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November 22, 2019

The Honorable Kathy Castor
Chair, Select Committee on the Climate Crisis
U.S. House of Representatives
Washington, DC 20515

The Honorable Garret Graves
Ranking Member, Select Committee on the Climate Crisis
U.S. House of Representatives
Washington, DC 20515

RE: House Select Committee on the Climate Crisis Request for Information

Dear Chair Castor and Ranking Member Graves:

The American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and Soil Science Society of America (SSSA) represent more than 18,000 scientists in academia, industry, and government, 12,500 Certified Crop Advisers (CCA), and 781 Certified Professional Soil Scientists (CPSS). We are the largest coalition of professionals dedicated to the agronomic, crop and soil science disciplines in the United States.

Climate change is indeed an existential threat, and the Societies applaud the House of Representatives for enacting a Select Committee to recommend policies to mitigate the causes of global climate change. American agriculture accounts for nearly ten percent of U.S. greenhouse gas emissions, and global agriculture is responsible for nearly a quarter of emissions worldwide.[1] It does not need to be this way. Farmed soils have between 25 and 75 percent less carbon than undisturbed soils, which means that agriculture has the potential to be an enormous carbon sink.[2] American farmers can become globally recognized land stewards as they sequester more than a fifth of U.S. carbon emissions without interfering with food production.[3]

Sequester Carbon, Build Soil

We already know enough to get started

Sustainable agriculture that focuses on a broad, systems approach that returns carbon to the soil and builds soil organic matter has the double effect of pulling carbon out of the atmosphere and building healthier soils.[4] Principles of such farming include no or low tillage; cover crops; diverse crop rotations,

[1] https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions, https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data#Sector

[2] Lal, Rattan. "Managing soils and ecosystems for mitigating anthropogenic carbon emissions and advancing global food security." *BioScience* 60.9 (2010): 708-721.

[3] Fargione, Joseph E., et al. "Natural climate solutions for the United States." Science advances 4.11 (2018): eaat1869.

[4] Lal, Rattan. "Enhancing crop yields in the developing countries through restoration of the soil organic carbon pool in agricultural lands." *Land Degradation & Development* 17.2 (2006): 197-209.

sometimes including grazing; land applications of manure, biosolids or urban compost; and precision agriculture.[5]

Healthy farms need healthy soil

Soils with more organic matter absorb and retain more moisture, reducing the need for irrigation and increasing a farm's resilience to the damage associated with droughts or flooding.[6] More specifically, farms with high soil organic matter require fewer additional fertilizers and can produce healthier crops and higher yields.[7]

Jump-Start Soil Health

Increase funding for Extension

Many practices that increase carbon sequestration and soil organic matter are already cost-effective, but widespread adoption is hampered by a variety of factors, including awareness. The U.S. Department of Agriculture (USDA) and universities use Extension agents on a county level to deliver knowledge discovered through research to the farmers who can directly apply it on their land, but funding for Extension in real dollars has declined, as has the number of Extension agents available for farmers.[8] Congress should triple the funds for the conservation technical assistance staff at USDA's National Resources Conservation Service (USDA NRCS) and university Extension agents to empower a new Climate Conservation Corps, with NRCS, Certified Crop Advisors, and university Extension employees serving as the boots-on-the-ground to help farmers transition to a new carbon economy.

Incentivize sustainable practices and results

Adoption of sustainable practices is not only hampered by awareness. Some sustainable practices may benefit agricultural systems in the long-term, but farmers need to earn a profit in the short-term to stay in business. Incentives are needed that pay farmers directly to off-set short-term financial risks when they engage in sustainable practices that build soil. Further, crop insurance subsidies should be more generous to producers engaging in sustainable practices, and crop insurance should be more flexible.[9] For example, the USDA's Risk Management Agency should extend the kill-by date for cover crops from April 1 to May 15. This would enable farmers to qualify for full crop insurance subsidies while also giving extended time for crops to put more carbon in the soil, a practice that may reduce cash crop yields in the short-term but will reap benefits in the form of carbon sequestration and healthier soils in the long-term.[10]

Expand the Conservation Reserve Program (CRP)

For some lands, the ecological costs of farming to the country outweigh the economic benefit to the farmer. In these cases, the Conservation Reserve Program (CRP) is used to pay farmers for restoring

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[5] Montgomery, D. R. (2017). *Growing a revolution: bringing our soil back to life*. WW Norton & Company.

[6] Basche, Andrea. "Turning Soils Into Sponges: How Farmers Can Fight Floods and Droughts." *UCS, editor Washington, DC* (2017): 1-18.

[7] Lal, Rattan. "Soil carbon sequestration impacts on global climate change and food security." *science* 304.5677 (2004): 1623-1627.

[8] Wang, SL. 2014. "Cooperative Extension System: Trends and Economic Impacts on U.S. Agriculture". Choices. Quarter 1.

[9] Pan, William L., et al. "Integrating Historic Agronomic and Policy Lessons with New Technologies to Drive Farmer Decisions for Farm and Climate: The Case of Inland Pacific Northwestern US." *Frontiers in Environmental Science* 5 (2017): 76.

[10] Gaudlip, C., N. Sedghi, R. Fox, L. Sherman, and R. Weil. 2019. Effective cover cropping in extremes of weather. Agronomy News-University of Maryland Extension 10:1-4.

forests and grasslands. But market forces can trump the CRP, compelling farmers to plant on land better suited to conservation. Congress should adjust CRP guidelines to incentivize conservation under a variety of economic circumstances.

Research Climate Resiliency

Soil research is needed to identify best practices

Understanding the soil ecosystem is critical. Hundreds of millions of dollars per year in soil research is needed over the next decade to establish soil health benchmarks so that best practices can be developed for farmers over wide geographic ranges. There are proven means of management-based soil carbon sequestration,[11,12,13] but which practices have the biggest impact, and where, is essential information for allocating incentives. Also necessary are rapid soil tests that incorporate these benchmarks. USDA's National Institute of Food and Agriculture (NIFA) should carve out funding for research on soil health and the sustainable, systems-based approaches that return carbon to the soil and build soil organic matter. Congress should fully fund AgARDA with a mandate to invest in high-risk and complex, systems-level soil health research.

Water and irrigation research helps farmers and natural ecosystems

Agriculture accounts for approximately 80 percent of freshwater use in the United States.[14] That's because irrigation can double to triple grain yields.[15] But even as irrigation helps farmers grow more food on less land, extreme weather events and increased development put pressure on those freshwater resources. Research on better irrigation strategies and on crops that require less water is key. This research has the double benefit of helping farmers withstand droughts and floods while preserving more freshwater for natural ecosystems and human consumption.[16]

Diverse crops and markets make resilient farms

As new weather patterns change which crops a farmer can grow, science needs to step in with options to keep farms resilient. Some research is needed to help commodity crops adapt, but farmers and their lands will benefit from a diversity of options. Crop diversification means market diversification, enabling farmers to weather crop price fluctuations, and diverse crop rotations are a tenant of a soil health-centered agriculture – a win-win for farmer and climate.[17] Agronomic research should widen to include a multitude of crops, and investments are needed in economics, marketing, and outreach to prepare

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[11] Poeplau, Christopher, and Axel Don. "Carbon sequestration in agricultural soils via cultivation of cover crops–A meta-analysis." *Agriculture, Ecosystems & Environment* 200 (2015): 33-41.

[12] Luo, Zhongkui, Enli Wang, and Osbert J. Sun. "Can no-tillage stimulate carbon sequestration in agricultural soils? A meta-analysis of paired experiments." *Agriculture, ecosystems & environment* 139.1-2 (2010): 224-231.

[13] McDaniel, M. D., L. K. Tiemann, and A. S. Grandy. "Does agricultural crop diversity enhance soil microbial biomass and organic matter dynamics? A meta-analysis." *Ecological Applications* 24.3 (2014): 560-570.

[14] https://www.ers.usda.gov/topics/farm-practices-management/irrigation-water-use/

[15] Kukal, Meetpal, and Suat Irmak. "Irrigation-limited yield gaps: trends and variability in the United States post-1950." *Environmental Research Communications* (2019).

[16] Basche, Andrea D., and Marcia S. DeLonge. "Comparing infiltration rates in soils managed with conventional and alternative farming methods: a meta-analysis." *BioRxiv* (2019): 603696.

[17] Pan, William L., et al. "Integrating Historic Agronomic and Policy Lessons with New Technologies to Drive Farmer Decisions for Farm and Climate: The Case of Inland Pacific Northwestern US." *Frontiers in Environmental Science* 5 (2017): 76.

markets for them. Perennial crops, including perennial grain crops, for example, have an enormous potential to sequester carbon year after year while saving farmers money in seeds and planting.[18]

Expand on-farm energy production through biofuel systems
Biofuels play an important role in meeting global energy demands, but many crops traditionally used for bioethanol production, such as corn (maize), sugarcane, and sugar beets, are primarily valuable as food and feed sources. Because the priorities of energy and food are in constant competition, these types of biofuel crops will not be able to meet rising global energy demands. Instead, investments are needed to research and deploy biofuel systems that use agricultural residues and waste while promoting sustainable land use.[19]

Nitrogen management research benefits the planet and the farmer's bottom line
The use of industrially produced nitrogen fertilizers on farms has saved billions from starvation and substantially reduced the amount of land that would have been cleared for agriculture. But any applied nitrogen a crop does not immediately use can pollute waterways, causing "dead zones" and "do not drink" water advisories. Excess nitrogen in the soil also converts to the potent greenhouse gas nitrous oxide, which causes three hundred times more warming than carbon dioxide.[20,21]

Researchers are discovering new ways to reduce nitrogen applications without compromising yields. Precision agriculture combines best practices with on-farm data and digitally enabled equipment so that fertilizers can be applied according to variabilities across a field, a paradigm shift from managing a whole field the same way. Meanwhile, management techniques take advantage of rotations with crops that produce, or "fix," their own nitrogen from the air, and a recent discovery of nitrogen fixation in corn (maize) represents a huge potential for reducing nitrogen applications worldwide.[22]

Research and Extension Are Vital
Farmers need healthy soils that sequester carbon, resist flooding, and retain moisture; they need Extension experts who can rapidly bring them up to speed on the latest best practices; they need policies that incentivize conservation and follow soil health principles; and they need resilient crops and robust markets for them. Each of these needs can be met with increased investments in Extension and agriculture research on soil health, agricultural best practices, and a diversity of crops. Resilient, sustainable farms of the future must be our legacy.

Thank you for your consideration. For additional information or to learn more about the ASA, CSSA, and SSSA please contact Karl Anderson, Director of Government Relations, kanderson@sciencesocieties.org or 202-408-5382.

Cc: Members of the House Select Committee on the Climate Crisis

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[18] Glover, Jerry D., et al. "Increased food and ecosystem security via perennial grains." *Science* 328.5986 (2010): 1638-1639.
[19] Gupta, Anubhuti, and Jay Prakash Verma. "Sustainable bio-ethanol production from agro-residues: a review." *Renewable and sustainable energy reviews* 41 (2015): 550-567.
[20] Canfield, Donald E., Alexander N. Glazer, and Paul G. Falkowski. "The evolution and future of Earth's nitrogen cycle." *science* 330.6001 (2010): 192-196.
[21] Snyder, C. S., et al. "Agriculture: sustainable crop and animal production to help mitigate nitrous oxide emissions." *Current Opinion in Environmental Sustainability* 9 (2014): 46-54.
[22] Van Deynze, Allen, et al. "Nitrogen fixation in a landrace of maize is supported by a mucilage-associated diazotrophic microbiota." *PLoS biology* 16.8 (2018): e2006352.