Written Testimony of Earthjustice

on Voluntary Carbon Markets in Agriculture and Forestry

Before The House Committee on Agriculture

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Chairman David Scott
House Committee on Agriculture
1301 Longworth House Office Building
Washington, DC 20515

Thank you for the opportunity to testify on the role of voluntary carbon markets in the agriculture and forestry sectors, and how to take advantage of these sectors' tremendous prospects to both reduce greenhouse gas (GHG) emissions and restore the amount of carbon lost from soil. This testimony inspects the effectiveness of market schemes as a climate solution, and offers recommendations on holistic, scalable approaches to agriculture and land management as part of our national response to climate change.

There is no doubt that agriculture must be part of any solution to the climate crisis. Of course, agriculture is highly vulnerable to the more extreme and variable weather that climate change is bringing, and our food and economic security depend upon both stabilizing our climate and increasing the resilience of our food system. More relevant here, and usually not recognized, agriculture is a major contributor to climate change, and we simply cannot reach our climate goals without more aggressively and effectively addressing this contribution. Agriculture's contribution is equivalent to approximately one-third of U.S. total GHG emissions – about the same as the transportation sector -- when properly calculated to include all climate change impacts related to agriculture.[1]

Fortunately, we can be confident that agriculture can play a pivotal role in tackling the climate crisis. Implementation of proven and well-documented climate-friendly agricultural practices can increase the amount of carbon removed from the atmosphere, increase the amount of carbon stored in soil, and/or reduce agricultural emissions of carbon dioxide, nitrous oxide, and methane. These practices will also often increase resilience to extreme weather, reduce environmental and public health harms, and, in most cases, over time, improve producer productivity or profitability. While proven, these practices are used on only small portions of U.S. farmland; policy changes are needed to dramatically accelerate their adoption. Crafting that policy is the task of this Committee.

The urgency of the climate crisis must be met with effective answers. We offer this testimony to address key issues concerning the use of carbon markets in agriculture as a proposed climate solution and explore the following points:

1. Any climate solution must account for the true climate impact of agriculture, which is approximately one-third of all U.S. GHG emissions.

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[1] *See* EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2019* (2021), https://www.epa.gov/sites/production/files/2021-04/documents/us-ghg-inventory-2021-main-text.pdf. EPA concludes that agriculture's GHG emissions are about 10% of total U.S. GHG emissions; as explained below, this approach significantly understates the correct figure.

2. There are a number of agroecological practices that provide proven ways to reduce GHG emissions and sequester and store carbon. Scaling up these efforts and funding additional research into them offer an effective solution to the climate crisis.
3. Carbon markets do not provide an effective climate solution. They are impermanent, uncertain, and based on a scientific fallacy, all of which undermines their credibility. They are also historically inequitable, and fail to address longstanding environmental justice concerns.

I. Agriculture's True Climate Impact

As lawmakers analyze solutions for tackling the climate crisis, it is imperative they understand the true climate footprint of the agricultural sector. Though the Environmental Protection Agency (EPA) estimates that agriculture is responsible for about 10% of U.S. GHG emissions,[2] this figure excludes many factors that contribute additional emissions from the sector. This figure does not account for emissions from on-farm fuel and electricity use (*See figure below, Bar 2*), emissions associated with the manufacture of agricultural inputs like fertilizer (*See figure below, Bar 3*), or emissions downstream of production such as food processing, distribution and food waste. Additionally, these estimates do not account for the impacts of methane on policy-relevant timescales, as they utilize 100-year timeframes rather than a more relevant 20-year timeframe (GWP20) accurately reflecting methane's concentrated warming impacts (*See figure below, Bar 4*).[3]

A major omission in this account of agriculture's climate footprint is related to land use. Past and ongoing conversion to cropland and grazing land has resulted in enormous losses of stored carbon, and agricultural activities pose ongoing threats to the magnitude and persistence of the remaining soil carbon stocks. Furthermore, this estimate does not include the impact of continued land use, i.e., the continuing yearly impact of prior conversions of natural lands to agriculture.[4]

The use of land for growing crops or raising livestock means that agricultural land—62% of the continental United States—cannot be used for other purposes, including those that could have a very different climate impact, for example by sequestering or storing carbon in grassland or forest land. A more accurate and complete assessment of agriculture's climate impact would include the "quantity of carbon that could be sequestered annually if [that land] were instead devoted to regenerating forest [or grassland]."[5] *See figure below, Bars 5 and 6*. Adding these climate change impacts to the annual food system emissions would very dramatically increase agriculture's true climate change footprint: "the cumulative potential of carbon dioxide removal on land currently occupied by animal agriculture is comparable in order of magnitude to the past decade of global fossil fuel emissions."[6]

Thus, when correctly calculated to include all agriculture related climate change impacts, including the foregone sequestration potential of agricultural land use, it is clear that the overall impact of agriculture to climate change is equivalent to far more than only 10% of U.S. GHG emissions. A more complete accounting of these contributions including each of the factors laid out above raises this estimate to at least one-third of U.S. direct GHG emissions, closer in magnitude to total emissions from the transportation sector. This estimate is in line with numerous recent estimates at the global scale, which

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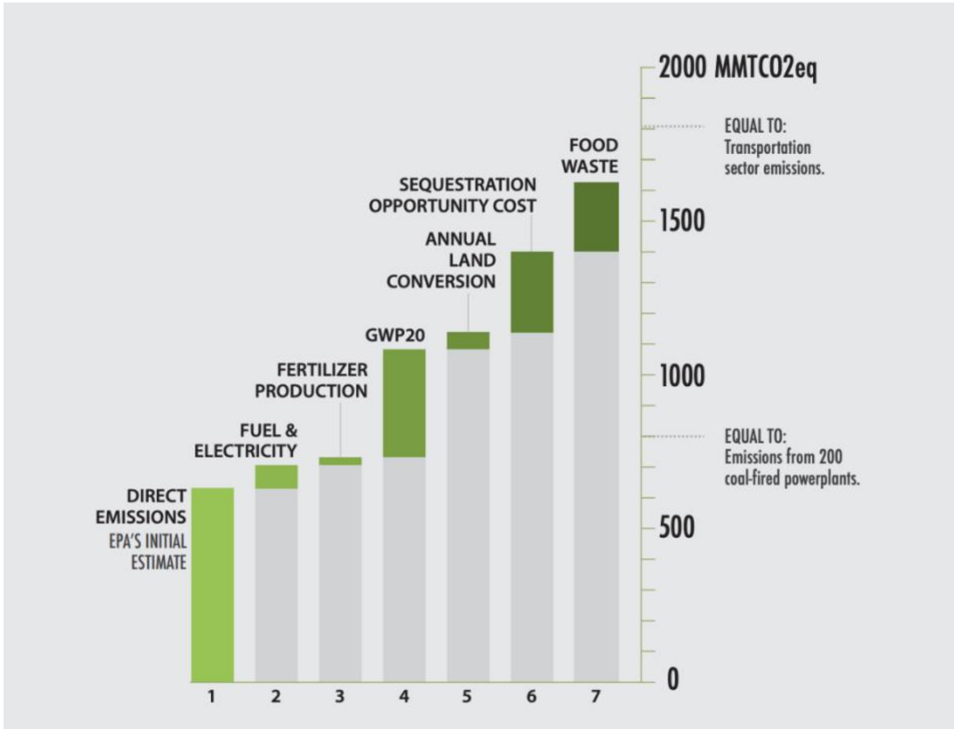
[2] *See* EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2019* (2021), https://www.epa.gov/sites/production/files/2021-04/documents/us-ghg-inventory-2021-main-text.pdf.
[3] Intergovernmental Panel on Climate Change, Climate Change 2013: The Physical Science Basis Ch. 8, at 714 tbl.8-7 (2014) at 720.
[4] Matthew Hayek et al., The Carbon Opportunity Cost of Animal-Sourced Food Production on Land, 4 Nature Sustainability 21 (Jan. 2021)
[5] Timothy Searchinger et al., Assessing the Efficiency of Changes in Land Use for Mitigating Climate Change, 564 Nature 249 (Dec. 13, 2018).
[6] *See Hayek supra note 7.*

place agricultural emissions at one-third or more of anthropogenic greenhouse gas emissions.[7] Any solution to the climate crisis must focus not only on agriculture's potential to store more carbon in the soil, but also on the need to reduce agriculture's GHG emissions.



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II. A Number of Agroecological Practices Provide Proven Ways to Reduce GHG Emissions and Sequester and Store Carbon in Soil.

Several climate-friendly practices with demonstrated benefits are available to reduce agriculture's GHG footprint. A large body of scientific literature, in addition to traditional knowledge and experience, support the environmental benefits of these practices, making them excellent candidates for effectively and efficiently increasing carbon sequestration, reducing greenhouse gas emissions, and building climate resiliency. However, due to financial and technical barriers, adoption of some of the most effective climate-friendly practices remains low. Lawmakers should focus greater attention on incentivizing adoption of practices with the greatest climate benefits, while also supporting continued research on how to most effectively adopt these practices at scale across the nation, as these practices offer a true climate solution.

Agroforestry has a strong potential for reducing the net climate footprint of agriculture — with realistic rates of adoption leading to carbon sequestration rates equal in magnitude to over a third of fossil

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[7] Id. See Crippa, M., Solazzo, E., Guizzardi, D. et al. Food systems are responsible for a third of global anthropogenic GHG emissions. Nat Food 2, 198–209 (2021). https://doi.org/10.1038/s43016-021-00225-9; *See also*, Sonja J. Vermeulen et al., *Climate Change and Food Systems. Annual Review of Environment and Resources*, 37 Ann. Rev. Env't & Resources 195 (2012).
[8] U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2019* (2021) at Table 2-7. [2] *Id.* Table 2-12. [3] Values adjusted using 20-year global warming potentials for N2O and CH4. [4] *Id.* Table 2-8. [5] Hayek, M.N., Harwatt, H., Ripple, W.J. *et al.* The carbon opportunity cost of animal-sourced food production on land. *Nat Sustain* 4, 21–24 (2021). *Annualized, U.S. value from personal communication with author.* [6] U.S. EPA including emissions from ammonia production, nitric acid production, composting, phosphoric acid production, anaerobic digestion at biogas facilities, and 75% of landfill emissions. Table ES-2.

fuel emissions in the U.S.[9] Agroforestry practices, including alley cropping, silvopasture, and riparian forest buffers, integrate or re-introduce woody vegetation into crop and animal farming systems where the landscape would naturally support such vegetation. Alley cropping systems integrate trees and shrubs into crop production, while silvopasture refers to the integration of trees and shrubs with livestock activities.[10]

Improved nutrient management is another practice with enormous climate benefits. Synthetic nitrogen fertilizer application and other agricultural soil management practices account for more than half of greenhouse gas emissions from agriculture. In addition to representing a large proportion of the environmental footprint of agriculture, these emissions are responsible for over three-quarters of all nitrous oxide emissions across sectors in the U.S.[11] Reducing nitrous oxide emissions from agriculture is particularly urgent as the warming potential of nitrous oxide is 265-298 times greater than carbon dioxide.[12] Improving nutrient management practices, including precision application, cover crops and longer and more varied crop rotations (which naturally provide nutrients and thus reduce fertilizer needs), using natural rather than synthetic fertilizer, riparian buffers, and soil amendments, can greatly reduce the climate footprint of agriculture by reducing nitrous oxide emissions while also preventing nutrient runoff and avoiding air and water pollution from excessive fertilizer use.[13]

Diversified conservation crop rotations and cover crops can also help increase soil carbon sequestration by introducing a wider range of inputs into soil, maintaining soil cover throughout the year, and minimizing soil disturbance and erosion.[14] By building organic matter, these practices, in addition to reducing the need for synthetic fertilizers, can improve water quality, improve water retention and thus reduce the need for water inputs, and mitigate nitrous oxide emissions. In addition, these practices can reduce the vulnerability of crops to pests and pathogens, thereby reducing the need for pesticides that are harmful to pollinators and water quality.[15] Similarly, cover crops significantly increase soil carbon by increasing carbon inputs from plants and reducing erosion.

Protecting land in conservation programs and expanding enrollment in such programs are among the most effective strategies to reduce the climate footprint of agriculture. In particular, avoiding conversion of grasslands has been identified as the most impactful agricultural activity in the U.S. to mitigate climate change.[16] Additionally, preventing conversion of natural lands is critical for protecting biodiversity and allowing wildlife habitat to remain intact.

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[9] *See* Ranjith P. Udawatta & Shibu Jose, *Agroforestry Strategies to Sequester Carbon in Temperate North America*, 86 Agroforestry Sys. 225 (2012).

[10] *See, e.g.*, Shibu Jose & Sougata Bardhan, *Agroforestry for Biomass Production and Carbon Sequestration: An Overview*, 86 Agroforestry Sys. 105 (2012); *see also* Ranjith P. Udawatta & Shibu Jose, *Agroforestry Strategies to Sequester Carbon in Temperate North America*, 86 Agroforestry Sys. 225 (2012).

[11] *See* EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2018*, 2-4 (2020), https://www.epa.gov/sites/production/files/2020-04/documents/us-ghg-inventory-2020-main-text.pdf.

[12] *Id.* at 1-10, Table 1-3.

[13] *See* Nat. Res. Conservation Serv., Conservation Practice Standard Conservation, *Nutrient Management Code 590* (2012), https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1046433.pdf.

[14] *See, e.g.*, Christopher Poeplauab & Axel Dona, *Carbon Sequestration in Agricultural Soils via Cultivation of Cover crops – A Meta-analysis*, 33 Agric., Ecosystems & Env't 200 (2015); Jinshi Jian et al., *A Meta-analysis of Global Cropland Soil Carbon Changes Due to Cover Cropping*, 143 Soil Biology & Biochemistry 107,735 (2020); *see also* R. Lal, *Soil Carbon Sequestration and Aggregation By Cover Cropping*, 70 J. Soil & Water Conservation 329 (2015); C. Tonitto et al., *Replacing Bare Fallows With Cover Crops in Fertilizer-Intensive Cropping Systems: A Meta-analysis of Crop Yield and N Dynamics*, 112 Agric., Ecosystems & Env't 58 (2006); Meagan E. Schipanski, *A Framework for Evaluating Ecosystem Services Provided By Cover Crops in Agroecosystems*, 125 Agric. Sys.12 (2014); Jason P. Kaye & Miguel Quemada, *Using Cover Crops to Mitigate and Adapt to Climate Change. A Review*, 37 Agronomy Sustainable Dev. 4 (2017).

[15] *See* Giovanni Tamburini et al., *Agricultural Diversification Promotes Multiple Ecosystem Services Without Compromising Yield*, 6 Sci. Advances 2020 eaba1715 (2020).

[16] *See* Joseph E. Fargione et al., *Natural Climate Solutions for the United States*, 4 Sci. Advances eaat1869 (2018).

Each of these practices has proven climate benefits. They can increase the amount of carbon removed from the atmosphere, increase the amount of carbon stored in soil, and/or reduce agricultural emissions of carbon dioxide, nitrous oxide, and methane. These practices will also often increase resilience to extreme weather, reduce environmental and public health harms, and, in most cases, over time, improve producer productivity or profitability. However, they are now used on only a small portion of U.S. grazing and crop land. It must be a policy priority to greatly accelerate adoption of these practices, as well as increasing investment in research into their benefits and technical assistance to help with their adoption. Research, outreach and technical support, and financial assistance to increase adoption of these practices together ameliorate agriculture's overall climate impact.

III. Carbon Markets Are Not an Effective Climate Solution.

There is a tremendous amount of growing interest in the use of carbon markets in agriculture as a way to reduce GHG emissions and increase soil carbon stocks. While there may be effective ways private companies can invest in climate-friendly farming – for example, paying farmers within their supply chain to reduce their emissions or to sequester more carbon in the soil – adoption of carbon market or "offset" schemes raises a number of concerns. Several of the challenges are technical, such as those related to measurement and verification, additionality, and permanence. Other challenges are more historical, social, and economic, such as those related to equity, access, and intersections with pollution- or emissions-reduction mandates. Almost all of these issues are inextricably tied to the realities of our current agricultural system and cannot be easily addressed or dismissed. Together, these concerns raise grave doubts as to whether private carbon offset markets can and should be part of any climate solution for the agriculture sector.

A. Market Schemes Are Impermanent, Based on a Scientific Fallacy, and Uncertain.

As an initial matter, it is critical to recognize that climate change is attributed to the removal of large amounts of fossil carbon, which would have remained sequestered in the absence of anthropogenic activities. In contrast to these slow-cycling fossil stocks, carbon in biogenic pools including vegetation and soils is inherently impermanent and perpetually vulnerable to decomposition. Thus, as a matter of logic, market schemes that depend on impermanent carbon sequestration and storage cannot be used to offset fossil fuel emissions. Rather, these permanent emissions require a permanent solution.

Moreover, offset-based schemes are based on a scientific fallacy that equates increases in soil carbon stocks with past and ongoing losses of fossil carbon. They allow industry to buy credits for carbon storage in soil to be used to discount fossil fuel emissions. However, these are not at all equivalent. Building soil organic carbon is important in part because it helps us recover from the debt of decades of soil organic carbon losses from agricultural intensification. Offsets are based on the false premise that restoration of anthropogenic soil carbon losses should be counted as an offset for ongoing fossil emissions — before we've come close to repaying the enormous debt of carbon losses from agricultural activity. Soil carbon will never be able to offset ongoing losses of fossil carbon. Soil carbon is inherently impermanent compared to fossil carbon and is increasingly vulnerable to loss as global change accelerates losses of soil organic carbon through warming. And while improvements in methods to characterize and quantify permanence are critical to improve our understanding of soil carbon storage, it is important to note that improvements in measurement themselves do not enhance permanence or alter that foundational difference in permanence between soil organic carbon and fossil carbon.

In addition, carbon sequestration in agricultural lands is complex and nuanced, and currently, more scientific research needs to be prioritized for offset market schemes to be credible, effective, and fair. There are looming uncertainties and challenges around measurement and verification and additionality that render these schemes questionable as a climate solution.

Measurement and verification issues may relate to (1) verifying practice adoption, (2) measuring outcomes for improving efficacy and optimizing incentivized practices, or (3) measuring outcomes for direct payments related to the magnitude of an outcome (e.g. payments per unit carbon sequestered or per unit emission reduced). We are doubtful that programs that are based not on adoption of practices but purportedly on precise determinations of emission reductions or soil organic carbon changes over time can – at least in the near term -- be credible and effective at a reasonable cost. The current gold-standard of detecting real changes in soil organic carbon over time requires extensive, direct sampling of soil cores followed by in-lab analyses using, for example, loss on ignition. There remain unresolved questions as to the necessary frequency, depth, and spatial distribution of soil samples necessary for accurate measurements (not to mention the additional measurements required for information related to permanence, additionality, or any other components of soil health). Even with extensive sampling, detecting small changes in soil organic carbon over time is challenging.

Some programs seek to pair some amount of actual sampling with cheaper and less time-consuming approaches including spectroscopic measurements, modeling, and surrogate measurements.[17] These additional approaches are highly attractive to industry due to their reduced costs of implementation, yet they currently lack the accuracy and precision needed in a market context to substitute for direct measurements. As a result, we have low confidence in estimating specific, local changes in soil organic carbon from modeling based on management practices alone without direct measurements.

Carbon market schemes must also consider the concept of additionality, i.e., how much additional carbon is stored in the soil relative to what would have been stored in the absence of the scheme, or how much emissions are reduced through implementation of a practice relative to emissions that would have occurred in the absence of the scheme.[18] Determining the baseline for additionality determinations can be difficult. For example, producers already implementing climate-friendly practices may not be able to further increase soil carbon. However, they could switch to higher GHG emitting conventional practices, so arguably the continuation of sound practices is additional. Determining the baseline may also be difficult if emissions could or should be reduced through other means. For example, there tends to be more opportunity for additionality with practices that directly increase sequestration in soils compared to practices that reduce certain GHG emissions (e.g. manure methane from CAFOs) or reward avoided conversion of non-croplands, as these outcomes may (and we believe should) be achieved through alternative non-payment approaches. In evaluating additionality, it is important to recognize that soil carbon gains in these schemes are generally helping to restore lost soil carbon stocks due to prior agricultural activities and that these gains may still leave soil carbon stocks depleted relative to what would be stored in soil in the absence of agricultural activities.

Finally, offset schemes focus exclusively on soil carbon storage and thus reflect a narrow view of soil functions. Carbon storage is only one of the many ecological functions of soils and incentivizing continual increases in soil carbon everywhere independent of considerations of other ecosystem processes is neither realistic nor necessarily beneficial for soil fertility, biodiversity, plant productivity, GHG emissions, or other ecosystem functions. Proposed offset schemes in agriculture are typically based on the false premise that soil carbon should be constantly increasing everywhere and that increases in soil carbon are always indicators of improved soil function. While soil erosion and degradation should be addressed,

[17] Oldfield, E.E., A.J. Eagle, R.L Rubin, J. Rudek, J. Sanderman, D.R. Gordon. 2021. Agricultural soil carbon credits: Making sense of protocols for carbon sequestration and net greenhouse gas removals. Environmental Defense Fund, New York, New York. edf.org/sites/default/files/content/agricultural-soil-carbon-credits-protocolsynthesis.pdf. See also Emily Bruner & Jean Brokish, Illinois Sustainable Ag Partnership, *Ecosystem Market Information: Background and Comparison Table* (2021).
[18] See Sharon Billings et al., Soil Organic Carbon is Not Just for Soil Scientists: Measurement Recommendations for Diverse Practitioners, 31 Ecol Appl. e02290 (2021).

those cannot be adequate surrogates for a broad climate solution and any such ecological justifications should be examined carefully.

Thus, given the additional challenges and fallacies surrounding these carbon markets, these schemes cannot and should not be used to offset GHG compliance obligations, and do not provide an effective and credible climate solution.

IV. Carbon Markets Are Not Equitably Accessible and Raise Environmental Justice Concerns.

There are about 2 million farms, 400 million acres of cropland and 800 million acres of pasture and rangeland in the country.[19] Due to a long, enduring history of discriminatory and exploitative practices – including systemic denial of farm loans and other assistance to Black, Indigenous People of Color (BIPOC) producers by the U.S. Department of Agriculture—most of this land is owned by white farmers and ranchers. Discriminatory practices and policies continue to plague the agricultural sector.

With this problematic history in mind, solutions to the climate crisis should be designed to benefit and be accessible to small and historically disadvantaged producers. Any system that pays producers to adopt climate-friendly practices should be available to all producers and must not become another mechanism through which the bigger and white establishments reap the benefits while smaller farms and BIPOC-owned and other historically excluded operations are left out. It must also ensure that producers who have been using sustainable practices for years are not excluded from receiving benefits simply because their soil is already carbon rich or because they have already implemented strategies for reducing emissions.

Congress should prioritize providing technical assistance and outreach by diverse service providers with linguistic and cultural competency, partnering with community-based organizations and local community leaders who have earned trust of farmers and producers, employing BIPOC experts to lead trainings on issues unique and salient to local communities, and where possible, and make trainings and technical assistance opportunities credit-bearing in partnership with land grant universities. In lieu of market schemes, Congress should provide resources BIPOC farmers need to succeed – as a starting point, support and funding for completing baseline soil health assessments, debt relief, access to equipment, non-GMO seed, and access to affordable land are chief priorities.

In addition, historically, environmental justice communities have not benefited from market-based policies though they are the most burdened by pollution-generating facilities. Equitable climate policies must consider non-GHG co-pollutants and address local environmental impacts to environmental justice communities. Thus, any market-based proposal must be informed by input from the most impacted communities.

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[19] *See* USDA National Agricultural Statistics Service Census of Agriculture 2017

Congress faces a once-in-a-generation opportunity and obligation to invest in agricultural solutions to the climate crisis and empower farmers and ranchers to play key roles in addressing the warming climate. Given the true climate impact of the agriculture sector and the lingering questions and concerns on the validity and effectiveness of carbon market schemes to provide sound climate change solutions and direct benefits to our nation's farmers and ranchers, we urge Congress to consider policy solutions and programs that incentivize adoption of climate-stewardship practices that are evidenced to sequester carbon and reduce GHG emissions. These practices not only effectively reduce agriculture's climate footprint, but they also help build resilience, improve water and air quality, and protect biodiversity. Support for these practices and programs ensures that farmer livelihood and agricultural resiliency are not tied to a volatile carbon market, where the transaction costs are prohibitively high and the price of carbon too low to ensure robust participation within the sector. Funding for these practices, and for more research and technical assistance related to them, provides a true solution to the growing climate crisis.

Respectfully submitted,

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