NATIONAL SUSTAINABLE AGRICULTURE COALITION

June 19, 2020

Sen. Brian Schatz, Chair
Senate Democrats' Special Committee on the Climate Crisis
U.S. Senate
722 Hart Senate Office Building
Washington, DC 20510

Sen. Tammy Baldwin, Committee Member
Senate Democrats' Special Committee on the Climate Crisis
U.S. Senate
709 Hart Senate Office Building
Washington, D.C. 20510

Re: Request for comment from the Senate Democrats' Special Committee on the Climate Crisis

Submitted electronically to rural_climateinput@schatz.senate.gov

Dear Chairman Schatz and Committee Member Baldwin,

The National Sustainable Agriculture Coalition (NSAC) welcomes the opportunity to submit input on how extreme weather and climate change are impacting communities, businesses, and families across the country for the Senate Democrats' Special Committee on the Climate Crisis to consider in their development of federal policy solutions required to effectively address the climate crisis. We applaud Congress for recognizing the severity of the problem, and we look forward to working with you and other members of Congress to ensure farmers and ranchers have the tools they need to be leaders in nationwide efforts to significantly mitigate and adapt to the pressures of a changing climate.

NSAC is a national alliance of family farm, food, rural, and conservation organizations[i] that together take common positions on federal agriculture and food policies to advance sustainable agriculture. Our member organizations, and the farmers and ranchers they work with across the country, understand that climate change presents a severe and immediate threat to the agriculture sector and to both rural and urban communities across the country.

Not only are farmers and ranchers on the frontlines when it comes to the impacts of climate change – including droughts, floods, extreme temperatures, severe storms, and shifting pest and disease pressures – they are also uniquely positioned to be part of the solution and significantly contribute to climate change mitigation. Farmers and ranchers must be active partners in the development of farm and food policy that will be a central element to our nation's response to the climate crisis.

They have practical insight and valuable tools – through soil health management practices that sequester and store carbon in the soil and the adoption of agricultural systems that reduce greenhouse gas emissions – that are essential to climate change solutions.

In that light, NSAC makes the following recommendations that engage farmers as part of the solution to climate change. Our recommendations are based primarily on our recent policy position paper which contains a comprehensive overview of current agricultural and climate science[ii]. *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge* (*Agriculture and Climate Change*) explores both the impact of climate change on U.S. agriculture, as well as the potential contribution of U.S. agriculture to global climate change mitigation, and puts forward detailed public policy recommendations to address agriculture's role in responding to the climate crisis.

Based on the research findings summarized in the paper, NSAC has developed the following policy priorities related to climate change and agriculture:

- Support producers to make US agriculture climate-positive
- Remove barriers to and strengthen support for sustainable and organic production systems
- Support climate-friendly nutrient management to reduce nitrous oxide emissions
- Support composting of manure and other organic "wastes"
- Build carbon sequestration potential of sensitive and marginal lands through grassland restoration, reforestation, or other perennial plantings
- Support climate-friendly livestock production systems and end subsidies for confined animal feeding operations
- Support on-farm energy conservation and low-carbon renewable energy production
- Fund public plant and animal breeding for climate-resilient agriculture
- Reform crop insurance so that it fully supports climate-friendly, sustainable, and organic production systems

Key policy mechanisms based on these underlying principles, include increasing support for land use practices that maximize carbon sequestration in soil and plant biomass; implementing improved nutrient management strategies that minimize the release of nitrous oxide emissions; supporting the transition to advanced grazing management to replace industrial livestock production systems; and investing in research to further identify ways in which farmers and ranchers can lead regional-specific efforts on the ground to address the climate crisis.

We thank you for your serious consideration of our recommendations, and look forward to working with you to support innovative policies that bring farmers and ranchers to the table as a critical part of the climate change solution.

Sincerely,

Cristel Zoebisch
Climate Policy Associate

Michael Happ
Conservation Policy Specialist

Eric Deeble
Policy Director

i Agriculture and Land-Based Training Association Salinas, CA; Alternative Energy Resources Organization Helena, MT; CCOF Santa Cruz, CA; CalCAN Sacramento, CA; California FarmLink Santa Cruz, CA; C.A.S.A. del Llano (Communities Assuring a Sustainable Agriculture) Hereford, TX; Catholic Rural Life St Paul, MN; Center for a Liveable Future – John Hopkins University Baltimore, MD; Center for Rural Affairs Lyons, NE; Clagett Farm/Chesapeake Bay Foundation Upper Marlboro, MD; Community Alliance with Family Farmers Davis, CA; Community Involved in Sustaining Agriculture South Deerfield, MA; Dakota Rural Action Brookings, SD; Delta Land and Community, Inc. Almyra, AR; Ecological Farming Association Soquel, CA; Farmer-Veteran Coalition Davis, CA; Florida Organic Growers Gainesville, FL; FoodCorps, OR; GrassWorks New Holstein, WI; Hmong National Development, Inc. St Paul, MN and Washington, DC; Illinois Stewardship Alliance Springfield, IL; Institute for Agriculture and Trade Policy Minneapolis, MN; Interfaith Sustainable Food Collaborative Sebastopol, CA; Iowa Natural Heritage Foundation Des Moines, IA; Izaak Walton League of America St. Paul, MN/Gaithersburg, MD; Kansas Rural Center Topeka, KS; The Kerr Center for Sustainable Agriculture Poteau, OK; Land Stewardship Project Minneapolis, MN; MAFO St Cloud, MN; Maine Farmland Trust Portland, ME; Michael Fields Agricultural Institute East Troy, WI; Michigan Food & Farming Systems – MIFFS East Lansing, MI; Michigan Organic Food and Farm Alliance Lansing, MI; Midwest Organic and Sustainable Education Service Spring Valley, WI; Montana Organic Association Eureka, MT; The National Center for Appropriate Technology Butte, MT; National Center for Frontier Communities Silver City, NM; National Hmong American Farmers Fresno, CA; Nebraska Sustainable Agriculture Society Ceresco, NE; Northeast Organic Dairy Producers Alliance Deerfield, MA; Northern Plains Sustainable Agriculture Society LaMoure, ND; Northwest Center for Alternatives to Pesticides Eugene, OR; Ohio Ecological Food & Farm Association Columbus, OH; Oregon Tilth Corvallis, OR; Organic Farming Research Foundation Santa Cruz, CA; Organic Seed Alliance Port Townsend, WA; Pesticide Action Network Berkeley, CA; Rural Advancement Foundation International – USA Pittsboro, NC; Union of Concerned Scientists Food and Environment Program Cambridge, MA; Virginia Association for Biological Farming Lexington, VA; Wild Farm Alliance Watsonville, CA; Women, Food, and Agriculture Network Ames, IA.

ii National Sustainable Agriculture Coalition. 2019. Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge. Washington D.C. https://sustainableagriculture.net/wp-content/uploads/2019/11/NSAC-Climate-Change-Policy-Position_paper-112019_WEB.pdf

RECOMMENDATIONS

1. What challenges do you face from weather extremes? What would it take for your community to be prepared for more severe storms, droughts, wildfires and flooding? What additional tools would be valuable as you work to plan for future weather extremes and to ensure your community is prepared to make it through disaster events?

Farmers and ranchers work at the frontlines of climate change. They struggle every day to prepare for increasing droughts, floods and severe storms, extreme temperatures, impacts on crop yields, and shifting pest and disease pressures. They face the disproportionate impacts that climate change has on economically disadvantaged rural communities. They need the tools and policies that support their efforts to adapt their operations to be more resilient as they adapt to rapidly changing and increasingly unpredictable weather events. Agricultural producers have a critical stake in building healthy soils and systems to enhance their resilience to these stresses.

Recent climatic events, including the Midwest's unprecedented flooding in 2019, intense landfalling hurricanes in 2017 and 2018, and historic droughts in California between 2014 and 2017 highlight the urgent need to help agricultural producers build resilience into their operations to respond to ongoing and future impacts of climate change.

The warmer winters and more extreme temperature fluctuations that have characterized climate change in most parts of the U.S. present a unique set of challenges for perennial fruit and nut crop production. Milder winters can "trick" these crops into breaking dormancy too early, resulting in crop losses when an untimely spring frost damages opened flowers or young fruit. Orchardists in the Appalachian region of Virginia and neighboring states have suffered near-complete crop failures several times in the past 15 years as a result of this aspect of climate change. Higher mean wintertime temperatures can also lead to inadequate "chill hours" to meet the requirement for some tree crops to fruit at all. Orchardists in California and elsewhere have suffered this kind of loss in walnut, pistachio, and other crops. In order to make their operations more resilient to warmer winters and erratic temperature swings in spring, fruit and nut growers need new cultivars with more resilient responses, such as reduced chill requirements (e.g., for nut crops in California), bud break linked to daylength rather than temperature, and greater tolerance to freezes during flowering and fruit set (for regions suffering increased risks related to spring frosts).

The extreme flooding in the Midwest in 2019 led to saturated soil conditions that prevented or seriously delayed planting of corn, soybean, and other production crops, resulting in major production losses. Growing winter cover crops has been shown to improve soil structure and drainage, often to a marked degree that can shorten deluge-related planting delays by critical days or even weeks. In addition, strategically placed conservation buffer plantings can reduce runoff, soil erosion, and nutrient losses during extreme rainfall events. However, producers will need technical and/or financial assistance to implement these key flood-resilience practices.

Several times during the past decade, extreme droughts in portions of the Great Plains caused grazing land vegetation to wither, often forcing ranchers to sell off livestock at a net loss in order to avoid animals starving to death. During this time, several stories emerged about ranchers who practiced regenerative systems such as Management Intensive Grazing (MIG), and were thus able to retain a greater percentage of their herds and bring them to market weight. Widespread adoption of such systems could enhance the ecological resilience of entire regions, as well as economic resilience

of rural communities depending on successful ranching enterprises. However, transitioning into MIG can entail learning new skills and acquiring new infrastructure (such as moveable fencing), which can create economic and logistical barriers to adoption. These can be overcome through a combination of technical and financial assistance through the National Resources Conservation Service (NRCS) conservation programs, coupled with informative, hands-on field days hosted by innovators and early adopters.

Another category of climate change impacts pertains to weeds, pests, and crop diseases. As temperatures warm and climate zones shift, geographic ranges of weed, pest, and microbial pathogen species shift to higher latitudes and altitudes, and intensities of weed and pest pressure at a given locale often increase. Climate related shifts can also occur in soil organisms vital to soil health and fertility (bacteria, fungi, earthworms, etc.), and thereby alter soil carbon and nutrient dynamics. These impacts can fall especially hard on organic producers, whose production systems depend on healthy, living soils, and exclude the use of synthetic insecticides, herbicides, and fungicides. At the same time, best organic practices designed specifically to build soil health can enhance climate resilience in several ways: improved drainage after excessive rainfall, greater water holding capacity that enhances crop resilience to drought, improved nutrient cycling, and suppression of plant pathogens resulting in greater overall crop vigor. Yet, organic producers need additional tools to fully realize their potential to withstand and help slow climate change. These include new and improved, regionally-adapted crop cultivars and livestock breeds that are selected for performance in organic and low-input sustainable production systems and for resilience to weather extremes. Investment in these alternatives will also help improve the resilience of non-organic agricultural systems.

The nation's three million farmworkers are highly vulnerable to the impacts of climate change, as rising temperatures intensify heat stress on all who work outdoors, and climate-related increases in pest pressure lead to more pesticide use and hence farmworker exposure to pesticides.[iii] The current COVID-19 pandemic has further intensified impacts on farmworkers and other food system laborers, as recently illustrated both by serious outbreaks in several meat processing facilities as well as growing incidence among field workers. Many of these workers face a grim choice daily between putting their health or their employment and livelihood at risk. Given that farmworkers perform about two-thirds of the labor of putting food on Americans' plates, their wellbeing has become an urgent policy priority in this time of climate instability and pandemic, both on humanitarian principles and for the long term sustainability and resilience of a national food system that depends so much on the vital services they provide. Increasing farmworker protection is absolutely necessary in the face of climate change, and Congress needs to ensure that the nation's farmworkers are supported and protected as the impacts of climate change intensify.

NSAC believes that federal policies that provide incentives and technical support, and that facilitate the adoption of sustainable, organic, and resilient agricultural systems and practices that mitigate climate change impacts are absolutely necessary to help farmers, ranchers, farmworkers, and rural communities cope with rapid climate change. Our nation needs policy solutions that not only support farmers and ranchers in adapting to climate change pressures and building resilient agricultural systems, but also provide them with the tools and resources to play a leading role in mitigating the effects of climate change through carbon sequestration and greenhouse gas emission reductions.

2. What are the most important reasons for acting to improve resiliency and slow the impacts of changes to climate? How would you describe the risks and local impacts of inaction?

Farmers, ranchers, and rural communities are inherently connected to and dependent on the land and natural resources that support agricultural production. Because of this inherent connection, agricultural producers and rural communities will most directly suffer the consequences of inaction on climate change. Without appropriate mitigation strategies to the climate crisis, the economic and productive viability of American agriculture and the resilience of our food system is in extreme jeopardy.

Regardless of whether an agricultural community undergoes extreme drought or flooding, new or intensified pest and disease outbreaks, or disrupted fruit set related to altered temperature patterns, the results – individual farms forced out of business, community economies in decline, and shrinking supplies of some food crops vital to human or livestock nutrition – will be the same. With local and national economies already severely impacted by the coronavirus pandemic, a failure to take prompt action to build agricultural and community resilience to climate change may lead to disaster. Over the long term, inaction on both climate mitigation and resilience building will ensure disaster and pose a grave threat to American food security.

The dominant agricultural system in the U.S. lacks resilience to disturbances due to low levels of crop and livestock diversity, reliance on non-renewable, energy-intensive chemical inputs, and dependence on an underpaid, often undocumented workforce. This system results in extensive natural resource degradation, depleted soils, and loss of human dignity and social capital for farmers and farmworkers. In the face of increasing uncertainty, major changes in our food production systems are imperative. Improved agricultural practices for soil health and resource conservation will significantly enhance climate resilience, and can potentially sequester sufficient soil organic carbon and biomass carbon to make U.S. agriculture both climate neutral and more productive (see *Agriculture and Climate Change*). Improved farm labor practices will help address the loss of human dignity and social capital in agriculture, leading to a food production system that is more equitable and sustainable.

The U.S. Department of Agriculture's (USDA) policies and programs must emphasize soil health and support farmers and ranchers as they work to be part of the climate solution. To do so, investments in climate change mitigation and adaptation must be accelerated. As farmers continue to struggle with the current COVID-19 crisis, extreme weather, and an already lagging farm economy, there is significant need for additional financial and technical assistance for programs that support climate change mitigation and adaptation. The farmers and ranchers within our network are committed to improving soil health, sequestering carbon, reducing greenhouse gas emissions, and building resilient systems by implementing systems and practices toward these goals. However, financial constraints, now aggravated by the pandemic, limit our network's capacity to address the climate crisis unaided. This highlights the need for a substantial federal investment to support the nation's farmers and ranchers in adopting climate mitigation strategies. The following sections detail how Congress and USDA can support farmers and ranchers in adopting climate-friendly practices and becoming active leaders in our efforts to address climate change.

3. Are there existing tools for farmers, ranchers and communities such as those at the U.S. Department of Agriculture in their Natural Resources Conservation Service or Farm Service Agency that would help your area be more resilient? Are there ways those tools could be expanded or changed to address the challenges land managers face in keeping our working lands and agricultural operations productive and profitable in the face of changes in local and large-scale weather patterns and growing conditions?

Many existing USDA programs offer tools and resources to support agricultural producers in implementing soil health practices that improve the resilience of their operations, sequester carbon, reduce greenhouse gas emissions, and help mitigate the impacts of climate change. In addition to technical assistance and conservation planning, financial assistance programs like the Conservation Stewardship Program, the Conservation Reserve Program, the Environmental Quality Incentives Program, and the Regional Conservation Partnership Program can help farmers and ranchers implement conservation practices that will increase their resilience and help mitigate the impacts of climate change. NSAC offers the following recommendations to strengthen existing USDA programs and tools to better equip farmers and ranchers adapting to and mitigating climate change.

- ***Restore and increase funding for the Conservation Stewardship Program (CSP) and expand the program's focus on soil health and soil organic carbon sequestration***

Conservation programs, and especially CSP, can play a vital role in helping producers become part of the climate solution. The program can also help prepare their operations to withstand the impacts of an increasingly unpredictable climate. The 2018 Farm Bill directed USDA to highlight soil health and increased payment rates for key soil health/carbon sequestration practices including cover crops, resource-conserving crop rotations, and managed rotational grazing. However combined, the 2014 and 2018 Farm Bills cut CSP funding by nearly half, greatly restricting both farmer access and environmental improvements, including climate mitigation.

Congress must take steps to restore and expand funding for CSP not only to meet the already oversubscribed farmer demand for the program, but to also expand CSP's focus and utility to farmers in addressing climate adaptation and mitigation through carbon sequestration, soil health and other conservation goals that are achievable through CSP. Congress should also require NRCS to more fully support and reward active management and maintenance of current conservation efforts of those who are in the program and those who apply to CSP, as well as adoption of new activities. Currently, the program does not adequately reward ongoing conservation efforts of CSP participants and applicants, especially in the application ranking process and payment structure. Additionally, Congress should make climate resilience and mitigation clear priorities within CSP and develop regional climate bundles with incentives for farmers to adopt climate-friendly conservation practices.

The *Agriculture Resilience Act* (H.R.5861) outlines important changes that can be made to CSP for the program to better support farmers and ranchers as they adapt to and mitigate the impacts of climate change. A key addition suggested in the bill is the creation of a new CSP On-Farm Conservation Stewardship Innovation Grant program for on-farm research and development and pilot testing of innovative conservation systems and enhancements. This program is patterned after the Environmental Quality Incentives Program Conservation Innovation Grants On-Farm Trials program, which supports the implementation of innovative approaches that have positive

conservation effects, but have not yet been widely adopted. Through CSP On-Farm Conservation Stewardship Innovation Grants, farmers and ranchers could develop, test, and implement regionally-adapted climate mitigation conservation practices and encourage widespread adoption of these practices.

- ***Establish climate mitigation/adaptation (including carbon sequestration and greenhouse gas emission reduction) as a Natural Resources Conservation Service (NRCS) Resource Concern***

Current NRCS Resource Concerns include soil erosion, soil health (listed as "soil quality limitations"), water quality (nutrients and other pollutants), source water depletion, air quality (gaseous and particulate emissions), plants, animals (livestock, wildlife habitat), energy efficiency, and a new "weather resilience" concern that includes various causes of excess or deficient soil moisture. All other NRCS activities and services (i.e. conservation planning, technical assistance, practice standards, financial assistance) flow from this list of established resource concerns.

Anything that is not a current NRCS resource concern is not an identified problem, and therefore does not get addressed within the NRCS system. The current list addresses some climate related issues but in a disjointed manner. Air quality includes greenhouse gas emissions, soil health contributes to resilience and includes soil organic matter (carbon sequestration), and weather resilience addresses flooding and indirectly covers drought. We believe that the efficacy of NRCS programming to support producers as they cope with climate change and contribute to the solution would be greatly enhanced by making climate mitigation and adaptation an explicit Resource Concern, of equal importance with soil health within all NRCS programming. Making climate mitigation and resilience a Resource Concern would focus NRCS and program participant efforts more effectively than the current piecemeal approach.

For example, the Regional Conservation Partnership Program (RCPP) includes an emphasis on water quality and/or water conservation within eight "Critical Conservation Areas," covering about two-thirds of the U.S., but regional partnerships could also enhance the efficacy of conservation systems in sequestering carbon, mitigating greenhouse gas emissions, and building climate resilience. Since all farmers and regions are directly at risk from climate change, RCPP should establish climate mitigation and resilience as a priority resource concern, applicable to the entire U.S. as a Critical Conservation Area.

- ***Revise all NRCS Conservation Practice Standards (CPS), conservation enhancements, and other conservation activities to prioritize soil carbon sequestration, mitigation of nitrous oxide and other greenhouse gas emissions, and soil health and water quality improvements***

NRCS has developed a set of four principles of soil health management, which provide sound, science-based guidelines for soil organic carbon sequestration, greenhouse gas mitigation, and adaptation to the stresses of climate change:

- Keep the soil covered
- Maintain living roots as much of the year as practical
- Diversify the cropping system to build soil biodiversity
- Minimize physical, chemical, and biological soil disturbance (i.e. tillage, chemicals, overgrazing, invasive species)

A few additional principles for soil health related to climate mitigation and adaptation include:

- Integrate crop and livestock production
- Return and enhance organic residues to the soil

These six principles of soil health management should be used as a guide for maximizing the efficacy of NRCS Conservation Practice Standards (CPS), CSP Enhancements, and other conservation activities in enhancing carbon sequestration and mitigating and adapting to climate disruption. Specific criteria for each CPS that can affect carbon sequestration should ensure sequestration improvements, and considerations should provide practical information on maximizing carbon sequestration outcomes. As a start, the new Soil Carbon Amendment (CPS 808) interim practice standard should be made a permanent national standard.

In addition, the CSP offers "Bundles" – groups of Enhancements that work together to maximize soil health and other outcomes. Research has shown that integrated systems such as organic farming and conservation agriculture (which include multiple complementary practices) yield greater soil health, fertility, carbon sequestration, and greenhouse gas mitigation benefits than single practices, such as no-till. Yet, enrollment in Bundles is currently relatively low among CSP participants, which indicates a need for more effective outreach and technical assistance in implementation. Additionally, a CSP Bundle specifically crafted to support farmers in their transition to organic farming should be created. Transitioning to organic farming involves a set of various CSP Practices and Enhancements to be implemented simultaneously, and thus requires a Bundle. NRCS needs to better support organic farmers and those wishing to transition to organic production, which would be in line with efforts to equip farmers and ranchers to adapt to and mitigate the impacts of climate change.

Another new feature of the CSP, introduced through the 2018 Farm Bill, though pending implementation, is a supplementary payment for Comprehensive Conservation Planning, which supports a site-specific, whole-system approach to soil health and other conservation goals. NRCS should offer this option to CSP applicants without further delay and feature it in program outreach efforts.

Making climate mitigation and resilience a Resource Concern would enhance the efficacy of Comprehensive Conservation Planning and CSP Bundles in helping growers cope with climate change and contribute to carbon sequestration and greenhouse gas mitigation.

In addition, criteria for NRCS conservation activities, especially the Nutrient Management practice (CPS 590) and associated Enhancements, should be modified based on the latest science to effectively curb nitrous oxide emissions, while sustaining crop yields and soil health. Similarly, conservation activities related to management of livestock, manure, and other agricultural byproducts should be updated to maximize efficacy in mitigating nitrous oxide and methane emissions, and in building stable soil organic matter (carbon sequestration), as well as resilience of the farming or ranching system.

NRCS program outreach should prioritize and highlight CPS, Enhancements, and Bundles that have proven climate change benefits, such as Management Intensive Grazing (MIG), agroforestry, advanced nutrient management, etc. Emphasizing piecemeal mitigation of harmful chemicals and systems with massive greenhouse gas and environmental footprints, like concentrated animal feeding

operations (CAFO), will not result in the transformation needed for agriculture to reach net zero greenhouse gas emissions and to play a leading role in climate change mitigation.

- ***Expand the role of the Conservation Reserve Program (CRP), including the Grasslands Option, to explicitly support carbon sequestration goals***

The Conservation Reserve Program (CRP) pays farmers to convert sensitive and marginal farmland from production to ground cover with predominantly perennial plant systems. In doing so, CRP provides one of the largest soil carbon sinks created by a federal program; however, much could be done to enhance the carbon sequestration potential of CRP lands.

For example, Congress could create a new permanent easement component within CRP that is specifically targeted to support highly effective carbon-sequestering and climate-mitigating practices such as forest buffers and other permanent vegetative covers. Permanent protection options could be targeted to the most highly erosive land or land with the highest ecological benefits for wildlife and water protection.

The Grasslands 30 Pilot Program proposed in the *Agriculture Resilience Act* (H.R.5861) is a great example of how Congress can support climate mitigation in CRP. The program would help protect grasslands at risk of conversion to cropping or development, grassland exiting the CRP or CRP Grassland Initiative, and grassland of prime ecological or habitat significance by enabling the enrollment of these acres for 30 years into the pilot program, during which farmers would receive annual payments. Congress should include this provision in future climate legislation to ensure the nation's soil carbon sink remains protected.

- ***Increase the focus of the Environmental Quality Incentives Program (EQIP), CSP, and the Regional Conservation Partnership Program (RCPP) on climate change mitigation, energy conservation, and renewable energy production***

USDA should continue and expand the use of EQIP, CSP, and RCPP, which are authorized to promote energy conservation, to assist farmers and ranchers in obtaining energy audits of their operations, improving the energy efficiency of their operations, and establishing renewable energy systems.

USDA can increase the focus on energy conservation and on-farm renewable energy production through a variety of ways, including increasing the capacity of NRCS to provide technical assistance on energy conservation and renewable energy on farms, increasing the number of energy conservation practices and systems approved for technical and financial assistance through conservation programs, and expanding the use of EQIP, CSP, and RCPP to fund energy audits and the establishment of on-farm renewable energy (see *Agriculture and Climate Change* for additional recommendations).

- ***Increase funding for ACEP to protect our farm and ranch land from development pressures***

ACEP has helped farmers and ranchers keep their land in agriculture across the country. Farmland protection has been shown to avoid future greenhouse gas emissions, but insufficient funding has

limited the utilization of this program. When agricultural lands are developed, the greenhouse gas emissions associated with that land increase significantly. One study found that an acre of urban land emits 70 times more greenhouse gas emissions than an acre of irrigated cropland and 100 times more than an acre of rangeland.[iv] Protecting our farms and ranches will ensure this vast and important land is available for both food production and carbon storage.

As farmers and ranchers continue to face uncertainty due to the COVID-19 pandemic and urban, suburban, and low-density residential development advances, many may feel the need to sell or transfer their land. Congress needs to provide tools and resources to protect farm and ranch land. The 2018 Farm Bill retained ACEP with very few policy changes and largely restored funds that were cut in the 2014 Farm Bill. But the funding provided is nowhere near the level needed to counter the significant farmland loss trend and protect our farm and ranch land from development pressures. NSAC recommends increasing ACEP funding from $450 million to $700 million beginning in fiscal year 2022, as provided in the *Agriculture Resilience Act* (H.R. 5861). The Agricultural Land Easement (ALE) component of ACEP is a vital source of financial support to protect farmland, prevent future greenhouse gas emissions, and ensure our ability to continue food production and carbon storage in our soils for generations to come.

Additionally, NSAC urges Congress to require land receiving ALE payments to have a conservation plan covering all applicable resource concerns, including soil health and greenhouse gas emissions reduction, and to provide the option of automatic enrollment in the Conservation Stewardship Program (CSP) to help cover costs associated with conservation planning. The 2018 Farm Bill removed the requirement that an easement be subject to an agricultural land easement plan within ALE, unless the land is highly erodible. NSAC believes all land receiving ALE payments, not just highly erodible lands, should have a conservation plan in place with support provided for its development through CSP.

4a. What are the most promising opportunities for land managers to benefit from climate action that are based on tools, such as conservation practices, that are currently in use?

The most practical and cost-effective way to remove excess carbon from the atmosphere is through living plants and soils. For the past 450 million years, land plants have converted atmospheric carbon dioxide into organic carbon, and soil microbiomes have transformed plant residue carbon into stable soil organic carbon. As stewards of our land and natural resources, farmers, ranchers, and landowners are well positioned to sequester carbon in their soils and perennial biomass through best management practices for soil health, resource conservation, crop and livestock production, and agroforestry. These practices also enhance the resilience of farm, ranch, and forest ecosystems to extreme weather, climate shifts, and other stresses; and thus, help stabilize income and economic viability of agricultural and forestry enterprises.

Research has shown that undisturbed perennial vegetation such as native prairie, grassland, savanna, and forest (including agroforestry and permaculture systems) sequester far more carbon than even the best-managed annual crop rotations. Therefore, in addition to the recommendations under Question 3, NSAC recommends rigorous enforcement of the Sodsaver provision as a promising opportunity for land managers to benefit from climate action.

- ***Rigorously enforce conservation compliance measures and the Sodsaver provision to protect highly erodible land***

Farmers whose land includes highly erodible areas or wetlands must adhere to specific conservation requirements to be eligible for most federal programs, including federal commodity programs and crop insurance. These requirements, known collectively as conservation compliance, help ensure that our shared natural resources have a basic level of protection.

USDA should take immediate steps to ensure effective enforcement of existing conservation compliance measures for controlling soil erosion. Eroded soil rapidly loses its organic carbon to the atmosphere as carbon dioxide, and at least 6 percent of human-caused greenhouse gas emissions worldwide have been attributed to soil erosion.[v] In addition, Congress should require compliance plans and implementation to increase soil carbon levels, and measures such as nutrient management planning and integrated pest management to reduce the inputs of synthetic nitrogen and pesticides, and to minimize nitrous oxide emissions from fertilized soils. Additionally, Congress should designate a small percentage of farm bill mandatory spending for compliance technical assistance and enforcement.

NSAC fully supports the provision in the *Agriculture Resilience Act* (H.R.5861) that would add soil health plans to the existing conservation compliance regime and apply this new component to all cropland. The legislation would also expand the definition of highly erodible land to all cropland eroding at more than twice the soil loss tolerance level, reduce the maximum allowable erosion levels, and require effective treatment of ephemeral gully erosion. The bill also includes a provision requiring that land leaving the Conservation Reserve Program meet the same erosion standards. NSAC urges Congress to incorporate these provisions in future legislation to protect highly erodible land across the country.

America's native grasslands are one of our most productive natural resources, providing wildlife habitat, flood mitigation, erosion control, and helping to sequester significant amounts of carbon dioxide. Unfortunately, these lands are also some of the most threatened natural resources in the country. While much of the remaining prairie in the U.S. is not well-suited for crop production, federally subsidized crop insurance creates an incentive for producers to till up and plant on native grasslands by reducing the financial risk.

Recognizing this, Congress established what is known as a Sodsaver provision in the 2014 Farm Bill, which partially protects grasslands in six States within the Prairie Potholes region by reducing crop insurance premium subsidies on land that is tilled from native prairie. Many of these grasslands are in areas with high erosion levels when perennial cover is removed, or with naturally wet or slow-draining soils in which tile drains accelerate losses of soil organic carbon and other greenhouse gases.

Congress should expand Sodsaver, so it applies equally to farmers across the entire country. In addition, USDA should rigorously enforce this policy and ensure farmers are aware of the penalties associated with tilling native prairie.

- ***Strengthen conservation compliance to incorporate soil health***

A small percentage of farm bill mandatory spending should be designated for conservation compliance technical assistance and enforcement. Conventional row crop operations subsidized through farm bill commodity programs have been identified as systems with relatively large levels of

net greenhouse gas emissions and other negative environmental impacts, including soil erosion. USDA should take immediate steps to ensure effective enforcement of existing conservation compliance measures for controlling soil erosion, which not only impacts productivity but also releases carbon into the atmosphere.

In addition, legislative measures should be enacted to require the adoption of conservation compliance plans that include additional measures (such as conservation tillage combined with cover cropping) to increase soil carbon levels and measures (such as nutrient management planning and integrated pest management) to reduce the inputs of synthetic nitrogen and pesticides, and to minimize nitrous oxide emissions from fertilized soils.

- ***Eliminate conversion of agricultural land to development, as well as conversion of grassland to cropping in the United States by 2040***

NSAC fully supports the national goal for farmland preservation established in the *Agriculture Resilience Act* (H.R. 5861) introduced by Rep. Chellie Pingree (D-ME) of reducing the conversion of agricultural land to development and grassland to cropland by at least 80 percent by 2030 and eliminated by 2040. As urban, suburban and low-density residential development demands increase, we are losing thousands and thousands of acres of agricultural land. Converting agricultural land to development results in significant increases in greenhouse gases emissions and diminishes our ability to store carbon in our soils. Long term, this development also poses a threat to our food security and our rural economies. At the same time, the conversion of grass and forest land to cropland results in net greenhouse gas emissions. This conversion has resulted in large amounts of carbon lost from our soils, with losses on a smaller scale continuing each year. Ending the net loss of farmland to development and zeroing-out net conversion of forest, prairie, and grazing lands to cropland will entail a substantial expansion of the Agricultural Land Easement (ALE) component of the Agricultural Conservation Easement Program (ACEP), and grassland conservation initiatives within ACEP, CRP, and CSP.

4b. What new tools and strategies have the most potential for improving resiliency and sequestering carbon?

While many existing USDA programs can be strengthened to fulfill agriculture's potential to mitigate climate change, many tools and strategies are yet to be discovered. Significant investments in research are needed to further identify ways in which farmers and ranchers can lead efforts on the ground to address the climate crisis. For example, while the above-noted six principles of soil health management provide an excellent overall roadmap to both agricultural resilience and carbon sequestration, additional research is needed to better understand and optimize the role of soil and plant microbiomes, as well as crop genetics (variety selection and plant breeding) in realizing the full potential of U.S. agriculture to become part of the climate solution. Research efforts should focus on optimizing sequestration and resilience in USDA certified organic cropping systems (no synthetic agrochemical inputs, some tillage) and agroforestry, permaculture, and advanced grazing systems (potential to eliminate both forms of soil disturbance), as well as conservation agriculture (no tillage, some use of agrochemicals). Over the past 20 years, much USDA research through the Agricultural Research Service (ARS), the National Institute of Food and Agriculture (NIFA), and NRCS conservation practices has focused on the conservation agriculture approach, yet these agencies have begun to give more attention to organic, advanced grazing, and agroforestry systems. We believe

that increased USDA research and practical support for organic, advanced grazing, and agroforestry systems is essential to the nation's agricultural climate resilience and mitigation strategy.

Another set of tools needed is improved means to measure, monitor, and document carbon sequestration and greenhouse gas emissions mitigation outcomes of both existing and new experimental systems of agricultural production and resource conservation. Advances in laboratory methods and in field sensing and data technology for tracking soil and agroecosystem carbon and nutrient dynamics will move the frontier of climate-in-agriculture research forward. In addition, farmers need simple, practical, and reliable tools and methods to assess the carbon sequestration, nutrient cycling, and resilience of their soils and production systems.

In order to meet these research and development needs, NSAC recommends increasing funding and capacity for NIFA competitive grant research programs like the Sustainable Agriculture Research and Education (SARE) program, the Agriculture and Food Research Initiative (AFRI), and the Organic Agriculture Research and Extension Initiative (OREI), while also focusing on providing long-term solutions to the climate crisis by supporting increased capacity for ARS' Long-Term Agro-Ecosystem Research (LTAR) Network. Additional funding for USDA's Climate Hubs, led by ARS and the U.S. Forest Service, is also critical to meet the research and development needs of U.S. agriculture to address the climate crisis.

As climate disruptions intensify, agricultural producers will need new crop varieties and animal breeds suited to a variety of local and ever changing climate conditions. NSAC urges Congress to invest federal funds into the research and development of public plant and animal breeding to ensure climate-resilient agriculture. Developing crop cultivars with enhanced capacity to partner with beneficial soil microbes for nutrient cycling, carbon sequestration, disease suppression, and tolerance to drought and other weather extremes has emerged as a high priority and opportunity for climate-resilient agriculture.

- ***Increase the capacity of SARE to help farmers increase carbon sequestration and meet the specific regional challenges of a rapidly changing climate***

SARE is USDA's best-positioned program to contribute practical on-farm research and education for climate change mitigation and adaptation. For the past 30 years, SARE has been highly successful in building the knowledge and tools necessary to promote sustainable agriculture, and in getting these resources into the hands of actual farmers and ranchers. In many cases, producers themselves have been involved in developing and conducting research and education, adding a practicality to the outcomes that has yet to be matched by any other USDA research program. In addition, regional councils guiding the program ensure funded research is relevant to the regionally-specific challenges farmers face, which will be essential in the face of climate change.

We urge Congress to scale up investments in SARE by increasing the program's current authorization for appropriations from $60 to $100 million. This increased funding will allow the program to explicitly incorporate climate change mitigation and adaptation into the program's mission and funded research. We also recommend an additional $50 million per year in mandatory funding for a new SARE Resilience Initiative dedicated to 1) research and development of climate-resilient farming and ranching systems that build soil health, sustain production and economic viability through diversified and climate-adaptive enterprises, and contribute to climate mitigation through carbon sequestration and greenhouse gas emission reduction; and 2) associated new market

and food system development R&D – including systems research, extension, professional development, and farmer-led R&D.

- ***Authorize Long-Term Agro-Ecosystem Research (LTAR) Network and focus long-term research on climate-resilient agricultural systems***

To provide long-term solutions to complex challenges in U.S. agriculture, the USDA Agricultural Research Service (ARS) launched a Long-Term Agro-Ecosystem Research (LTAR) Network in 2011. With a focus on integrating research that drives increased sustainable production while using system resources, the network links 18 existing long-term agricultural research sites nationwide that conduct projects across multiple agroecosystems – croplands, pasturelands, and rangelands. The goals of the LTAR Network are to deepen our understanding of agroecosystem function and to sustain and expand long-term agricultural productivity while restoring and improving soil, water, biodiversity, and other key resources. As the climate crisis unfolds, LTAR has prioritized development of innovative, climate-resilient, and climate-mitigating farming and ranching systems for different agro-ecoregions across the U.S., to be applied at the field, landscape, and regional scales.

However, the capacity of the LTAR Network to continue its vital work depends on continued investment into this one-of-a kind research network and leveraging support from the broader research community. In order to ensure this long-term research continues in the future, we urge Congress to permanently authorize LTAR and establish an authorization for appropriations of $5 million per year per site. We also recommend that Congress designate no fewer than 8 of the 18 current LTAR sites to focus the majority of their research on developing new systems of agriculture (i.e. organic and other agro-ecological systems) that are more resilient and support agriculture in becoming climate neutral with respect to greenhouse gas emissions.

- ***Prioritize climate specific research and education within existing USDA competitive grants programs***

In addition to farmer-based research through SARE and long-term, whole-systems research through LTAR, additional investments are needed across all of USDA's research programs on climate adaptation and mitigation, including the Agriculture and Food Research Initiative (AFRI), Organic Agriculture Research and Extension Initiative (OREI), and other relevant USDA competitive grant programs.

We therefore urge that Congress not only scale up investments in funding for OREI and AFRI, but also establish specific climate research and education priorities within each program.

Priority for extramural grants should be given to proposals focused on:

- Designing and implementing practical, on-farm systems which increase stable carbon sequestration
- Improving methods for measuring soil organic carbon – concentrating on creating assessment systems which are rapid, low-cost and remote
- Designing and implementing practical, on-farm systems to optimize nutrient cycling and minimize nitrous oxide emissions from agricultural soils
- Evaluating total greenhouse gas footprint of different livestock production systems

- Designing and implementing intensive rotational grazing, silvopasture, and other advanced approaches to climate mitigation in livestock production
- Breeding and developing new public crop cultivars and livestock breeds for resilience to climate disruption and performance in climate-mitigating farming and ranching systems

- ***Support research into advanced nutrient management and mitigation of agricultural nitrous oxide emissions***

Additional research is also needed to develop and refine best nutrient management approaches for all soils, regions, and crop rotations. Since soil nitrous oxide emissions are directly related to soil soluble nitrogen levels, widespread adoption of improved nitrogen management could slash agricultural nitrous oxide by more than 50 percent.

Thus, Congress should enact federal policy that will support producers to reduce nitrogen inputs through soil health and biological nutrient cycling. This includes mandating improvements in NRCS conservation standards, technical assistance through NRCS and other USDA programs, and making biologically based nutrient management and nitrous oxide mitigation a high priority for ARS research and in NIFA competitive grant Requests for Applications.

- ***Fund public plant and animal breeding for a climate-resilient agriculture***

Climate change will result in rapid and unpredictable changes in the growing regimes for crops and forages and conditions for animal agriculture that will likely vary on a regional basis. For example, climate change thus far has tended to intensify drought in the Western region, while much of the North Central, Northeast, and Southern regions have experienced greatly intensified rainfall and more uneven seasonal distribution, as well as higher total rainfalls. Federal research investments will be needed in order to develop crop varieties and animal breeds suited to a variety of local and continuously changing climate conditions.

As local climate conditions continue to change, the availability of a diversity of plant and animal genetic resources will be needed to address the growing challenges of global and regional climate changes, increasing pest and pathogen pressure, food security, and safety and resiliency concerns. Plant cultivars that are better adapted to sustainable organic systems, (especially integrated, minimum-till, high-biomass-cover crop based organic systems, etc.) will facilitate adoption of these climate-friendly practices. Cultivars with enhanced nutrient and water use efficiency can reduce the need for fertility and irrigation inputs and enhance cropping system resilience to weather extremes. Livestock breeds that are better adapted to performance in pasture-based systems, especially management-intensive rotational grazing (MIG), will facilitate adoption of this highly beneficial and climate-friendly system of livestock production.

NSAC recommends that Congress ensure an initial investment of $50 million in annual extramural research funding within USDA starting in 2021, ramping up to at least $100 million by 2026, as well as $50 million in annual USDA intramural research funding to support public cultivar and breed development and ensure a supply of regionally-adapted seed varieties in the face of a changing climate. In addition, USDA should support recruitment and training of new professionals in plant breeding and cultivar development, thereby ensuring a viable "pipeline" of the next generation of plant breeders.

4c. What are the key barriers to adoption of these practices? Are there solutions you would recommend prioritizing?

Sustainable and organic production systems strengthen the resilience of agricultural operations, protect our natural resources, and provide climate benefits. Yet sustainable and organic operations continue to be a minority of agriculture in the U.S. Given the benefits that sustainable and organic production systems offer in terms climate change adaptation and mitigation, greater efforts should be made to promote sustainable and organic agriculture as systems of production that can build soil health, improve nutrient cycling, and lower fossil fuel energy inputs. NSAC urges Congress and USDA to do more to remove barriers and strengthen support for sustainable and organic production systems. Additionally, increased support and emphasis should be placed on historically underserved farmers and ranchers to ensure they have access to the tools and resources they need to implement climate-smart agricultural practices. In particular, USDA needs to strengthen its outreach efforts to beginning, socially disadvantaged, limited-resource and other historically underserved groups of farmers.

- ***Promote organic agriculture to make agriculture more resilient in the face of climate change while reducing greenhouse gas emissions from the agriculture production sector***

USDA can promote organic and sustainable agriculture by:
  - Pursuing additional opportunities to align NRCS conservation practice standards and the development of an Organic System Plan (OSP)
  - Training NRCS staff in organic systems and assisting in the development of a cadre of organic technical service providers
  - Ensuring that financial and technical assistance for organic systems in general, and for conventional producers in the process of transitioning to organic systems in particular, are available through EQIP and CSP in every state and country in the nation
  - Incorporating specific CSP enhancements for organic cropping and livestock systems and including organic specific options for more generally available enhancements such as conservation tillage, nutrient management, pest management, and invasive species control

- ***Ensure historically underserved farmers and ranchers, including beginning, socially disadvantaged, and limited-resource farmers and ranchers, are fully supported and empowered in their climate resilience and mitigation efforts***

While USDA has adopted provisions to improve service to producers of color, beginning and limited-resource producers, and other historically underserved constituencies, particularly through higher payment rates and advance-payment options in EQIP and other conservation programs, more needs to be done to ensure that these producers receive the financial and technical support they need in order to meet the challenges of climate change and contribute to solutions. For example, many eligible producers have not accessed the EQIP advance payment option because they did not know about it, and overall participation by farmers of color and limited-resource farmers in conservation and other USDA farmer programs has lagged behind enrollment of white farmers. In addition to the urgent need to build agricultural and community resilience for those most vulnerable to the worst impacts of climate disruption, every producer who is not served by the programs that could help them build healthy, resilient, climate-mitigating production systems is a missed opportunity, and every farm that goes out of business due to lack of USDA program support

can lead to a huge increase in net greenhouse gas emissions if the land is converted for residential or commercial development.

NSAC urges USDA to strengthen its outreach efforts to historically underserved farmers and ranchers. For example, by strengthening programs such as the ATTRA Sustainable Agriculture Program whose mission specifically serves historically underserved producers and communities to build resilience and contribute to climate solutions. Another example of action that USDA could take is to conduct a robust outreach effort to let all eligible producers know about the EQIP advance payment option.

4d. What challenges do you see in the balance of food and fiber production with the incorporation of additional resiliency and carbon sequestration activities? Are there tools or strategies that could help reduce the difficulty of these challenges?

The paradigm of "maximizing agricultural production to feed an expanding global population" poses existential challenges to agricultural sustainability, climate mitigation, and resilience. For example, the 1970s imperative to plant annual field crops "fencerow to fencerow" accelerated soil erosion and decomposition of soil organic carbon into carbon dioxide; and maximum-yield research led to heavier applications of nitrogen fertilizer and concomitant spikes in nitrous oxide emissions from cropland soils.

The recently released Federal Register notice requesting stakeholder input on the USDA Research, Education, and Economics mission area's Agriculture Innovations Agenda for 2020 - 2050 (AIA) continues to reflect this paradigm (Docket No. USDA–2020–0003). The AIA calls for a 40 percent increase in U.S. agricultural production during the next 30 years, while simultaneously decreasing agriculture's environmental and climate "footprint" by half. Farmers often face tradeoffs between maximum production and optimum conservation, soil health, and carbon sequestration.

Paradoxically, while hunger and food insecurity remain major national and global problems, overproduction of corn, soybean, beef, dairy, and other commodities periodically lead to market gluts, depressed prices that can be ruinous to farmers, mass-production of low-nutritional-value food products (e.g., high fructose corn syrup), and – during market disruptions such as those caused by COVID-19 – dumping of milk and euthanizing of meat animals.

Taking all these considerations into account, U.S. agriculture needs to move from a paradigm of *maximum production* to one of *optimum production* which increases the economic viability of farmers and ranchers that can balance practices that enhance system resilience, resource protection, soil restoration, carbon sequestration, and greenhouse gas mitigation.

Key strategies include regionalization of food systems and diversification of farm and ranch ecosystems. Increased emphasis on local and regional food systems with farmers serving their communities through direct markets and short, regional supply chains that build local economic and social capital will greatly increase food security and community capacity to withstand the multiple impacts of crises such as the current pandemic, as well as climate change. More diversified cropping systems and crop-livestock integration improve the resilience of individual farms to market fluctuations, adverse weather events, and other stresses. In addition, diversified farms serving local and regional customers support human health and community resilience through more diverse, balanced diets and improved access to fresh healthful food.

In contrast, a global food system that emphasizes highly processed foods based on a few commodities not only poses human health risks, but is also more vulnerable to crop failures resulting from extreme weather, pest and disease outbreaks, and other climate change impacts.

Another main challenge in balancing food and fiber production with the adoption of climate mitigating activities is the current reliance on concentrated animal feeding operations (CAFOs) as an integral part of the meat supply chain in the U.S.

CAFOs are currently the source of the majority of meat, dairy, and eggs consumed across the nation, and they generally rely on large-scale row crop grain production using synthetic fertilizers and pesticides and often store animal waste in lagoons and other systems that generate additional greenhouse gas emissions.

Currently, some USDA programs support CAFOs with taxpayer dollars. NSAC recommends moving away from a livestock production system that has massive greenhouse gas and water pollution impacts in favor of well-managed grazing systems, especially rotational grazing systems that sequester considerable carbon while building soil, forage, and livestock health.

In addition to incentivizing widespread adoption of climate-friendly livestock production systems, NSAC also recommends Congress incentivize climate-friendly manure management and storage practices. Almost half of agriculture's greenhouse gas emissions in the U.S. comes from manure management and enteric fermentation, meaning livestock is the largest single contributor to agricultural greenhouse gas emissions. The *Agriculture Resilience Act* (H.R.5861) looks to reduce potent methane emissions in livestock operations by introducing a new Alternative Manure Management Program. The program supports non-digester dairy and livestock methane management strategies to effectively reduce greenhouse gas emissions and to maximize environmental benefits. Current livestock manure storage and management in pits and lagoons results in large emissions of methane and water and air pollution. Congress should provide financial and technical assistance to farmers to incorporate non-digester manure and methane management practices. Congress should also set a goal to cease building any new or expanded waste lagoons for CAFOs and to convert at least two thirds of wet manure handling and storage to alternative management by 2040, as outlined in the *Agriculture Resilience Act* (H.R. 5861).

- ***Support climate-friendly livestock production systems and end subsidies for concentrated animal feeding operations (CAFOs)***

Limit NRCS CPS 359 (Waste Treatment Lagoon): Limit eligibility for this Practice to existing confinement livestock operations only. Do not offer technical assistance or cost share under CPS 359 or other standards for new or expanding CAFOs. Strengthen requirements such that liquid manure be applied at ecologically acceptable rates.

While we recognize that this practice is designed and intended to reduce water resource impacts of CAFO operations, the increasing use of liquid manure storage facilities has been the major driver of increased total U.S. agricultural greenhouse gas emissions between 1990 and 2018. We believe that because NRCS has a responsibility to protect natural resources and the environment, it is extremely problematic that the agency is continuously supporting and subsidizing CAFO expansion in areas already in high environmental risk.

CAFOs cause massive release of methane and associated air quality and quality of life problems in rural areas. They are also a foremost source of greenhouse gas emissions. CAFOs require import of huge amounts of grain, which must then be transported to the CAFOs, contributing to further greenhouse gas emissions. Additionally, the manure generated at CAFOs is seldom returned to regenerate depleted croplands. USDA should examine EQIP, ARS, and all other programs to phase out those which support CAFOs and increase those which support MIG.

- ***Adopt a national policy to support management-intensive rotational grazing and other advanced grazing systems, including support for transition to grazing***

Cattle and other ruminant livestock emit methane, whether raised on pasture or in confinement. However, management-intensive rotational grazing systems (MIG) shrink the greenhouse gas footprint of livestock production by eliminating manure storage facilities, improving forage quality (which reduces enteric methane), and sequestering more soil organic carbon in grazing lands. Advanced grazing systems, particularly MIG, have been shown to improve soil, forage, and livestock health dramatically, to reduce water pollution, and to sequester large amounts of carbon. The most productive soils in the world were created by ruminants intensively grazing and incorporating their manure under pressure of predators. MIG farmers today are replicating this process, which has created soils that sequester more carbon than any other farming system.

Well-managed grazing systems also mitigate manure-related water impacts and greenhouse gas emissions. Diversified organic and sustainable operations that integrate crop and livestock production can further reduce climate impacts by optimizing nutrient cycling and utilizing on-farm resources to feed and maintain both livestock and crops.

In contrast, CAFOs contribute a large part of U.S. agriculture's greenhouse gas emissions. Liquid manure storage (lagoons, pits, etc.), over-application of stockpiled manure on nearby acreages, and dependence on high-input corn, soy, and other commodity crops for livestock feed add up to a large climate footprint as well as threatening water and air quality and human health in neighboring communities.

Therefore, Congress should enact, and USDA should implement, measures to encourage the widespread adoption of MIG-based systems and crop-livestock integrated production. The new CSP Supplemental Payment for Advanced Grazing Management takes an important step in the right direction, but it must be backed up through restoration of full CSP funding, enhanced education and technical assistance to help livestock producers make this transition, and a phase-out of CAFO infrastructure subsidies through EQIP and other mechanisms such as federal loan guarantees. Congress should support legislation focusing a majority of EQIP livestock-related conservation practice payments to the adoption and improvement of pasture-based production systems.

- ***Support diversification and reduced concentration of processing facilities, especially in meat packing, with support for diverse local meat processing plants***

Resilient agricultural systems must be the goal of all efforts to combat climate change. The recent COVID-19 crisis has revealed a lack of resilience in supply chains due to the concentration of processing in a few large plants owned by a handful of companies. When these plants had to close,

farmers were forced to plow under vegetables, pour milk down the drain and euthanize animals. Meanwhile store shelves were bare, and prices skyrocketed for consumers.

USDA Rural Development's Value-Added Producer Grant (VAPG) program was established to help producers create locally-owned processing and marketing facilities. VAPG should be expanded to help diversify and de-concentrate the processing of food – especially meat. Just as VAPG was initially modeled after successful state programs, in expanding VAPG, USDA should look to state programs such as Kentucky Agricultural Development Board's recent push to support local meat processors.

4e. What types of recognition, certification, compensation, or other acknowledgement would be most useful to promote the use of conservation practices that are particularly effective at reducing climate change?

In addition to expanding support for conservation and research programs outlined in our recommendations under Questions 3, 4a, and 4b, there is an urgent need to have a better understanding of outcomes and measurement of these outcomes for all the various conservation program, practices, and initiative to assess and inform agriculture's involvement in tax credits, supply chain initiatives, and carbon trading. Existing tools to measure soil carbon vary in degree of accuracy and reliability, both of which are required for effective use of carbon markets and other ecosystem service markets. Without accurate measurement tools that take into account geographic variations and other variables, quantifying soil carbon will continue to be inadequate and will not guarantee net greenhouse gas emission reductions.

Recognition, certification, and compensation should factor in that adaptation strategies will be different for each region. The emphasis should be on site-appropriate whole-farm systems, rather than in establishing single practice prescriptions across USDA programs.

- ***Establish a Monitoring, Evaluation, and Reporting Initiative to create outcomes-verified data and metrics that would be needed for tax credits, supply chain initiatives, and carbon trading***

Measurement, evaluation, and reporting (MER) requirements on conservation outcomes are needed for all conservation programs and initiatives, including a description of all the approaches, methods, and metrics USDA is developing or already has in place. This information is necessary in order to define, evaluate, and communicate outcomes specifically related to the potential of USDA conservation programs to help farmers mitigate impacts of climate change. Recent and ongoing advances in sensor technology and real-time in-field monitoring of soil carbon and nitrogen dynamics as well as crop-soil water relations, crop nutrient status, and plant diseases should help make effective MER more and more feasible in the near future.

While USDA is currently able to measure conservation effects on a national, regional, and landscape scale through the Conservation Effects Assessment Program (CEAP), CEAP is not able to assess the effects of individual USDA conservation programs, practices, and initiatives – which will be needed in order to establish outcomes-verified data on the carbon sequestration rates of various NRCS practices and integrated suites of practices. In order to build the necessary partnerships, infrastructure, and capacity to measure, evaluate, and report on the effects of conservation programs

and initiatives on carbon sequestration and net greenhouse gas footprint, USDA will need a targeted source of funding.

To date, carbon markets have not resulted in overall greenhouse gas emissions reductions and may not be the best option to incentivize farmers to implement climate-friendly practices. In addition to the issues around accurate measurements, carbon markets seem to lend themselves to land consolidation of corporate entities, which further negatively impacts historically underserved farmers in accessing land. Soil carbon storage is also impermanent – any carbon sequestered in the soil can be released with a change in land management practices or through severe weather events. Furthermore, volatile pricing of carbon credits does not give small to mid-sized farmers enough of an incentive to take on the risk to transition to best practices for land stewardship and conservation. Federal programs need to provide stable and increased funding that supports all farmers, particularly small, mid-size, and historically underserved farmers, in transitioning to climate-friendly agricultural practices.

- ***Focus climate change research, conservation incentive programs, and federal commodity and crop insurance on whole-farm systems***

Given the range of uncertainty with regard to the specific impacts of climate change on agriculture in any given location, adaptation strategies should not be viewed as a set of single practice prescriptions. Resilience in agricultural systems is a function of the health of the entire agricultural ecosystem and climate change strategies must therefore focus on whole- system – rather than piecemeal – approaches. Specific policy recommendations include:

  - An emphasis on "sustainable systems for agricultural production" and not just "sustainable practices" across USDA's research, education, and extension activities concerning climate change.
  - Increased emphasis on systems approaches to risk management that incentivizes cropping system diversity and re-integration of livestock and cropping systems such as the Risk Management Agency's Whole Farm Revenue Protection crop insurance program.
  - Substantial reform of USDA commodity and crop insurance programs with the long- term goal of reorienting our farm safety net system from overproduction, specialization, and environmental harm to a new safety net that puts farmers and climate-smart agriculture first, supports diversified operations and a rational balance among production, resilience, and stewardship of climate, soil, water, and other resources.

- ***Expand support for organic certification by increasing funding for the National Organic Certification Cost Share Program and by increasing cost share payments***

Organic food is a rapidly growing sector of the American food economy. Domestic production has been growing, but much of the organic food and fiber American consumers and manufacturers purchase is imported. The gap between domestic supply and consumption that is currently filled by imports is an important market opportunity for American farmers and ranchers. In addition to the market opportunity that organic farming presents, organic farming builds soil health, stores carbon, releases fewer greenhouse gases, and builds resilience to the effects of climate change.

Current cost share assistance is at a rate of 75 percent of certification costs up to a maximum of $750 per year, which is not enough to support widespread adoption of certified organic

production. The *Agriculture Resilience Act* (H.R.5861) proposes to increase the maximum annual cost share payment for organic certifications to $1,000 per organic producer or handler per year. Congress should increase support for organic agriculture and incentivize adoption of climate-smart practices by organic farmers. In addition to increasing cost share payments and mandatory funding for the National Organic Certification Cost Share Program, Congress should create a national program to support farmers in their transition to organic agriculture. The program should include farmer-to-farmer mentorship opportunities, financial and technical assistance, and set-asides and incentives for beginning and socially disadvantaged farmers, as well as other historically underserved farmers.

5. What technical assistance is most important for agricultural producers in your region? Who is best suited to deliver technical assistance? What additional tools or resources would make it possible to best tailor and deploy these strategies in your area?

NSAC urges Congress to protect farm bill conservation program mandatory funding and provide robust discretionary funding to support NRCS field staff in providing technical assistance to farmers and ranchers. Farmers are most likely to adopt new practices by learning from other farmers. If other farmers are implementing a practice, farmers are more likely to see the practice or system as practical and profitable. Technical assistance providers should incorporate farmer innovators whenever possible. This is especially true for measures to mitigate and prepare for climate change, since these strategies are largely based on recent science and commonly require site-specific selection and implementation of a suite of multiple, complementary practices. Few priorities are more urgent than providing producers and rural communities with the practical tools and know-how they need to build resilience to the specific impacts of climate change in their locale.

For example, while research and rancher experience have abundantly validated the carbon sequestration and other benefits of management-intensive rotational grazing (MIG) systems, widespread adoption has been thwarted, to a large degree by the steep learning curve in making a transition from existing practices to MIG, and in adapting the general MIG concept to a specific ranch in its particular locale, climate, soils, and scale of operation. In addition to the new CSP supplemental payment for MIG under the 2018 Farm Bill, livestock producers need technical support in making this transition successfully. Similar constraints apply to adoption of whole farm conservation strategies in organic, agro-ecological, and other cropping systems. Thus, it is essential that Congress expand and maintain funding for NRCS to recruit and train a sufficient cadre of field staff who can provide this vital assistance to producers. Additionally, Congress should increase by 10 percent the funding directed to Cooperative Agricultural Extension efforts, including the ATTRA Sustainable Agriculture Program, that will work directly with farmers to implement climate-resilient systems of agriculture production.

NRCS Plant Materials Centers (PMC) are another example of regionally-relevant technical assistance provided to farmers. Each of the 25 PMCs is based in ecologically distinct areas and helps evaluate plants and vegetative technologies to support USDA conservation programs and practices. Congress should prioritize funding and utilization of PMCs to support activities like demonstrations of cover crops and other climate-friendly cropping systems to support widespread adoption of these practices in a regionally-relevant manner.

Additionally, USDA should take immediate steps to ensure effective enforcement of existing conservation compliance measures for controlling soil erosion, and it should also strengthen

conservation compliance by requiring compliance plans and implementation to increase soil carbon levels and measures. Technical assistance should be provided for the implementation and enforcement of these measures.

- ***Create a special technical assistance initiative for climate mitigation/adaptation***

Congress should set aside one percent of all farm bill conservation funding as a dedicated fund for a major technical assistance initiative that involves NRCS, third party providers, non-profit organizations, and Cooperative Extension on an effort to increase adoption rates of the most critical conservation practices and activities for soil health and greenhouse gas emission reduction. Such technical assistance should focus on soil health principles and practices, carbon sequestration in soil/biomass, greenhouse gas-mitigating nutrient management strategies, and farming systems that further climate mitigation goals, including integrated organic and sustainable production systems, crop diversification, crop-livestock integration, agroforestry, silvopasture, and perennial conservation buffers, advanced grazing management). Additionally, Congress should ensure that targeted technical assistance is available to underserved farmers – including beginning, limited resource, small-scale, and socially disadvantaged farmers.

6. What technical assistance is most important for rural communities in your region?

Different regions and farming systems will need different kinds of technical assistance to meet the climate challenges. For example, fruit and nut growers need information on cultivars that are less sensitive to disruption of seasonal development by changed weather patterns, while Midwest corn and soybean farmers may need cultivars with greater heat tolerance.

Arid regions in the West need best water conservation through integrated soil health and irrigation management, while the Mississippi River Basin may need technical assistance in flood management. Growers in Mediterranean climates such as California and parts of the Pacific Northwest need integrated soil health management strategies, including but not limited to improved rotations with winter cover crops adapted to their region, in order to manage the soil moisture extremes of hot, rainless summers, and very rainy winters. With its more even seasonal rainfall distribution and cool-temperate climates, the Northeast might seem to have less climate vulnerability – however infrequent but extreme hurricanes and other rainfall events have illustrated the need for flood-preparedness at farm and community levels.

Farming systems that depend on laborers who must work outside in the heat need assistance in developing strategies to protect worker health as climate change intensifies heat stress. Other regions or grower groups may have other specific technical assistance needs in facing the climate challenge.

Climate science has revealed that parts of the Southeast are in a "warming hole" where rainfall is higher, and temperatures are lower than in the past and often even lower than more Northern locations. Similarly, the Corn Belt has experienced anomalous cooling in summer due to the vast plantings of corn, associated transpiration and resulting increased rainfall. Technical assistance must be adjusted to take into account climate anomalies existing in local areas.

Congress should increase support for training and improvement of agricultural extension education to farmers and ranchers on how to fully utilize conservation programs and crop insurance programs

to build climate resilient systems of production. Congress should increase funding for programs like the ATTRA Sustainable Agriculture Program, which has a long history of providing such reports and support.

Additionally, increased funding for the USDA Climate Hubs is absolutely necessary to address regional technical assistance needs, since the impacts of climate change will vary from region to region. Climate Hubs develop and deliver region-specific tools and information to farmers and ranchers to help them make climate-informed decisions, and they also provide assistance to implement those decisions. The *Agriculture Resilience Act* (H.R. 5861) provides a first ever legislative authorization for the USDA Climate Hubs, establishing a national network of regional hubs dedicated to climate change adaptation and mitigation. We urge Congress to authorize Climate Hubs and increase their funding so farmers and ranchers can receive science-based and region-specific information and technical assistance.

7. A wide range of solutions have been proposed to slow climate change, and there are additional strategies that could be developed. What approaches to policy and action to reduce the severity of climate change and the impacts of severe weather would you be most interested in seeing put in place? What do you see as the best way to accomplish action as quickly as possible?

The recommendations provided in this response represent immediate next steps that Congress and USDA can take in our efforts to address the climate crisis. However, a coordinated federal response is critical. The country needs strong leadership and planning while climate mitigation is still possible. Introducing comprehensive climate legislation, one that recognizes agriculture's key role in our efforts to combat climate change, is absolutely necessary. Legislation must include clear goals around carbon neutrality, a timeframe, and action steps to achieve these goals.

- ***Establish a national goal and timeframe for U.S. agriculture to achieve carbon neutrality***

USDA has made erosion reduction, healthy soils and improved water quality national priorities – which are reflected throughout USDA conservation, research, and rural development programs. Preventing erosion conserves soil organic carbon, building soil health enhances soil organic carbon accrual, and best nutrient management to protect water quality also reduces emissions of nitrous oxide, which is the U.S. agriculture's largest *direct* contribution to greenhouse gas emissions. Perennial plantings from perennial food and forage crops to permanent conservation buffers, silvopasture, and other agroforestry applications can sequester tons of carbon per acre. Advanced rotational grazing management systems further enhance soil organic carbon sequestration and reduce direct greenhouse gas emissions from livestock production.

By making a climate-neutral agriculture a national priority, USDA should logically focus a significant portion of conservation, energy, research, and rural development program spending on systems and practices that most-effectively store carbon and minimize greenhouse gas emissions; and support widespread adoption through funding allocations, financial and technical assistance for producers, ranking of program applicants, support services, and other policies throughout its suite of programs.

The *Agriculture Resilience Act* (H.R.5861) sets a national goal for the agriculture sector to achieve net zero emissions by no later than 2040. It also outlines subgoals and action steps to achieve climate-neutral agriculture by 2040. The legislation's subgoals span across six main categories: research, soil

health, pasture-based livestock, farmland preservation, on-farm renewable energy, and food waste. Congress should set a national goal and timeframe for agriculture to be climate-neutral and should direct USDA to develop a plan to meet this goal, as outlined in the *Agriculture Resilience Act* (H.R. 5861).

- ***Prioritize carbon sequestration through plant and soil as the nation's leading carbon sequestration strategy, and give full recognition to farmers, ranchers, and other land managers as leading practitioners of this strategy***

Periodic reports of the U.S. Global Change Program and the International Panel on Climate Change review a number of technologies and strategies for capturing and removing excess carbon dioxide from the atmosphere in order to slow, stop, and reverse global warming. These include: 1) enhancing land plant photosynthesis and storage as soil organic carbon and in plant biomass, 2) fertilizing oceans to stimulate phytoplankton photosynthesis, 3) alkalizing the ocean or land surfaces to absorb carbon dioxide from the air, 4) scrubbing carbon dioxide from the air to store deep underground, and 5) adding aerosols such as sulfuric acid to the stratosphere to reflect more solar radiation and reduce surface warming.

Of these five strategies, only the land plant-soil carbon pathway, potentially enhanced through the entire suite of agroecological systems and practices cited above, is ready for widespread implementation and is relatively free from unintended adverse consequences or "side effects." All the others face major and potentially costly technological hurdles and can backfire. For example, alkalizing or fertilizing the ocean can upset entire marine ecosystems in unpredictable ways, stratospheric aerosols can interfere with the ozone layer, and underground carbon storage may leak, thereby defeating their own purpose.

This comparison further highlights the vital role that farmers, ranchers, foresters, and rural communities can and will play, not only in building a more climate resilient food system and society, but also in helping to combat the global carbon imbalance and greenhouse gas emissions that drive climate change. Any federal legislation to address the climate crisis must elevate, train, remunerate, and fully support our farmers and ranchers to become leaders in climate mitigation and resilience.

[iii] "Farmworkers at Risk: The Growing Dangers of Pesticides and Heat." *Union of Concerned Scientists*, 2019. 20 pp. https://www.ucsusa.org/sites/default/files/2019-12/farmworkers-at-risk-report-2019-web.pdf

[iv] Brillinger, R., Merrill, J., and Lyddan, K. (2013). Triple Harvest: Farmland conservation for climate protection, smart growth and food security in California. California Climate and Agriculture Network. http://calclimateag.org/wp-content/uploads/2013/02/Triple-Harvest-Full-Report.pdf

[v] Lal, R. 2003. Soil erosion and the global carbon budget. *Environment International*. 29:437 450. https://doi.org/10.1016/S0160-4120(02)00192-7