partners to reduce food loss and waste through increased consumer

education and outreach, improved data collection and tracking of food loss and waste, improved food labeling and donation guidelines, collaboration to reduce food loss and waste across the supply chain, and reduced food loss and waste at Federal facilities.

- **Invest in infrastructure improvements that can facilitate the implementation of CSAF practices.** USDA’s Rural Development office offers loans and grants to provide funds for the costs of construction, improvement, and acquisition of facilities and equipment needed to provide enabling infrastructure and technology, such as broadband service, in eligible rural areas. Broadband is essential infrastructure for implementing practices like precision agriculture, which is an important technology for reducing nitrous oxide emissions from fertilizer, for reducing emissions from fuel use, and for increasing agricultural productivity. Broadband is also necessary to ensure that rural communities remain engaged and have access to the full suite of USDA resources.
- **Support and help finance renewable energy and energy efficiency activities.** USDA is committed to supporting rural communities in completing energy audits, providing renewable energy development assistance, making energy efficiency improvements, and installing renewable energy systems. USDA currently has programs that help convert older heating sources to cleaner technologies, produce advanced biofuels, install solar panels, construct anaerobic digesters, build biorefineries, and much more. USDA’s Rural Development office is at the forefront of renewable energy financing, with options including grants, guaranteed loans, and payments.

- **Help build community resilience to climate change.** Climate change poses risks to the operational and economic viability of farms, ranches, and forests. USDA provides risk management products that build resilience to these threats. USDA should examine additional opportunities to incorporate CSAF through USDA’s risk management and disaster relief programs in innovative ways that work for farmers, ranchers, and forest landowners. In addition, USDA should build on the existing work to improve resilience through promotion of soil health practices and other adaptive practices.

4. Strengthen education, training, and technical assistance for CSAF practices

Outreach, education, training, and technical assistance are important elements of effective voluntary programs. They also help USDA learn from program participants. Effective communication and meaningful engagement with Tribes, producers, and forest owners on CSAF practices is necessary for conveying the benefits of these practices, raising awareness of available financial assistance, creating literacy around new and emerging market opportunities, and integrating feedback into programs for continued improvement. Technical assistance will also be important in ensuring that producers have access to the expertise they need to successfully implement and integrate CSAF practices into their operations in ways that are ecologically appropriate and tailored to their needs. In addition, it will be necessary to train field office staff, conservation planners, forest managers, and other technical staff on the suite of CSAF practices and the new tools, opportunities, and markets related to CSAF so that they are well positioned to provide effective guidance to producers and landowners.

To meet these needs, USDA should rely on and enhance many of its existing efforts, relationships,

and programs. This includes the USDA, Farm Service Agency’s (FSA) county office staff as well as NRCS’s Conservation Technical Assistance Program, which provides conservation planning and implementation assistance through a network of locally respected and technically skilled conservationists. USDA should work to incorporate Indigenous and Tribal knowledge into its CSAF outreach and education strategy. USDA should also leverage its Climate Hubs, which deliver science and data syntheses; tool and technology curation and implementation support; and technical assistance and training on CSAF practices and technologies. This strategy should also build on programs such as the Soil Health Initiative, which provides education, outreach, and training on critical conservation strategies. In addition, USDA should continue to work through partners like land-grant university extension offices, conservation districts, Technical Service Providers, and others to perform outreach and deliver technical assistance on CSAF practices. To build trust and ensure effective outreach to Tribes and socially disadvantaged producers and forest landowners, USDA will work with partners such as 1890 land-grant institutions, historically Black colleges and universities (HBCUs), Hispanic-serving institutions, Tribal colleges and universities, and other potential technical assistance partners from socially disadvantaged communities. New initiatives, such as the Civilian Climate Corps, may also play a role in mobilizing additional work force to support outreach and technical assistance efforts.

Specific opportunities for improving education and outreach under USDA’s CSAF strategy may include:

- **Strengthen and increase technical assistance.** With input from Tribes and stakeholders, USDA should identify opportunities to leverage existing technical assistance skills and resources in support of USDA’s climate goals. The Department should also expand and strengthen its network of expertise,

including through recruitment and training of additional NRCS and Forest Service staff and Technical Service Providers, to enable better outreach to socially disadvantaged producers and new and beginning farmers in areas of CSAF practices and technologies, as well as their climate benefits and appropriate applications. Finally, USDA should work with Tribes and stakeholders to determine gaps or limitations in capacity and accessibility of technical assistance to farmers, ranchers, and forest owners, with a priority of understanding the needs of socially disadvantaged producers, new and beginning farmers, and local and regional food systems.

- **Build on and expand existing education and outreach efforts.** USDA should expand CSAF knowledge through activities such as on-farm and forest adaptation demonstrations and other applied research and technical assistance. USDA should leverage its network to reach a wider community of producers, as described above in recommendation 2. Achieving these outcomes will require meaningful engagement with community-based groups, non-governmental organizations, educational institutions, Tribes, and other State and Federal agencies on CSAF strategies. USDA should also increase awareness and participation in its conservation programs, particularly from socially disadvantaged producers and landowners. Education and outreach efforts should also include use of extension services and partnerships with 1890 and other land-grant universities, HBCUs, Hispanic-serving institutions, and Tribal colleges and universities. USDA can work with its offices, including Office of Partnerships and Public Engagement and Office of Tribal Relations, to leverage internal equity efforts to amplify these opportunities.

- **Invest in and strengthen the role of the Climate Hubs.** USDA Climate Hubs help identify regional climate vulnerabilities and work with farmers and land managers to prioritize, plan, and implement projects or practices to adapt to climate stressors. The Climate Hubs also serve to connect research to practice, reducing the vulnerability of productive working lands to long-term climate change and extreme weather events. In support of the CSAF strategy, the Climate Hubs should continue to lower barriers and increase the rate of adoption of CSAF practices. They should also help identify opportunities for collaboration with partners to develop necessary innovations or curate tools and technologies to moderate stressors. The Climate Hubs should also continue to bring lessons-learned back to USDA agencies and their partners to complete a cycle of learning, enhance resilience, and improve productivity.

5. Support new and better markets for agriculture and forestry products generated through CSAF practices

The private-sector demand for carbon credits and commodities produced with CSAF practices could be an important lever for incentivizing CSAF practice adoption across the landscape. Consumers, including processors and their domestic and international customers, are increasingly demonstrating a preference for agricultural commodities produced using CSAF practices. Extensive evidence exists that a growing number of purchasers of agricultural commodities are placing a premium on commodities that can demonstrate these attributes. However, barriers and limitations, such as high transaction costs, difficulty in estimating GHG benefits, and high implementation costs of some CSAF projects, are hampering growth in these markets and

limiting opportunities for agricultural producers to effectively participate.

A wide range of market-based approaches exists for incentivizing climate-friendly agriculture commodities. These include voluntary markets for carbon where agriculture and forestry can provide carbon offsets or credits, sustainable supply chain initiatives, and 'insetting' approaches where companies reduce emissions within their own supply chains and production facilities. They can also include markets for low-carbon biofuels, renewable energy, and biobased and wood products. These markets can promote voluntary adoption of conservation technologies and practices and leverage private-sector demand for GHG benefits associated with CSAF practices. These types of market opportunities can offer cost-effective ways to incentivize CSAF practice adoption and provide new income streams. Through the CSAF strategy, USDA should support the identification and verification of the GHG benefits associated with CSAF practices and facilitate the participation of farmers, ranchers, and landowners in new markets for CSAF goods and services.

The expanded adoption of CSAF practices will increase opportunities in domestic and international markets for commodities produced in climate-friendly ways, ensuring benefits for farmers and forest landowners. Ultimately, these efforts will contribute to the development of new and additional markets and uses for a broad range of crops, commodities, and forest products.

It is also important to broaden access for small, socially disadvantaged, and beginning farmers, ranchers, and forest landowners, as well as those early adopters who have paved the way and demonstrated the benefits of agricultural and forest conservation. Opportunities for supporting markets for CSAF practices include:

- **Support producer participation in voluntary carbon markets.** Although agricultural and forest carbon market opportunities have great potential to finance large-scale adoption of CSAF practices, there are barriers that have

kept that potential in check. As a result, only 2 percent of carbon offsets sold in the United States are generated from agricultural practices. These barriers include the relatively small scale of agricultural and small forestry offset projects, high transaction costs associated with project development, monitoring, reporting, and verification, and confusion in the carbon marketplace where there is a lack of consistency among approaches to protocols for generating GHG offsets from agriculture. For these reasons, producers and small landowners have yet to reap the full benefits of this market potential. USDA can help to overcome these market barriers. In line with the Department's commitment to equity, inclusion, and transparency, efforts are underway to solicit public input and inform our decision-making as we consider possible strategies. These strategies may include setting standards to reduce transaction costs; adopting science-based monitoring, reporting and verification approaches for CSAF practices; bolstering market infrastructure; or serving as a source of demand for agricultural carbon credits by setting clear price signals through price supports, loan programs or other financial tools that can help producers implement CSAF technologies. USDA's carbon market strategy will likely include a multi-pronged approach to achieve a variety of objectives.

- **Support the role of agriculture in decarbonizing the transportation sector.** The growth of the U.S. biofuels sector, driven in part by the Renewable Fuels Standard, has reduced GHGs and strengthened the rural economy. Ethanol produced from corn reduces GHG emissions relative to gasoline. Market opportunities such as California's Low Carbon Fuels Standard and the 45Q

Federal Tax Credit for carbon capture and sequestration can further drive down the GHG footprint of the biofuels sector. USDA should identify opportunities for agriculture and forestry to play a role in the production of low-carbon biofuel feedstocks, and for innovative technologies such as Biomass Energy with Carbon Capture (BECCS) to reduce emissions associated with biofuel production while spurring rural economic development.

- **Support renewable energy development in rural America.** USDA should help position Tribes, farmers, ranchers, rural landowners, and environmental justice communities to be leaders in renewable energy development. This includes making investments in technologies such as rural wind and solar that can operate on working farms and ranches, liquid fuels, renewable natural gas from livestock, and production of sustainably produced biomass for renewable energy generation. Investments in these technologies can provide new market opportunities for Tribes and rural America and create new uses for agriculture and forestry waste products, while reducing GHG emissions.
- **Support deployment and development of methane digesters, biogas, and biobased products.** The adoption of on-farm biogas capture technologies and the production of biobased products can provide producers with new income streams while also reducing GHG emissions and improving water quality. Opportunities to generate income from these technologies include the generation of renewable electricity and the production of biobased products from manure, renewable natural gas (RNG) and liquified natural gas (LNG). USDA should support producers as they enter these new markets and consider innovative finance

mechanisms to provide upfront capital for biogas technologies and encourage the connection of multiple small operations to provide economical renewable energy production.

- **Support new markets for wood products.** Wood products such as building materials currently account for 9 percent of annual carbon sequestration and storage in the United States. Potential increases in the use of wood in buildings could sequester carbon at the rate equivalent of taking 7 million cars off the road per year. USDA should support the wood products industry and the development of new wood product innovations such as cross-laminated timber, nanomaterials, and urban wood utilization to enhance carbon sequestration while providing economic opportunities to both rural and urban America.

6. Develop a forest and wildfire resilience strategy

Forests are distributed across the spectrum of rural to urban environments, covering 896 million acres (including approximately 130 million acres in urban, suburban, and developed areas), or 33 percent of land in the United States. Forests on public and private lands provide numerous benefits to people in the United States, including clean water, fiber and wood products, fish and wildlife habitat, biodiversity, recreational opportunities, spiritual renewal, and carbon storage. Forests and harvested wood products take up the equivalent of more than 14 percent of economy-wide CO₂ emissions in the United States annually, and there is potential to increase carbon sequestration capacity by approximately 20 percent (–187.7 million metric tons [MMT] CO₂) per year by facilitating re-plantings in understocked productive forestland.

Realizing this carbon potential while maintaining other ecosystem services, building resilience to climate change, and reducing risk to severe

wildfire, will require integrating climate considerations throughout forestry-related programs and practices in USDA. Core actions include fuels reduction, climate-informed reforestation and forest management, research to support mitigation and adaptation, and an equitable distribution of services related to wildfire mitigation and response. Maintaining the health and integrity of America's forests is vital to protecting their carbon sequestration potential, including conserving old-growth forests from wildfire and other threats, ensuring proper forest regeneration after fire and other disturbance, and ensuring that forests are resilient across large landscapes. Forest and wildfire resilience opportunities within the CSAF strategy include:

- **Increase the rate of fuels reduction to decrease the risk of severe wildfire.**

Over 10 million acres burned across all jurisdictions in the 2020 wildfires, with nearly 4.8 million acres on Forest Service lands—the most since the “Big Burn” of 1910. High-intensity wildfire adversely affects communities, people, and watersheds, and can move forests from being a solution to address our changing climate to a significant emitter of GHGs. Restored, resilient forests that withstand low-intensity wildfire are key to decreasing wildfire risks to our forest-dependent communities and providing long-term carbon storage to mitigate climate change. In FY 2020, the agency improved forest conditions on over 2.65 million acres. Forest Service and other research scientists have determined that this current level of treatment is not enough to keep pace with the scale and scope of the wildfire problem. Current modeling indicates that in order to significantly reduce the risk of high-intensity wildfire, USDA must increase the scale of its actions by two to four times more than is currently treated. This means that over the next 19 years, it is necessary to treat an additional 20

million acres on National Forest System (NFS) land and 30 million acres on other Federal, State, Tribal and private lands, especially in the Western United States. USDA needs to thin forests and return low-intensity fire to fire-adapted landscapes across the country in the form of prescribed fire to enable U.S. forestlands and communities to be resilient to the natural fire they need. Working collaboratively through shared stewardship with States, Tribes, local communities, and private landowners, a sustained investment over the next 10 years to treat other Federal, State, Tribal, and private lands, especially in the Western United States, can reset our future.

- **Increase the rate of reforestation, especially after disturbances.** Nearly 90 percent of current reforestation needs on National Forest System lands are the result of wildfire and other natural disturbances. The greater the rate of reforestation, the greater the cumulative carbon sequestration. Increasing the rate of reforestation also requires increases in nursery capacity and associated supply chains. Climate-smart principles and ecologically sound strategies should underpin all reforestation efforts, ensuring that investments into nurseries and planting are reinforced by intentionally choosing climate-adapted species and genotypes and using climate-informed planting techniques, consistent with maintaining or restoring the ecological health of the landscape.
- **Support applied forest research to inform climate mitigation and adaptation.** Forest inventory, trend, and health analyses help quantify the distribution and extent of forests, disturbance agents and impacts, and forest carbon and benefits. This information informs decision-making and creates

context for further applied science such as market analyses, scenario planning, climate impacts modeling, large landscape research, and adaptation decision support tools and processes all of which support shared stewardship and climate resilience. This type of research should also be used to assess carbon baseline information in different forest types and potential carbon gains from improved forestry practices. As with agricultural practices, USDA needs to increase data collection and the field testing of carbon sequestration results associated with specific CSAF practices to help calibrate and/or validate methods and systems used to quantify GHG benefits of forestry practices. Enhancements to the wildland fire system, including prediction, planning, decision support, impact assessment, and recovery, are also important to help manage fire risk.

- **Ensure equitable distribution of services regarding wildfire mitigation and response.** As climate change exacerbates the severity and frequency of wildfires, USDA needs to work with Tribes, partners, communities, and across landscapes, to reduce the risk of catastrophic wildfire, mitigate smoke hazards, and communicate in ways that are meaningful for each community. USDA should incorporate Indigenous and Tribal ecological knowledge into its wildfire strategy. This work needs to be distributed equitably across all populations, considering the unique risks to socially disadvantaged populations who are often the most vulnerable to climate change. Likewise, by engaging with diverse communities to develop and implement climate mitigation and adaptation strategies, USDA can gain critical insights and input from local knowledge and needs.

7. Improve research

Ensuring that agricultural lands, national forests, and private working lands are sustainably managed makes agriculture and forest production more resilient to climate change and other disturbances such as drought, invasive species, and wildfire. Further, based on the best available science, new strategies and management practices should be developed to mitigate and adapt to climate change. Agricultural systems must adapt to changing weather patterns and temperature regimes to ensure food security. Moreover, increasing agricultural productivity even while improving agriculture's carbon footprints critical given the need to feed a growing world population. These enormous challenges call for innovative research supported by bold, trans-disciplinary collaborations. Some of these research opportunities are provided below:

- **Support landscape-scale conservation and management.** USDA should build on its existing research by identifying existing gaps and generating new interdisciplinary research that incorporates Tribal and stakeholder input to increase the use of best management practices, innovative technologies, and tools to promote resilient farms, forests, and rangelands, and improve ecosystem services. These initiatives should include open access to research data to facilitate trans-disciplinary research, meaningful and substantive Tribal and stakeholder engagement, and the co-development of research and management recommendations. Investment in research and development, education, and extension activities can also increase our collective understanding of whole ecosystem responses to current and projected climate change, as well as environmental impacts of agricultural and forestry activities. USDA should also invest in farmer-led research efforts to demonstrate the effects of CSAF practices on working lands.

- **Evaluate potential climate benefits of new technologies.** USDA should leverage its research agencies to evaluate the potential of new CSAF technologies and practices to mitigate and adapt to climate change. USDA should develop protocols for performing research to evaluate the effectiveness of these technologies and practices and should publish these protocols to allow partners to perform research consistent with USDA's methods.
- **Increase our understanding of climate change and variability, its effects on agriculture and forests, and ways to build adaptation and resilience.** USDA should collaborate with relevant agencies, including the National Oceanic and Atmospheric Administration, to perform and contribute to research that addresses the resiliency and vulnerability of agricultural production, natural resource stewardship, and socioeconomic systems. This includes analyses, tools, and data that support decisions for agriculture, water resources, land, and forest management. Likewise, it is critical to identify mechanisms that increase resilience of food and forest products systems after extreme events. It is necessary to monitor and evaluate the environmental effects (including benefits and limitations) of adaptation and mitigation practices through a combination of scientific research and adaptive management.
- **Support research into human dimensions and economic effects of climate change for agricultural and forest-dependent communities.** USDA should develop deeper knowledge of the human dimensions of climate change and weather variability, including perceptions and effective framing of risk, adaptation, and mitigation incentives. Examining the economic effects of climate change and weather variability on communities and agricultural producers will contribute to the development of appropriate and effective responses. USDA should also determine the economic costs and benefits of CSAF practice implementation on farms, rangelands, and forest lands. In addition, USDA should consider the effect of climate change on food nutrient content and human health.
- **Target research on technologies with potential for mitigating U.S. agricultural GHG emissions.** The agricultural industry is increasingly called upon to contribute to climate change mitigation by reducing GHG emissions, sequestering carbon to reduce atmospheric CO₂, and even developing working lands-based approaches for generating energy as alternatives to fossil fuels. Working lands are also faced with adapting quickly to unprecedented climate changes and weather extremes with minimal interruptions in production. Specific opportunities for deeper research identified by a recent series of internal USDA listening sessions included development of solutions for reduction of enteric methane emissions; animal resilience to climate stress; abatement of nitrous oxide emissions from fertilizer (e.g. from improved fertilizer management or use of enhanced efficiency fertilizers); enhancement of soils and crops for carbon storage and adaptation; and improved waste management for GHG emissions reductions and energy generation.

Next Steps

This report is the beginning of a process to position USDA to adapt to and mitigate climate change in ways that build strong communities, fair markets, and are inclusive of all Tribes and stakeholders. USDA will continue outreach on CSAF to ensure policies are responsive to the needs of constituents. Ongoing activities include:

- **Continue outreach plans and activities.** Public comments received through the Federal Register Notice process and listening sessions are being reviewed and will be given full consideration as USDA continues to develop its CSAF strategy. As mentioned, these initial engagement opportunities will serve as the starting point for ongoing conversations between the Department, Tribes, and stakeholders who will benefit from or be impacted by its CSAF strategy and programs. USDA values this input and is intent on designing its strategy around the needs of farmers, ranchers, and landowners, with particular attention to removing barriers and elevating opportunities for socially disadvantaged groups.
- **Develop and implement strategies based on stakeholder feedback.** As USDA continues to gather input and lessons-learned from Tribes, stakeholders, and States, it will refine and narrow its vision to develop concrete actions and policies for implementing a CSAF strategy. Specifically, USDA will internally review its programs to identify opportunities for integrating elements of a CSAF strategy into existing programs as well as making the necessary investments in training, tools, personnel, programs, and research to enable successful implementation of a CSAF strategy. In implementing any strategies going forward, USDA will identify ways to work across the Department and partner with other Federal agencies, Tribes, State and local governments, and others to effectively implement a CSAF strategy.

