Soil Carbon Monitoring for Enhanced Producer Decision-Making

Recommendations for the upcoming Farm Bill

WHY SOIL CARBON?

Soils, the second largest carbon sink after oceans, present an untapped opportunity to significantly draw down atmospheric carbon and bolster operational resilience for US farmers and ranchers.

US farmers and ranchers can become more competitive and resilient to extreme weather by implementing practices that sequester soil carbon, such as agroforestry, cover crops, and rotational grazing. To increase soil carbon storage on our croplands and grazing lands, we need the Farm Bill to authorize a producer-centered research agenda that grounds these practices in science and spurs practice adoption.

Existing federal soil data and models like DayCent offer soil carbon projections for croplands, but still lack high-resolution and ground-truthed data that spans diverse land types and geographies, and captures higher-certainty soil carbon stocks and fluxes. Better data is critical to informing policies and incentive programs that encourage the adoption of management practices at scale.

SOIL CARBON RESEARCH CHALLENGES

- Existing soil carbon research efforts are disparate, siloed, and sparsely funded.

- Existing soil carbon measurement efforts are sporadic and often not producer-focused.

- Sampling and measurement of soil carbon storage are arduous, expensive, and non-standardized.

- Farmers and ranchers face unknown risks and costs in implementing soil carbon practices.

- Incomplete and non-comprehensive source data hinders the accuracy and certainty of soil carbon models.

THE FARM BILL OPPORTUNITY

- Streamline and coordinate soil carbon research.

- Map soil carbon stocks across the US, linking land management practices to soil health outcomes to inform land management.

- Develop measurement protocols, tools, and models for soil carbon.

- Launch demonstration trials to build farmer and rancher confidence in soil carbon practices and the related ecosystem benefits.

- Leverage improved soil carbon monitoring, reporting, and verification (MRV) and inventory and analysis efforts to catalyze higher certainty predictive models.

1. *Streamline and coordinate federal soil carbon research efforts.*

Several federal agencies conduct research related to soil health, soil carbon, and relevant technological innovations. Yet, current efforts are uncoordinated, risking duplication and delays in advancing new best practices. A whole-of-government approach, led by USDA, can ensure soil carbon research, education, and technical assistance activities are centralized, efficient, and accessible to producers on the ground.

- **Create an interagency committee on soil carbon research** with USDA as the committee lead to develop a federal soil carbon strategy and action plan.

- **Establish a soil carbon research coordinator to lead the committee,** identify potential improvements to collaboration on soil carbon research, and advise on budget proposals.

2. *Extend and leverage existing USDA work to launch a national soil inventory and analysis network.*

Accurate soil management starts with accurate measurement. An inventory and analysis network can map existing soil carbon stocks, uncover areas with the greatest potential gains and maintenance needs, and link agricultural management practices to carbon and other soil health outcomes that producers prioritize.

- **Create a soil inventory and analysis network** to provide a critical, up-to-date resource on soil carbon stocks across the US and connect soil carbon outcomes to different agricultural management practices.

- **Increase support for existing federal infrastructure,** including the Long-Term Agroecosystem Research (LTAR) Network and the Agricultural Research Service (ARS) Climate Hubs, to organize additional long-term soil carbon research, establish new monitoring sites, and translate findings into actionable insights for farmers and ranchers.

3. *Develop and improve soil carbon MRV tools and protocols.*

Accurate monitoring, reporting, and verification (MRV) is critical to laying the groundwork for science-based producer incentives. Disparate MRV protocols and complicated, expensive tools prevent producers from implementing robust soil carbon MRV in a harmonized way.

- **Authorize the Climate Hubs and LTAR Network** and dedicate funding to lead and coordinate soil carbon MRV efforts at USDA and connect the research outcomes to producers through management tools.

- **Resource and fund the LTAR Network** to audit existing and develop new soil sampling protocols, develop and improve new soil carbon measurement tools, and advance soil carbon dynamics research.

- **Resource and fund the Climate Hubs** to make soil sampling and soil carbon MRV resources publicly available to farmers and ranchers.

4. *Establish a network of real-world demonstration trials.*

Demonstration trials help farmers and ranchers gain confidence in implementing new practices and ensure they're maintained long-term. These trials showcase which practices work best for different regions, enable farmers to make informed decisions, and spur early adoption of innovative agricultural practices.

- **Increase funding for Conservation Innovation Grants (CIG) On-Farm Trials** through the Environmental Quality Incentives Program (EQIP) to develop an ambitious network of soil carbon demonstration trials through the Soil Health Demonstration program.

- **Increase authorization for the Sustainable Agriculture Research and Education (SARE) program** to expand on-farm soil carbon demonstration trials, helping create a community of practice rooted in local agricultural realities and producer management priorities.

5. *Catalyze predictive modeling efforts.*

If implemented, the above efforts to improve source soil health and carbon data can allow for cutting-edge, higher-certainty predictive models that accelerate the adoption of soil health practices and strengthen producers' bottom line. Additional long-term source data would immensely benefit existing models, like DayCent and COMET-Farm, while also opening the door to new and emerging producer tools and incentives, for example, higher-accuracy carbon intensity (CI) scores for sustainable biomass cultivation.

- **Inform modeling tools** that predict the impact of land management practices on soil carbon sequestration, utilizing measurements and information from improved federal soil carbon efforts.

- **Enhance new and emerging producer tools and incentives** using long-term soil data that reflects the diversity of operations, geography, soil types, and more across the US, and is responsive to variation in long-term weather conditions.

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