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Centering resilience in US federal agricultural policy

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Soil health management – supporting the physical, chemical, and biological properties of soil to support vital living ecosystems – is the key to centering resilience in agricultural systems, including soil carbon accrual. While federal policies promoted by presidential administrations in recent decades vary in the degree and way they support ecosystem-centric approaches and resilience of the agricultural sector, Congress and the agricultural community have remained largely supportive of soil health-related practices. Producers face a myriad of barriers when implementing soil health practices, often stemming from systemic policies that aim to advance conventional chemical-dependent agriculture over resilient alternatives. We present key policy recommendations that shift the focus from soil carbon sequestration to soil health, to create a policy platform for the current Farm Bill for agricultural resilience that puts farmers and ranchers first.

KEYWORDS

federal policy, soil carbon, soil health, sustainable agriculture, farm bill

1 Introduction

1.1 Creating agricultural resilience via supporting soil health

Soil health is critical to building and maintaining resilience in agricultural systems. Agricultural resilience is defined here as the ability of land to withstand or quickly recover from environmental shocks to plant–soil systems (e.g., increasing frequent extreme weather events) (Yang et al., 2024). Enhancing resilience in our agricultural lands increases our ability to maintain a functional food system in a rapidly changing world (Zurek et al., 2022; Elechi et al., 2022). Healthy soils arise through a combination of environmental and management factors. Soil health incorporates physical, chemical, and biological properties that support "the continued capacity of the soil to function as a vital living ecosystem that sustains plants, animals and humans" (NRCS,[1] Lal, 2016). Soil health practices and their benefits have been applied by Indigenous stewards for millennia (Altieri, 2004; Carlisle, 2022; Sands et al., 2023) and now are increasing in popularity due to their potential to build agricultural resilience, especially via building soil organic carbon (Basche et al., 2020; Robertson et al., 2014). Soil organic carbon is dynamic; it naturally cycles from plants to soil to atmosphere. In doing so, it serves as a key energy source for microorganisms, supports soil structure, facilitates root penetration, and increases soil water holding capacity (Lal, 2016). Healthy soils with high soil organic carbon have been linked to increased agricultural yields (Kane et al., 2021), particularly under drought conditions, owing to the moisture retention capacities of soil organic carbon (Bagnall et al., 2022). The potential for agricultural management to increase soil organic carbon varies widely (Scharlemann et al., 2014), in part due to the complexities of biological processes (i.e., soil–plant-microbial interactions, Cotrufo et al., 2013), and to the ongoing maintenance of practices to build and retain soil health (Crow and Sierra, 2022; Dynarski et al., 2020; Rocci et al., 2024; Saifuddin et al., 2024).

Healthy soils maximize multiple ecosystem and provisional benefits (Figure 1) that are often prioritized by land managers - crop and forage productivity, nutrient retention, and wildlife habitats, among others. However, a focus on regionally specific management approaches is required to optimize multiple soil functions and minimize unintended trade-offs (Minasny et al., 2017; Moinet et al., 2023). In fact, thinking 'beyond carbon' is critical. Regionally appropriate management can protect sensitive ecosystems, including ecosystems with naturally low levels of nutrients and organic matter that support unique species. In these locations a sole focus on increasing soil carbon could lead to planting fast-growing trees, at the expense of critical habitat. Collaboration between local communities, technical assistants, and scientists can determine culturally, economically, and ecologically appropriate soil health practices that address regional conservation priorities.

1.2 Recent prioritization of soil carbon for mitigation

Previous federal policies, and linked state policies, commonly prioritized building soil carbon over 'producer-first' policies that would have expanded access to economic incentives and technical assistance, and research to support agricultural resilience. For example, the Biden-Harris Administration focused primarily on the capacity of agricultural soils to sequester and store carbon and *mitigate* climate change through "climate-smart" activities rather than on building overall agricultural resilience through soil health. The principal focus on climate-smart soils provided a single, measurable metric to quantify the impacts of agriculture as a climate solution and connect it to other climate-change mitigation investments through policies like the Inflation Reduction Act (IRA, HR 5376). The IRA importantly increased funding to the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) conservation programs, funding an additional 23,000 contracts in 2024 focused on climate-smart practices[2] that also had the potential for co-benefits related to soil carbon sequestration. The IRA also established a national Soil Carbon Monitoring Network, which expanded the Conservation Evaluation and Monitoring Activity (CEMA) methods to include a Soil Organic Carbon Protocol, and research for Measurement, Monitoring, Reporting, and Verification (MMRV). Outside of the IRA, USDA established the Partnerships for Climate Smart Commodities (PCSC) program to support new or emerging markets for commodities that store carbon or mitigate greenhouse gasses (GHG). The program catalyzed cross-sector support and enrolled over 14,000 farms and ranches in climate-smart conservation practices by offering cash payments and connections to new markets, while investing in improvements to soil carbon MMRV. Despite the focus on "climate-smart," this funding supported existing conservation practices and USDA anticipated adoption across more than 25 million acres,[3] ultimately promoting soil health and agricultural resilience.

The 2025 Trump-Vance Administration largely reversed Biden-era agriculture policies (Table 1), downsizing the USDA by over 15,000 employees, and proposing reorganizations to NRCS' and the Agriculture Research Service's (ARS) regional structures – agencies vital to supporting producers in adopting conservation practices and researching impacts of conservation management, respectively. Congress has remained partially supportive of existing bipartisan USDA conservation programs, maintaining some increased funding for the Environmental Quality and Incentives Program (EQIP) and the Conservation Stewardship Program (CSP) in the One Big Beautiful Bill (HR 1), while rescinding a portion of IRA investments for conservation programs.[4]

Despite changes in prioritization of soil carbon across Presidential Administrations, the private sector has continued to prioritize soil carbon accrual in voluntary carbon markets. As businesses aim to decrease their GHG footprint, they turned to purchasing carbon credits that offer payments to producers to implement specific conservation practices to build soil carbon (Oldfield et al., 2022). While an emphasis on soil carbon in these programs has been met with some interest from producers, carbon markets as levers to facilitate soil management changes are still being tested. Additionally, there have been early challenges, including outcome verification, low payments to producers, and a narrow focus on soil carbon that misses other soil health benefits such as improving biodiversity (Barbato and Strong, 2023; Moinet et al., 2023).

1.3 Barriers to soil health practice adoption

Existing agriculture policy has prioritized consolidation of agricultural lands, processing centers, and markets for annual systems (Sumner, 2014; Andrew, 2022; Spangler et al., 2020, MacDonald et al.,

1 https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/soil-health.

2 https://www.nrcs.usda.gov/sites/default/files/2023-10/NRCS-CSAF-Mitigation-Activities-List.pdf.

3 https://www.usda.gov/climate-solutions/climate-smart-commodities.

4 https://sustainableagriculture.net/blog/whats-really-inside-the-final-budget-reconciliation-bill-a-breakdown-of-food-and-agriculture-provisions/.

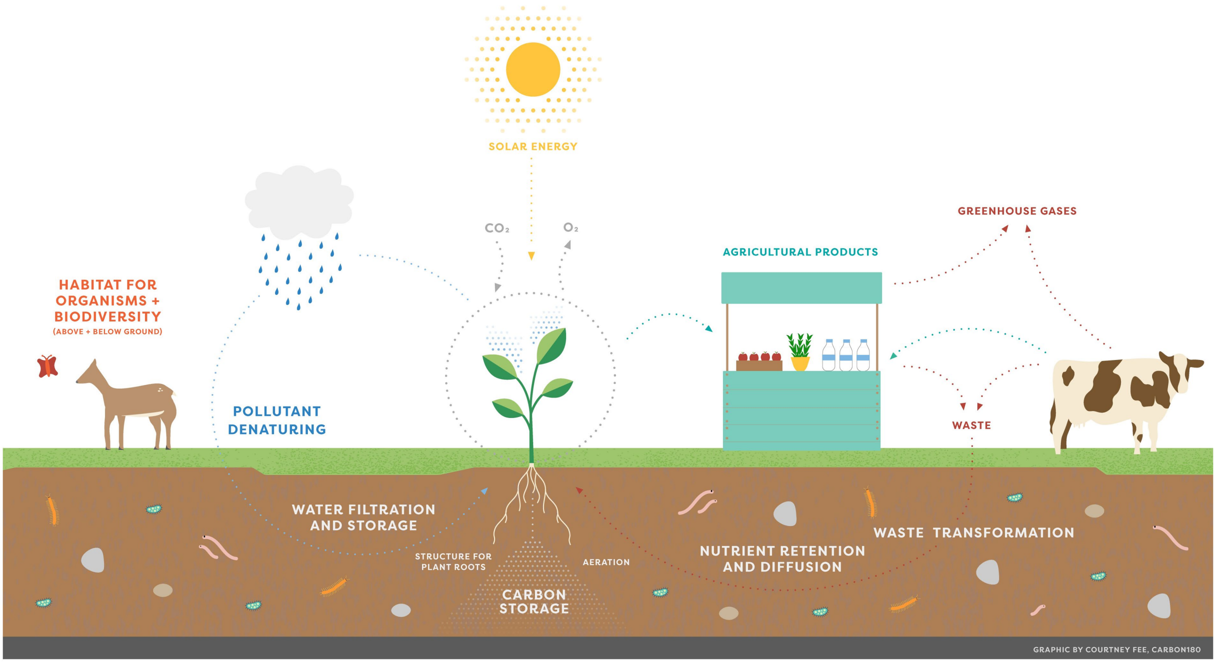

FIGURE 1
Within agricultural systems managing healthy soils supports "multiple benefits," which we define as broad functional support for the diverse living ecosystem, often used in the context of positive outcomes of conservation and soil health management practices. Diffuse impacts across multiple species and processes often prove challenging to *fully* quantify.

TABLE 1 Comparison of Biden-era and Trump-era agricultural policies that center soil carbon.

Relevant soil carbon program/policy	Biden-era actions	Trump-era actions
Partnerships for climate smart commodities	Established by USDA using commodity credit corporation funding ($3.1 billion for over 140 projects)	Re-named the program into the advancing markets for producers and required projects to be re-submitted for evaluation under new criteria
NRCS conservation programs	Increased funding by an additional $19.5 billion over 5 years for NRCS conservation programs to invest in supporting producers implementing "climate-smart" practices through the IRA: - EQIP: $8.45 billion - CSP: $3.25 billion - RCPP: $4.95 billion - ACEP: $1.4 billion - CTA: $1 billion	Rescinded un-obligated IRA conservation funds and removed the "climate-smart" guardrails for funding, but increased permanent baseline funding for 10 years. Additional investment over a 10-year period of: - EQIP: $17.35 billion - CSP: $4.8 billion - RCPP: $2.19 billion - ACEP: $1.78 billion Due to rescissions there is an overall reduction of conservation spending by $1.8 billion over the next 10 years. In December 2025, the Trump administration announced a $700 million Regenerative Agriculture pilot program, which will be funded by EQIP ($400 million) and CSP ($300 million) for the first year of the program
Soil carbon and greenhouse gas MMRV	Invested $300 million of IRA funding to the establishment of national soil carbon, and greenhouse gas monitoring networks in agricultural systems	Rescinded un-obligated funds
USDA staffing	6% growth in non-seasonal, full time USDA staff	To date, USDA has seen a decrease of ~15,000 staff due to the Deferred Resignation Program. USDA aims to relocate staff to five regional hubs which is predicted to result in additional staff attrition

2018). These policies created systemic barriers that resulted in the perpetuation of an agricultural system that relies on chemical inputs to sustain productivity and often results in loss of healthy soil via erosion (Alori et al., 2020; Gosnell et al., 2019, 2020a; Lal, 2016). As a result, producers who are interested in building soil health outside of conventional agriculture systems face several types of barriers: access to land (Spangler et al., 2020), access to financial assistance for conservation practices (Gillespie et al., 2007), and access to regionally relevant technical assistance or education (Gosnell et al., 2020a; Stanley et al., 2024).

Long-term land access motivates investment in soil health and lessens financial vulnerability when making such investments. US agriculture policy has a history of removing land access with shortened land tenure (Spangler et al., 2020). Today, 39% of US producers operate on rented land (USDA National Agriculture Statistics Service, 2022), making long-term management planning – which is necessary for building soil health – challenging and dependent on landlord buy-in. Furthermore, current financial policies limit the ability of producers to adopt and maintain soil health practices without taking on additional financial and market risk. Consolidation of markets and processing centers has also made it difficult for producers to enter local markets – farmers instead sell products to bulk processors which homogenize the product and sell it through exclusively negotiated contracts. In this system, consumers are not able to distinguish between agricultural products produced with practices that promote soil health or those that are not. Only where advocacy has created a specific niche, (e.g., the pasture-raised chicken industry) can producers benefit from the opportunity to receive a green premium for diverse value-added products produced with soil health practices (Frerick and Schlosser, 2024). Finally, one-size-fits-all crop insurance requirements are often mis-aligned with soil health management goals, and have only slowly been updated recently to incorporate conservation of grasslands and allow use of cover crops (Rosch, 2021).

Producers also face challenges navigating education and incentive programs. At a basic level they face social stigmas toward adopting new soil health practices (Abson et al., 2019; Gosnell et al., 2019). The NRCS cost-share programs for soil health practices are oversubscribed, and the impact of the funds limited due to program capacity (staff time and infrastructure; Baldwin et al., 2023). Even with additional IRA investments, 64% of eligible contracts were left unfunded in 2024. Combined, these barriers translate to a slow adoption rate of soil health practices – only 28% of farms employ no- or reduced-tillage, 8% employ cover crops, and less than 2% employ an agroforestry practice (USDA National Agriculture Statistics Service, 2022). Maintaining practices long-term has also been challenging: for example, 80% of expired Conservation Reserve Program (CRP) land is converted back to cropland, losing benefits to soil health (Bigelow et al., 2020).

Despite these social barriers many motivations exist to adopt soil health practices, from potential long-term productivity benefits to improving agronomic benefits (e.g., reducing erosion, nutrient runoff, and invasive weeds) (Carlisle, 2016). Future policy should be the first line of action to address these systemic challenges and create an agriculture system that centers on soil health benefits. Policies and markets must account for maintenance of healthy soils practices and ensure accountability.

1.4 Leveraging federal policy to shift from mitigation to resilience

A focus on agriculture resilience through supporting soil health, instead of solely soil carbon, would support a 'farmer-first' policy platform, particularly by reducing agricultural risk in the wake of extreme weather events. Re-framing policies to focus on producers' soil health needs can increase producer adoption while positioning soil carbon as a potential co-benefit (Gosnell et al., 2020a). Soil health has received bipartisan support, as evidenced by the 2024 draft Farm Bills by the Senate Ag Majority (D) and the House Ag Majority (R) (Figure 2; Table 2). Now more than ever, policymakers must pass a new bipartisan Farm Bill to center soil health for a resilient agricultural

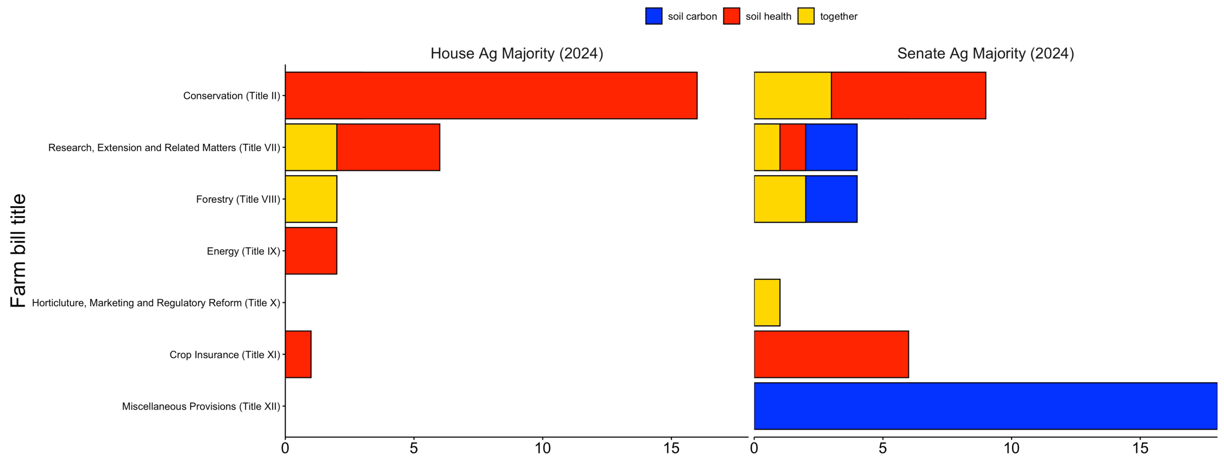

FIGURE 2
References to 'soil carbon' and 'soil health' across 2024 Farm Bill drafts in agriculture provisions: Senate Ag Majority were more likely to use soil health and soil carbon in the same provisions. There were fewer instances of soil carbon language in the House Ag Majority version, and only few opportunities where the two terms were linked. To search for soil carbon, the search terms "carbon sequestration" and "carbon storage" were used. * The instances here for the Forestry Title only pertain to agroforestry and biochar.

TABLE 2 Bipartisan support exists for soil health initiatives, as evidenced in the 2024 Farm Bill drafts.

Topic area	Provision	Senate Ag Majority	House Ag Majority	Farm Bill Title
General conservation	Doubled investment for CIG On-Farm Trials (half of investment goes to Soil Health Demo Trials)	X		Conservation
	Expands EQIP to include a focus on high priority practices that improve carbon sequestration and GHG mitigation alongside production	X	X	Conservation
	Expands the list of criteria for CSP to target improvements to soil health and carbon sequestration; Directs Secretary to establish long-term monitoring of conservation outcomes from conservation program enrollments, including soil carbon	X		Conservation
	Authorizes matching grant program within CSP for states and tribes to improve soil health on agricultural lands; soil testing methodologies to be integrated into these grants		X	Conservation
	Establish a Driftless Area Landscape Conservation Initiative to focus on climate-smart agriculture, carbon sequestration, soil health and ecological restoration in the Driftless area of Midwest USA	X		Conservation
	Mandates that producers who follow conservation practices to not be disqualified for insurance coverage	X		Crop Insurance
Specific soil carbon practices	Adds biochar research to High Priority Research and Extension Initiatives to understand how biochar application contributes to soil health and provide region specific information to land stewards	X	X	Research
	Authorizes a national agroforestry survey to be completed cooperatively through NASS – 3 years (S) or 5 years (H)	X	X	Research (S)/ Forestry (H)
	Authorizes an Agroforestry Pilot Program under CRP to allow operators to enroll agroforestry systems on CRP land that improve soil, water, and wildlife resources through the Transition Incentives Program	X		Conservation
	Expands CIG to include perennial production systems (including agroforestry) as new or innovative conservation approaches	X	X	Conservation
	Broadens focus of National Agroforestry Center to support soil health and carbon sequestration research in the context of agroforestry practices	X	X	Forestry
	Expands the National Agroforestry Center to establish one or more regional agroforestry centers and doubles authorization for appropriations from $5 to $10 million	X	X	Forestry
	Establishes a Center of Excellence focused on research, extension, and education which can focus on biochar production and application		X	Forestry
	Establishes a biochar application and demonstration project to facilitate the use of biochar through developing additional biochar applications and commercializing biochar		X	Forestry
	Establishes federal matching of state cover crop payments up to $5 per acre (COVER Act)	X		Crop Insurance
	Directs research and development on insurance of crop fields that regularly use cover crops	X		Crop Insurance
	Directs a study to assess the impact of plant biostimulants on aiding carbon sequestration, soil health, and other agronomic factors	X		Horticulture
General research and development	Update Forest Inventory and Analysis to report on status and trends in forest, rangeland, wetland, and other aquatic carbon sinks	X		Forestry
	Amends AgARDA to include qualified projects focused on GHG mitigation	X		Research
	Expands AFRI focus areas to include measuring, monitoring, and verifying greenhouse gas emissions and carbon sequestration	X		Research
	Adds Soil Health Research Initiative to High-Priority Research and Extension initiatives to focus on development of management practices that improve soil health, aid soil preservation or improve soil organic compounds		X	Research
	Establishes a Center of Excellence to focus on climate change adaptation and mitigation including soil health and carbon sequestration	X		Research
	Establishes a Soil Carbon Inventory and Analysis Network to analyze soil organic carbon across space, time and depth and the impact of land management strategies on soil carbon sequestration	X		Miscellaneous

Here Farm bill provisions are categories by the Farm Bill Title and if it was included in the Senate or House draft. The 2024 drafts represented the most updated Farm Bill content available at the time of publication.

system in the face of instability, to strengthen US agricultural supply chains, and to support access for all Americans to food, feed, fiber, and fuel. We recommend the following actions to support ecological and economic benefits:

1. Structure financial incentives that support adoption of soil health practices and improve long-term agricultural resilience.
2. Invest in long-term monitoring networks to understand ecosystem and economic impacts and use monitoring outcomes to guide management regionally.
3. Integrate social science into soil health management to improve farmer support systems.

2 Policy recommendations and options

2.1 Structure financial incentives that support adoption of soil health practices and improve long-term agricultural resilience

2.1.1 Bolster conservation funding

To support both new adoption and long-term maintenance of soil health practices, policy should offer a variety of economic incentives to attract and retain producers. Policymakers can re-establish previous IRA investments in existing conservation programs in the 2025 Farm Bill. Already, conservation programs emphasize healthy soils (e.g., CRP, CSP, EQIP, Outcomes Based Grazing Authorizations, and Regional Conservation Partnership Program), and protecting increased investments is a first step to expanding the reach of practiced-based initiatives for producers looking to adopt new management practices.

2.1.2 Develop new financial mechanisms that support resilience

Policymakers must invest in new legislation that allows producers to financially benefit from long-term maintenance of soil health practices to decrease the risk of practice reversals. Innovative policies can offset agricultural risk, open new consumer markets, and support on-farm productivity that align with conservation goals. Pilot programs, like warranty programs that offer payments for any yield differences after soil health practice adoption (The Nature Conservancy)[5] and discounts to crop insurance (Sherrick and Myers, 2023; Table 3), aim to center practices around improving soil health to build resilience for both agricultural producers and risk management agencies. Sherrick and Myers (2023) informed the COVER Act (HR 3478, S 1690), which proposes to offer a discount on crop insurance to producers who incorporate cover crops, was included in the Senate Ag Majority 2024 Farm Bill draft. The USDA could also explore new innovative financing policies that incorporate incentives that flow from outside demand, such as developing premiums on products grown with soil health practices. Premium programs for these products are being piloted in the private sector (e.g., Whole Foods Sourced for Good program) (Table 3). Public-private partnerships that connect research with private initiatives could be leveraged to promote a deeper understanding of the connection between soil health management and human health (e.g., Patagonia Provisions' Good Health from the Ground Up). Public investment could also accelerate recent efforts by private companies to create more regenerative and resilient supply chains (Caruso et al., 2025). These programs may also be appealing to the Make America Healthy Again Platform, although this platform continues to center agri-chemical business interests.[6]

Policy can further support multifunctional (i.e., conservation and commodity producing) systems that offer both ecosystem benefits and economic resilience. Currently, programs that allow harvesting in conservation areas are limited, but not unprecedented. The Grasslands CRP allows for haying and grazing on CRP land as long as conservation outcomes are maintained. Recently there has been support to expand this approach to agroforestry practices under CRP (Table 2), allowing producers to harvest trees in agroforestry systems while maintaining conservation outcomes of the contract. A variety of financial incentives focused on overall soil health efforts can safe-guard producers' operational productivity.

2.2 Invest in long-term monitoring networks to understand ecosystem and economic impacts and use monitoring outcomes to guide management regionally

2.2.1 Invest in publicly-funded agricultural monitoring

Congress has recognized the need for improved soil monitoring and to consolidate existing efforts. Congress re-introduced the bipartisan, bicameral Advancing Research for Agricultural Soil Health Impacts Act (HR 4865, SB 2582) in 2025 to monitor long term soil health and establish a national soil carbon monitoring network. Challenges to detecting changes in soil organic carbon in response to management at depth and over meaningful timescales for management (<5 years). Continued support for long-term monitoring plots and new national on-farm networks are required to improve our understanding of how and *why* soil health practices promote benefits across different soil types, climates, and management strategies. An expanded network of long-term monitoring plots would provide a platform to better understand the impacts of regionally specific soil health practices (Sykes et al., 2020). Regionally specific networks that provide regular updates on carbon accumulation under regionally-appropriate management activities could help inform producers seeking to transition to and maintain soil health practices (Griscom et al., 2017; Paustian et al., 2019; Zomer et al., 2017).

2.2.2 Improve data access

With soil health practices implemented across the nation in a variety of soils, climates, and cropping and livestock systems, producers need access to regional information on best practices and

5 https://www.nature.org/en-us/what-we-do/our-priorities/provide-food-and-water-sustainably/food-and-water-stories/ag-innovation-pilot-projects/?tab_q=tab_container-tab_element.

6 https://www.whitehouse.gov/wp-content/uploads/2025/09/The-MAHA-Strategy-WH.pdf.

TABLE 3 Alternative financing mechanisms for supporting soil health management to build carbon and ecosystem services.

Example	Year started	Eligible practices	US region	Goal
Saving Tomorrow's Agricultural Resources*	2017	Variety	Across US (11 states)	Link conservation agriculture management to premium markets
PENNVEST PA multifunctional riparian buffers	2018	Agroforestry	Northeast	Link conservation management with production by allowing food producing tree species in riparian buffers for conservation programs
Agree Conservation and Crop Insurance Research Pilot	2019	Cover crops, no-till	Midwest	Identify how cover crops and tillage affected resilience of corn and soybean yields in an extremely wet year; *Basis for COVER Act*
Grazewell, Country Natural Beef	2020	Various	West	Co-op model that links land management to monitoring for improvement in soil health and ecosystem services and provides the marketing, consolidation of commodities for producers
Growers Edge and The Nature Conservancy warranty-backed crop plans	2021	Cover crops	Midwest and Mid-Atlantic	An agronomic-backed warranty product designed to mitigate risk for farm operations and agriculture retailers to test regenerative practices
Land Core Risk Model	2024	Crop rotations	Midwest	Quantify economic risk-mitigation value of specific soil health practices in response to climate events to inform lenders and insurers to develop discounts for soil health practices
Mad Agriculture – Mad Capitol	2024	Variety	Nationwide	Provides loans to farmers specifically interested in transitioning into regenerative or organic practices where banks are risk-averse
Mad Agriculture – Mad Markets	2024	Variety	Nationwide	Provides processing for regenerative organic commodities and acts as middle-man between producers and CPG companies looking to source these products.
CPG company regenerative agriculture commitments	Varies	Variety	Nationwide	Private investment in supply chain to meet net-zero goals that prioritize outcomes-based approaches that support procurement of regeneratively grown agricultural commodities that protect soil health, biodiversity, and climate while supporting farm businesses. Sustainable Agriculture Initiative Platform, an agreement amongst companies was published in 2024
Grants to farmers to develop innovative soil health practices	Varies	Variety	Nationwide	Federal, state, and local organizations administer grant programs with the goal of allowing producers to "experiment" with soil health practices on their lands. Example: MD Healthy Soils Competitive Fund

*Only CO and WA STAR programs are currently focused on premium markets.

short- and long-term outcomes. Already, USDA and other federal agencies collect long-term soil data (e.g., Dynamic Soil Properties and CEMAs), but these are isolated from academic and industry efforts. New policies should focus on database harmonization and the development of new, widely accessible, decision support tools that meet producers' needs (e.g., informing cost–benefit trade offs of implementing a practice) and equip them with the knowledge to make regionally informed decisions. Data harmonization efforts must involve both the private and public sectors and include standardized collection of management data (e.g., developing the Common Farm Convention),[7] field and productivity measurements (e.g., CEMAs), lab data (e.g., MODUS standards)[8] and modeled outputs. Further, we need both *intensive* long-term research stations (e.g., Long Term Agroecosystem Research Network), as well as *extensive* opportunities that allow the majority of private producers to participate in low intensity monitoring efforts with government, research, non-profit or other external partners (e.g., monitoring programs at the Soil Health Institute,[9] The Soil Inventory Project[10], or Point Blue Conservation Science[11]).

Invest in model improvements. Policy can also promote investment into existing public data sources used to develop predictive ecosystem models (National Academies of Sciences Engineering and Medicine, 2019). New approaches using multi-model ensembles have the potential to reduce error in predicting outcomes from agricultural management (Basso et al., 2025). There is also a need to quantify and clearly communicate modelling uncertainty in commonly-used public facing tools. Scenario options for various climate futures should also be incorporated to aid in scenario planning and management decisions. Finally, using models to their full potential for decision-tools, requires gathering and connecting existing management data directly through continued field research on newer soil conservation (e.g., biochar) and long-standing management approaches (e.g., deep-rooted perennials) (National Academies of Sciences Engineering and Medicine, 2019).

7 https://our-sci.gitlab.io/conventions/common_farm_conventions/wiki/.
8 https://github.com/AgGateway/Modus.
9 https://soilhealthinstitute.org/.
10 https://thesoilinventoryproject.org/.
11 http://www.pointblue.org/ag-c.

2.2.3 Support public-private partnerships

Through public-private partnerships, federal agencies can support an environment of innovation in the private sector that expands producer access to direct technical and financial support for soil health management. We have seen historic interest from the private sector in soil health and soil carbon. In 2024 approximately 170 consumer packaged goods companies joined the Sustainable Agriculture Initiative Platform in an effort to come to an agreement around practices that address resilience across supply chains. This interest extends to opportunities for public-private partnerships, as exemplified by the PCSC program which included non-federal contributions as an evaluation criteria for project funding. Lowering the barrier to data sharing across public and private entities can amplify the impacts of monitoring efforts. However, across these partnerships, it is essential to ensure Findable, Accessible, Interoperable, and Reusable (FAIR) principles protect producer privacy and clarify options to share data securely (Wilkinson et al., 2016, USDA 2024–2026 Data Strategy[12]). Clear communication to producers about their rights and data use will create the foundation for a comprehensive, secure, and sharable dataset that contextualizes practice outcomes for producers regionally.

2.3 Integrate social science into soil health management to improve equity and culturally relevant support systems

2.3.1 Regionally-appropriate support

Soil health management practices will be implemented if aligned with producers' land management goals and socioeconomic needs (Gosnell et al., 2020b). Policies must be designed to offer a "menu" of conservation practices that match producers' natural resource concerns, providing a roadmap for longer-term transformational change and guiding producer access to programs. Social science research has highlighted that producers often turn to their own peer and social networks to learn soil health practices as opposed to government or industry players (Snorek et al., 2024). Therefore, the USDA should expand the breadth of technical assistance through alternative programs that support producer social networks, such as paid producer-to-producer learning opportunities, demonstration trials, and community cooperatives. Historically underserved agricultural communities face additional barriers in accessing USDA funding (Carter and Alexander, 2020; Singletary et al., 2016); USDA should expand community-led efforts and/or cooperative agreements with trusted organizations on the ground in these communities to ensure that these communities are supported. By reinforcing existing policy on education and training to focus on soil health practices, federal programs can reach broader communities, empower local leaders in soil health, and align with the objectives of producers to augment agricultural resilience (Buck and Palumbo-Compton, 2022).

In addition to empowering social networks for education, USDA can augment NRCS technical assistance for conservation programs by developing staff training from existing social science research on soil health management adoption– for example working with individual producers to make holistic, context specific decisions relevant to their operations (Gordon et al., 2022; Gosnell et al., 2020a, 2020b). It has also been shown that producers struggle to navigate complex NRCS applications and opaque competitive enrollment processes; the USDA should simplify application requirements while providing increased application assistance. By training staff to provide technical and application assistance that resonates with producers' needs, NRCS can expand the regionally-relevant soil health management options available to producers. This regional approach is demonstrated clearly in the rapid rise of state soil health policies (view current map[13]), and needs to be reflected in future federal legislation.

3 Conclusion

While federal policy actions have incentivized management changes aimed at soil carbon primarily for climate mitigation, producers remain focused on broader goals of increasing agricultural resilience and securing multiple co-benefits. Agricultural soil health policies have garnered bipartisan support, and with the momentum gained through efforts to build soil carbon, national and state level policies can expand to include broader benefits of these practices. With the 2025 Farm Bill, US policymakers have an opportunity to build programs that offer innovative financial incentives that align with risk management programs and increase on-farm income. By consolidating existing soil carbon monitoring efforts, improving data harmonization, and empowering producer social networks, policy makers have the opportunity to advance adoption and long-term maintenance of soil health management across US farms and ranches. However, to deliver the highest impacts, policies must be re-framed to align with soil health management activities and the USDA must be properly staffed to carry out 'producer-first' approaches. By addressing the socioeconomic barriers to adaptation and challenges of soil monitoring through science-backed policies, Congress can support a transformation of US agriculture to center soil health management for more resilient agriculture.

Author contributions

GK: Writing – original draft, Writing – review & editing. CC: Writing – review & editing. LE: Writing – review & editing. TF: Writing – review & editing. HG: Writing – review & editing. JH: Writing – review & editing. CL: Writing – review & editing. MM: Writing – review & editing. SM: Writing – review & editing. CR: Writing – review & editing. PS: Writing – review & editing. TZ: Writing – review & editing. EF: Conceptualization, Writing – original draft, Writing – review & editing.

12 https://www.usda.gov/sites/default/files/documents/fy-2024-2026-usda-data-strategy.pdf.

13 http://www.healthysoilspolicy.org .

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Conflict of interest

GK and CL were employed by Carbon180. CC, LE, CR, and EF were employed by Point Blue Conservation Science.

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