U.S. DEPARTMENT OF AGRICULTURE
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Natural Resources Conservation Service (NRCS) Implementation of Funds under the Inflation Reduction Act (IRA)
Docket ID: NRCS-2022-0015

Response from the Bipartisan Policy Center
December 21, 2022

(1) What systems of quantification should NRCS use to measure the carbon sequestration and carbon dioxide, methane, and nitrous oxide emissions outcomes associated with activities funded through IRA?

- **How should NRCS design a scientifically-based framework for field-based quantification and analysis that can integrate into USDA's Greenhouse Gas Inventory and Assessment Program?**
- **What methods should NRCS use to quantify carbon sequestration and carbon dioxide, methane, and nitrous oxide emissions?**
- **What sources of information should NRCS consider in developing protocols or what preexisting, standardized protocols should be used to support field-based data collection and analysis?**
- **What types of field-based data should be collected and analyzed to assess carbon sequestration and reduction in carbon dioxide, methane, and nitrous oxide emissions outcomes associated with agricultural and conservation activities?**
- **How should USDA monitor and track carbon sequestration and greenhouse gas emissions trends and the effects of NRCS supported activities?**
- **How or should the framework developed by NRCS to provide field-based quantification integrate with satellite data to provide a comprehensive picture of GHG emissions and removals from agricultural activities and conservation practice implementation?**

The U.S. Department of Agriculture has long spearheaded the standardization of best practices for quantifying fluxes in the land sector, as demonstrated in its 2014 report, *Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory*[1]. We view the resources made available via the Inflation Reduction Act of 2022 as an opportunity to build on this leadership and thoughtfully expand measurement networks, inventories, and experiments.

Throughout our response, we are aiming to underscore several key priorities. First, that the Natural Resources Conservation Service (NRCS) should identify opportunities to support long-term (>15

[1] USDA Office of the Chief Economist, 2014: Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory (usda.gov)

years) soil health monitoring and nutrient management at field scales. That is, if NRCS aims to establish a formal soil health monitoring network, it should identify pathways to sustain funding for such an endeavor beyond the resources provided by the Inflation Reduction Act. Second, the NRCS should better delineate and track the use of certain variations in practice standard adoption to assess greenhouse gas benefits and additional environmental impacts. For instance, nutrient management practices may have significant benefits for GHG reductions in the case of nitrogen fertilizer efficiencies but can have negligible benefits in the case of an adoption of a phosphorous nutrient management plan. NRCS presently lacks the full capability to effectively track and distinguish between these efforts for purposes of measuring the greenhouse gas benefits of its work. Third, data coordination, sharing, transparency, and interoperability—while adhering to best practices for privacy and responsibility—should be explored to leverage the full array of data available to quantify the effects of land management practices on emissions and sequestration across all landscapes, practices, and production systems.

Currently, there are a range of methods to measure the carbon dioxide, methane, and nitrous oxide emissions from landscapes, and to quantify above and below-ground carbon, including in soils. Long-term inventories and networks of above- and below-ground carbon and biomass sensors provide in situ measurements. Additional satellite-based data enable more comprehensive and precise assessments of carbon stocks in above-ground vegetation than soil stocks. Collectively, these data are used to inform and verify the models and tools that estimate carbon fluxes, storage, and other metrics of environmental change, and are summarized in reports, syntheses, and publications. However, there are tradeoffs in cost, accuracy, and data processing across different methods.

Data available from all approaches, inventories, and networks—past and ongoing—should be carefully integrated to leverage ongoing measurements and link practice changes to environmental impacts. The following methods, inventories, networks, and models are vital to informing NRCS quantification systems and are adapted from the U.S. Global Change Research Program Second State of the Carbon Cycle Report (SOCCR2)[2]:

Methods

- Physical sampling via field measurements of soil carbon to depths of at least 30 cm
- Field measurements of land-atmospheric carbon exchange and GHG emissions
- Spectral estimation of soil carbon
- Modeling informed by spatial data and direct observations
- Repeated soil surveys.

Field-based Data

Scientific research demonstrates that there are numerous factors that govern emissions of GHGs from agriculture and carbon sequestration and storage in the landscape. However, there are details regarding spatial and temporal variability that must be considered. The drivers—natural and

[2] U.S. Global Change Research Program, 2018: 2nd State of the Carbon Cycle Report (SOCCR2).

anthropogenic—that govern terrestrial carbon cycling differ across space and time, and influence variation in carbon stocks. These factors include[3,4]:

- Temperature
- Hydrology
- Topography
- Microorganisms and biodiversity
- Nutrient density
- Soil physics and chemical properties
- Disturbance history
- Atmospheric chemistry
- Precipitation
- Land management, including fertilizer application, nutrition, and disturbance management.

While models generally represent these drivers adequately and can provide useful estimates of the emissions benefits and/or sequestration, this is currently limited to certain practices, crops, landscapes, and climate. Therefore, additional field-based data on the above drivers—in addition to measurements of emissions and sequestration—are needed to inform process improvements, especially for below-ground carbon.

The NRCS could provide an essential role in advancing the coordination of the data needed to improved models, tools, and estimates—especially among non-federal entities. In doing so, NRCS could help to incentivize greater transparency, awareness, and access to these resources, driving research, innovation, and entrepreneurship.

Addressing these gaps is essential to ensuring the resilience and productivity of American natural and working lands. The Bipartisan Policy Center's (BPC) Farm and Forest Carbon Solutions Task Force developed a suite of consensus-based recommendations, laid out its 2022 report: Federal Policies to Advance Natural Climate Solutions. Among these is the recommendation that USDA expand existing measurement networks to better integrate relevant data from remote sensing systems and to include below-ground measurements of biomass, carbon, and other variables relevant for quantifying ecosystem change, carbon sequestration rates, and climate resilience *[Recommendation 1E, pg. 14]*.

Expanding existing measurement networks, such as the USDA's National Resources Inventory (NRI) and the Forest Inventory and Analysis (FIA) program, will support higher-frequency, small-area estimation of biomass and soil carbon attributes at existing monitoring sites. Enhancing datasets that track above- and below-ground carbon stocks, supporting investments in measurement technologies (e.g., remote sensing) that enable more efficient data collection at the landscape

[3] Forest Soil Carbon and Climate Change | Climate Change Resource Center (usda.gov)
[4] Considering Forest and Grassland Carbon in Land Management (fs.fed.us)

scale, and ensuring that new analytical tools and models make maximum use of real soil carbon data will meaningfully accelerate progress toward more accurate carbon accounting.

Long-term Inventories, Measurement Networks, and Satellite-based Measurements

- AmeriFlux Network
- Detrital Input and Removal Experiment (DIRT) Network
- Free-Air CO_2 Enrichment (FACE) Experiments
- Forest Inventory and Analysis (FIA)
- Greenhouse gas Reduction through Agricultural Carbon Enhancement network (GRACEnet)
- Gridded Soil Survey Geographic (gSSURGO) Database
- International Soil Carbon Network (ISCN)
- Landsat
- Global Ecosystem Dynamics Investigation Lidar (GEDI)
- Long-Term Ecological Research (LTER) Network
- Next-Generation Ecosystem Experiment (NGEE)–Arctic
- National Ecological Observatory Network (NEON)
- PEATcosm 1 and PEATcosm 2
- Rapid Carbon Assessment (RaCA)
- Spruce and Peatland Responses Under Changing Environments (SPRUCE)
- Orbiting Carbon Observatory-2 (OCO-2)

Confidence and certainty remain key challenges for existing methods of estimating net GHG emissions and carbon sequestration on a landscape scale. Current methods for on-the-ground measurement are time intensive and often cost-prohibitive for producers and forest landowners. That is, measurements cannot be collected in all places, for all production systems, and across all practice types. This is especially true for smaller production systems or plots, and can render the monitoring, reporting, and verification necessary for participation in voluntary carbon markets cost prohibitive for certain farmers and landowners. However, when thoughtfully integrated, in situ data can be used to inform and further refine models, which can provide robust estimates of GHG benefits and sequestration at reduced costs.

BPC's Task Force therefore further recommends that USDA strengthen its data, modeling, and technical tools such as COMET-Farm, COMET-Planner, LandPKS, DairyGEM, GRACEnet, APEX, Rangeland Analysis Platform, CART, and FIA, as well as its forest decision support tools, to allow more producers, landowners, and technical service providers (TSPs) to quickly and easily estimate the impacts of adopting climate-smart practices *[Recommendation 2F, pg. 19]. Additional key models include:*

Models

- Daily Century Model (DayCent)
- CENTURY Soil Organic Matter Model
- Denitrification Decomposition (DNDC) Model

- Environmental Policy Integrated Climate (EPIC) Model
- COMET-Farm
- COMET-Planner
- Agricultural Conservation Planning Framework (ACPF) Toolbox
- GRACE-Based Groundwater Indicator
- Soil Climate Analysis Network (SCAN)
- Ecosystem Demography (ED) Model
- Forest Vegetation Simulator (FVS)
- Multi-scale Synthesis and Terrestrial Model Intercomparison Project
- Ent Dynamic Terrestrial Biosphere Model (Ent TBM)
- Predictive Ecosystem Analysis (PEcAn)

In particular, COMET-Farm and COMET-Planner carbon management tools are highly effective resources for quantification and are based on the most current, peer reviewed methodologies found in *Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory*[5], from the USDA Office of the Chief Economist.

BPC's Task Force recommendation that USDA strengthen its data, modeling, and technical tools addresses several needs. First, more reliable models and improvements in other predictive tools can reduce the administrative and technical burdens faced by potential participants both in government programs and private markets. Second, accurate measurement of carbon benefits and other environmental outcomes can help producers and landowners maximize these benefits by informing their operational and management decision making. Third, data inputs and more effective decision support tools—matched to user needs and use cases—can help ensure that results are delivered in a timely, efficient, and rigorous manner.

It is also essential that USDA strengthen approaches to quantifying belowground carbon measurements and address other gaps such as practices for reducing enteric emissions and the use of enhanced efficiency fertilizers. For these models and all tools, resources, and methods, it is vital that they be continuously updated to reflect the best available science.

(2) How can NRCS engage the private sector and private philanthropy to leverage the IRA investments, including for systems of quantification?

(3) How should NRCS target IRA funding to maximize improvements to soil carbon, reductions in nitrogen losses, and the reduction, capture, avoidance, or sequestration of carbon dioxide, methane, or nitrous oxide emissions, associated with agricultural production?

[5] USDA Office of the Chief Economist, 2014: Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory (usda.gov)

(4) How should NRCS streamline and improve program delivery to increase efficiencies and expand access to IRA funded programs and projects for producers, particularly underserved producers?

(5) How can NRCS expand capacity among partners to assist in providing outreach and technical assistance to support the implementation of IRA funding?

Through the implementation of IRA resources, NRCS could further clarify the use of alternative funding arrangements to support tribal, small, and underserved producers.[6] Specifically, the BPC Farm & Forest Carbon Solutions Task Force recommends that: NRCS establish more innovative partnerships and expand the network of TSPs to include certified crop advisors, state foresters, third parties specialized in delivering technical assistance to socially disadvantaged and tribal producers and landowners, and other trusted partners to bolster the overall delivery of technical assistance for climate-smart practices [*Recommendation 2C, pg. 17*].

Additional technical support is needed for producers and landowners to implement climate-smart practices at scale. TSPs and innovative partnerships between NRCS and third parties can be leveraged to expand access to technical experts who can work with producers and landowners on conservation planning and implementation. Further, technical assistance from trusted partners and on-the-ground support are critical to help farmers, ranchers, and forest landowners overcome administrative barriers that impede the adoption of climate-smart practices, as described in BPC's Leveraging Outreach and Technical Assistance to Scale Natural Climate Solutions. Finally, TSPs are especially effective at providing outreach and assistance to socially disadvantaged groups who have historically been underserved. To cultivate the next generation of TSPs, the Task Force has identified opportunities to amend the process for by creating a "fast lane" wherein USDA can quickly certify or auto-enroll certain categories of providers or those with a base level of qualifications.

In short, there is a need for NRCS to clarify pathways for third party contributions to advance technical assistance and outreach to producers. Refining these pathways could catalyze new partnerships through local Soil and Water Conservation Districts (SWCDs), state conservation agencies, and other Federal, State, local, private, and volunteer organizations aimed at leveraging funds for Federal conservation programs.

[6] USDA NRCS Directive: (440-530-M, 2nd Ed., Nov 2022), subpart L