ORGANIC FARMING RESEARCH FOUNDATION
Fostering the improvement and widespread adoption of organic farming.

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Thank you for the opportunity to provide comment on the proposed themes and framework of the Fifth National Climate Assessment (NCA5), to be undertaken by the U.S. Global Change Research Program (USGCRP). NCA5 provides an opportunity to take a closer look at the impacts of climate changes on US agriculture, and the capacity of improved farming, ranching, and land management practices to advance the vital goals of climate mitigation and adaptation.

The Organic Farming Research Foundation (OFRF, https://ofrf.org) works nationwide to foster the improvement and widespread adoption of organic farming systems through research, education, and federal policies that bring more farmers and acreage into organic production. In recent years, the organic farmers we serve have felt the increasing impact of climate disruption on their operations, and are actively seeking new, science-based adaptive strategies.[1] Thus, helping organic producers meet the climate challenge and contribute to climate solutions through research and practical application has become a top priority for OFRF.

A substantial body of research shows that organic and agro-ecological production systems have great potential to improve the resilience of farms, ranches, rural communities, and food supplies to the impacts of climate disruption; to sequester carbon; and, if widely adopted, to reduce the net greenhouse gas (GHG) footprint of the US agricultural and food system to zero.[2,3] USDA Natural Resources Conservation Service (NRCS) has established five science-based principles of soil health management: keep the soil covered, maintain living roots, maximize diversity, minimize disturbance, and integrate crops with rotationally grazed livestock. Studies indicate that these five principles also provide an excellent roadmap for carbon sequestration and greenhouse gas mitigation, and that organic production methods further enhance these benefits by protecting soil biota from synthetic agricultural inputs.[2,3,4]

It is from this perspective that we offer the following comments and recommendations on specific aspects of the Draft Prospectus for the Fifth National Climate Assessment. Boldface headings refer to topic headings in the Federal Register notice, and italicized quotes are taken from that notice.

Overarching themes and perspectives for NCA5

In general, we agree with the five overarching themes outlined in the Federal Register (FR) notice. With regard *to "scientific understanding of human-induced and natural processes of global change"* and "*anticipated legacy effects of the human influence on the climate and oceans*," current and future effects of climate shifts on the soil biotic community and on soil-plant-microbiome relationships may have major long-term implications for the functioning of agricultural as well as natural ecosystems, and thus on agricultural production and food security. NCA5 should review recent research into these potential impacts, and explore mitigation and adaptation strategies that can maintain soil health and fertility in the face of these complex global changes.

In addition, we would like to propose a sixth overarching theme for NCA5:

> *Enhance understanding of the functioning of the plant-soil-microbiome continuum in global and regional carbon cycles, the impact of agricultural and land use practices, and the potential for organic and agro-ecological production and land management systems to effect net carbon sequestration in soils and plant biomass.*

1. Introduction and Context for NCA5

Regarding *"factors that affect resiliency and vulnerability, such as demographic and land use changes,"* note that conversion of agricultural lands to organic and sustainable production, increased emphasis on crop and enterprise diversification, reliance on local renewable natural and human resources, and smaller scale operations that serve local food systems can build community resilience in many ways. Organic farmers and ranchers seek to maximize soil health, which in turn enhances yield stability through weather extremes and other stresses.[2,3] In food-insecure regions in Africa, adoption of organic production systems that rely on locally available resources and low cost technologies have not only doubled crop yields, but also enhanced food security, public health, social capital, and community resilience in multiple ways.[5]

Regarding *"Risks to interconnected natural, built, and social systems,"* the philosophy of organic agriculture includes attending to the continuum of soil health with crop, livestock, and human health, including the wellbeing farmers and farm labor. In the United States, some 3 million farmworkers and food system workers do two-thirds of the labor that puts food on our plates every day; thus their wellbeing is vital to food security nationwide. Because of their often poor living conditions and low pay as well as the nature of their jobs, these workers face especially severe impacts from climate change, including heat stress during field or factory work, and increased pesticide exposure as intensifying pest pressures net more frequent chemical applications.[6] NCA5 must include a thorough assessment of this vulnerability and effective mitigation strategies.

3. Human Health and Welfare, Societal, and Environmental Vulnerabilities to a Changing Climate

Regarding the NCA mandate to analyze *"the effects of global change on the natural environment, agriculture, energy production and use, land and water resources …"* we urge the USGCRP to include in this analysis the impacts of warmer temperatures, extreme rainfall events, and intensified droughts on soil erosion rates, soil biological community structure and function, soil carbon sequestration, and water storage. Organic and agro-ecological farming and ranching systems depend on healthy living soils for long term sustainable production, and now require science based practical guidance on how best to protect soil and water resources from the worst impacts of climate disruption.

Regarding *"potential adaptive measures to minimize risks … [that] are identified in the published literature*," within the topic of agriculture, we urge USGCRP to give due consideration to organic and agro-ecological food and fiber production systems for their demonstrated capacity to enhance agricultural and community resilience, and minimize climate-related risks.[2,3,7]

We are grateful that the NCA5 intends to address additional topic areas including "*land cover and land use change; forests; ecosystems and ecosystem services.*" The potential to sequester carbon and build more resilient landscapes through a range of practices from reforestation and native prairie restoration to agroforestry, silvopasture, advanced grazing management, and sustainable organic production merits specific attention.

4. Regional Analyses Within the United States

Regarding *"topics to focus on within particular regions,"* soil carbon dynamics and best strategies to enhance carbon sequestration in soil and plant biomass will depend to a marked degree on climate (temperature and rainfall regimes), soil type, and other region specific factors. A thorough NCA5 assessment of region-specific aspects of soil function within the overall carbon cycle will inform and guide regional climate mitigation and adaptation strategies in the agriculture and land management sectors.

5. Information Needed To Support Climate Change Adaptation, Increased Resiliency, and Risk Reduction

Regarding "*adaptive measures and resiliency planning*," we believe that sustainable organic methods that embrace the NRCS Five Principles of Soil Health Management, coupled with close adherence to the spirit and letter of the USDA National Organic Standards can advance these goals to a substantial degree. While additional research is needed to fully realize this potential, enough is known today to reap major resilience benefits from widespread adoption.

Regarding *"near-term adaptation and resiliency needs,"* one top priority is to stop soil erosion. In addition to destroying the resilience and productivity of agricultural lands, soil erosion is responsible for a global annual loss of about 1 gigaton of carbon to the atmosphere as CO_2, or roughly six percent of the total human GHG footprint.[8] Thus, one near-term adaptation (and mitigation) priority is to bring soil erosion to a halt.

Regarding *"evidence of successful measures,"* we again refer to the large and growing body of research illustrating the potential of organic and ecological agriculture, soil conservation, and improved land management to advance the goals of climate mitigation and resilience.[1-5,7,8]

Regarding *"Recent literature on the potential for greenhouse gas emissions mitigation through natural and technological solutions,"* the safest, most cost-effective, and practical means to remove excess CO_2 from the atmosphere is through plant photosynthesis and subsequent sequestration of fixed carbon in soil and long-lived plant biomass. This strategy, proven through 450 million years of co-evolution of land plants, microbiomes, and soils, can become a highly effective natural solution when carbon sequestration is enhanced through agricultural and land management strategies such as:

- Organic farming and ranching systems that integrate the five NRCS principles of soil health management.
- Agroforestry and permaculture systems that utilize diverse perennial plant communities to meet human food and fiber needs while restoring soil and ecosystem health.

- Advanced grazing management and silvopasture as the dominant systems of animal agriculture.
- Restoration and protection of native forest, wetland, and prairie communities.
- Re-greening of urban areas.

We much appreciate this opportunity to provide input to USGCRP on the development of the Fifth National Climate Assessment.

Sincerely,

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[1] Jerkins, D, and J. Ory. 2016. *National Organic Research Agenda: Outcomes and Recommendations from the 2015 National Organic Farmer Survey and Listening Sessions*. Organic Farming Research Foundation, https://ofrf.org/research/reports/. 126 pp.

[2] National Sustainable Agriculture Coalition, 2019. *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge*. https://sustainableagriculture.net/publications/. 70 pp.

[3] Schonbeck, M., D. Jerkins, and L. Snyder. 2018. *Soil Health and Organic Farming: Organic Practices for Climate Mitigation, Adaptation, and Carbon Sequestration*. Organic Farming Research Foundation, http://ofrf.org/research/reports/. 78 pp.

[4] Klein, K. 2019. *Pesticides and Soil Health*. Friends of the Earth, 9 pp. Includes a review of refereed journal articles.

[5] United Nations, 2008. *Organic Agriculture and Food Security in Africa*. United Nations Conference on Trade and Development (UNCTAD) and United Nations Environment Programme (UNEP). 61 pp.

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

[7] Schonbeck, M., H. Baron, and S. Golden. 2020. *An Organic Approach to Increasing Resilience.* Organic Farming Research Foundation (www.ofrf.org), 14 pp.

[8] Lal, R. 2003. *Soil erosion and the global carbon budget*. Environment International, 29:437-450.