

**Climate Smart Agricultural
Recommendations
From the
Carbon Tracking and Monitoring
Workshop, July 2022**

Minnesota's Climate Action Framework presents an opportunity for Minnesota Agriculture. These recommendations for Minnesota Agency Leaders result from discussions at an Agricultural Carbon Tracking and Monitoring workshop held in July 2022. With 60 stakeholders, we advanced ideas for a more systematic approach to tracking, monitoring, and goal setting that addressed the need for meaningful reductions in agricultural carbon emissions in the context of environmental co-benefits and social equity. The [Workshop Report](#) provides a full description of the discussions.

This synthesis includes Context, Recommendations, and a Workshop Summary.

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Minnesota State Agency Policy Recommendations
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Context

Minnesota's Next Generation Energy Act set goals for greenhouse gas emission (GHG) reductions across all sectors of the economy. While Minnesota has accomplished significant reductions from the energy sector, emissions from livestock and cropping agriculture increased by 17% through 2020.¹

The Minnesota Climate Action Framework calls on the state to “Identify opportunities for farmers and landowners to participate in ecosystem services markets (e.g., for carbon removal, flood protection, and water quality) that incentivize best management practices for climate mitigation and adaptation.” Climate-smart agricultural conservation practices are not being adopted fast enough or providing large enough cuts in emissions to achieve the goals required to avoid dramatic consequences of climate change (see IPCC February 2022 Working Group II report).

Increasing continuous living cover (CLC) in the form of perennial production systems and managed rotational grazing builds soil health, boosts resilience to climate impacts, and sequesters carbon in the soil—providing potential climate solutions that also generate environmental and social co-benefits. No-till combined with cover crops, longer rotations with small grains, and other nutrient/manure management practices can also be climate-smart. These systems could reduce agricultural emissions and future production costs for farmers, as well as help meet Minnesota's goals for nitrogen reduction and habitat improvement.

Carbon markets, broader ecosystem service markets, and publicly funded incentives that pay farmers to implement carbon-sequestering practices could help farmers increase adoption of these practices, but additional data on effectiveness would help prioritize where to invest time and money. The lack of research on carbon and GHG reductions attributable to climate smart practices has hampered efforts to promote the most effective practices. Goals and baselines are needed to inform what should be tracked to determine progress or the lack thereof.

If goals and metrics are clear, these initiatives offer high potential to advance agricultural systems in a way that holistically serves the environment and the people living and working on it. However, the agricultural sector has historically underserved Black, Indigenous, and People of Color (BIPOC), women, immigrants, and beginning farmers. Therefore, including the diverse perspectives of “emerging” farmers is essential as we consider sustainability goals and tracking methods to ensure equity and inclusion in climate change solutions.

Goals should be set for avoiding emissions so that agriculture might achieve net emission reductions of 30% in five to six years and deeper reductions over longer horizons. Related goals should be formulated to advance equitable participation by small- and medium-sized farming and agricultural enterprises, including those led by underserved and under-represented farmers. A framework of metrics and methods must be developed to track the achievement of goals.

These recommendations for Minnesota Legislators and Agency Leaders result from discussions at an Agricultural Carbon Tracking and Monitoring workshop held in July 2022. With 60 stakeholders, we advanced ideas for a more systematic approach to tracking, monitoring, and goal setting that addressed the need for both social equity and meaningful reductions in agricultural emissions. The Workshop Report provides a full description of the discussions.

1 MPCA <https://public.tableau.com/app/profile/mpca.data.services/viz/GHGemissioninventory/GHGsummarystory>

Recommendations

1. *Integrate co-benefits in carbon markets and state-funded programs for agricultural incentives.*

- *Define guardrails for carbon markets on contracting and tracking to assure veracity.*
 - For example, set high, meaningful entry standards and then branch out to make sure more people are eligible; low bars like minimal tillage won't be impactful.
- *Build on and expand models such as Minnesota Agricultural Water Quality Certification Program (MDA) and the Working Lands RIM Easement Program (BWSR), which incentivize adoption of a suite of practices for soil health, not only single practices such as reduced tillage, and maintaining practices over time.*
 - These programs could also incorporate additional diverse strategies such as agrovoltatics, prairie strips, and paying for data collection and monitoring *in addition to* payments for implementing practices and carbon/ecosystem services.
 - Concepts from the Working Lands Watershed Restoration study completed in 2018 (BWSR) could be incorporated into programs that seek to shift row crop fields to working lands perennials.
- *Clearly connect climate practices with water quality and soil health practices such as:*
 - CLC as perennials on working lands can help with adaptation, resilience, GHG reduction, carbon sequestration, and improving soil quality and soil health.
 - CLC as cover crops in annual cropping systems and longer rotations (with small grains/cover crops and two or three-year perennials in rotation) that can help with adaptation, resilience, and greenhouse gas reduction, and improving soil quality and soil health.
 - Shorter-season summer crops (small grains and canning crops), since they are easier to implement with cover crops than full-season corn and soybean crops but economic returns may not be as good.
- *In addition to support for initiatives such as Forever Green crop research, expand funding for other marketable perennial crops such as hemp that may have both climate and ecosystem service benefits.*
- *Identify key groups and provide information to specific groups such as non-operating landowners may have shared values around this work and would support it.*

2. *Level the playing field for social equity and inclusion alongside carbon and ecosystem service markets.*

- *Model programs on community-level food systems, water quality planning, and climate adaptation planning approaches, e.g., Tribal nation's community food systems and food sovereignty plans.*
 - Design policies to bring new people to the land with secure and affordable land access, rather than just changing costs/incentives for people who are already there.
 - Support small producers through local mills, bakeries, and processors, including mobile abattoirs.
 - Fund programs that reward non-operating landowners for leasing land and equipment to emerging farmers.
 - Support land access for emerging and BIPOC farmers and prevent consolidation and development through farmland protection easements, cooperatives, and other approaches.
 - Since emerging farmers may be more likely to adopt beneficial practices and systems from the start, clarify in messaging how land access connects with the climate crisis.
- *Create incentive structures for commodities and specialty crops, especially for smaller operations, that offer higher payments for initial per-acre increments of practices and/or ecosystem services by:*
 - Putting caps on contract levels or eligible number of acres
 - Supporting farmers during a 3–5-year transition period to adopt CLC
 - Not using additionality as a prerequisite to participate in carbon markets, which penalizes farmers who have already adopted climate-smart practices, which if not continued would increase emissions.
 - Using scale-neutral, points-based programs tied to support and payments.
- *Keep the monitoring and reporting burden on the program rather than on farmers.*
 - Make tracking practically and financially accessible to growers and landowners.
- *Invest in education and county-level positions (e.g., USDA, NRCS, extension) that are devoted to providing growers with support (organized data and education) in tracking and monitoring GHG and SOC dynamics on their land.*
- *Increase investment in county-level resources for soil testing.*

3. Scale rewards for practices that have the greatest and longest-term effects—e.g., forest and grass-land maintenance and improvement—and be honest about the limitations of different land uses.

- Remove the most vulnerable lands from production, especially peat soils and former wetlands.
- Incentivize farmers and landowners to:
 - Shift marginal fields to production systems with high levels of conservation, ecosystem services, and potential for GHG reductions.
 - Retain grasslands through managed rotational grazing and “working lands” easements for perennials.
 - Help retire land from production, shift to working land-uses, or retain grasslands through managed rotational grazing and “working lands” easements for perennials.
 - Convert to forest or other perennial production systems. The main costs are planting and management. For improved grazing, improved or new fencing and watering systems may be needed.
- Consider lower payments if returns from conventional cropping on marginal land are smaller to begin with.
- Use GIS to identify land types and current use.
- Set high, meaningful entry standards; then branch out to make sure more people are eligible; (low bars like minimal tillage won't be impactful).

4. Develop integrated goals and systemic and monitoring tracking frameworks for carbon, ecological services, and equity to know if we are achieving goals.

- Develop a True Cost Accounting Framework and methods applicable to tracking and monitoring GHG emissions, along with environmental and social impacts, as well as co-benefits:
 - Set clear goals for agricultural GHG net reduction related to agricultural practices and land-uses.
 - Ensure standardization and transparency in tracking and modeling by:
 - Building accessible databases with long-term, site-specific GHG emission data.
 - Standardizing while recognizing the diversity of geology, soil types, cropping and livestock-on-the-land systems, farm size, and proxy vs. farm-scale data.
 - Allowing for comparison and verification to help reduce greenwashing.
 - Assuring flexibility in the face of great uncertainties and evolving science.
 - Integrating measurement and prediction-based approaches. Measurement of every single field is not necessary or viable but a purely prediction-based approach is not adequate either.
 - Account for ecosystem service trade-offs with GHG reductions and measure environmental co-benefits.
 - Set goals for social equity, landscape-level living cover, environmental co-benefits, net GHG reductions and other metrics related to these issues.
 - Identify near-term methodologies to value, and possibly monetize social outcomes and negative environmental externalities, along with added economic value, from addressing climate change impacts and solutions related to farming and food systems.
 - Invest in developing longer-term methods to identify and value what is harder to accomplish with current understanding.
 - Recognizing that environmental co-benefits are often best practices for climate too, but sometimes climate benefits may be overestimated.
 - Measuring environmental benefits from cover crops alongside any emissions reductions or increases from nitrous oxide emissions.
 - Consider and address challenges:
 - Be honest about the limitations of different land uses- where can we realistically reach carbon-neutrality??
 - Address methane and nitrous oxide emissions in goals and tracking.
 - Develop monitoring and tracking of markets and programs to understand current state of and changes regarding inclusion and equitable distribution of opportunities and access to larger, smaller, women and BIPOC farmers.
 - Evaluate tradeoffs of different monitoring/data systems.
 - Prioritize measuring of:
 - Soil erosion.
 - Surface and groundwater quality.
 - Habitat production and increased biodiversity.
 - Parameters that can be tied to the market and turned into cash payments.
 - Activities that can be certified for producers to increase the value of products.
 - Support and refine monitoring strategies for maximum accuracy and ease of use:
 - Utilize remote monitoring of living cover, soil carbon, e.g., by drone with ground penetrating capabilities.
 - Simultaneously monitor “stacked services”/co-benefits even if not all are directly related to GHG mitigation.
 - Build long-term MN-specific modeling capability at watershed, county, or sub-county level.

5. Expand funding for research to better understand links between soil health and carbon storage in systems managed with living cover and how soil carbon storage responds to management and weather.

- Increase funding to the Minnesota Office of Soil Health to do this comprehensively.
 - For example, support and refine monitoring strategies for maximum accuracy and ease of use.
- Support research and outreach station experiments (diverse in geography and cropping rotations) in process-based modeling of whole-farm systems to inform soil carbon credits and better understand “dynamic persistence” with respect to soil carbon storage in diverse CLC systems.
- Prioritize research funding for identifying and tracking benefits of stacking practices, including the soil health/ carbon storage impacts from CLC and managed rotational grazing systems, that:
 - Cuts across farm size, farmer identities, and production systems.
 - Is accurate, cost effective, and easy to use monitoring and tracking strategies.
 - Identifies how benefits stack with multiple practices in place.

Workshop Summary

The Ag Carbon Tracking and Monitoring Workshop was an effective convening of diverse stakeholders who contributed thoughtful, well-informed background, promising models, and gaps in policy and programs, as well as recommendations for agricultural carbon sequestration in the context of ecological services, and equity and inclusion. An important shared understanding from participants was that ecological and social systems are at a breaking point, and we must work at a systems level with as much mandated change as possible to reduce emissions and increase sequestration potential. The consequences of inaction are dire. It is important to collectively assert that Ag climate solutions hold great potential and actions are available and imperative at many scales and via many farm types. These include cropping and livestock systems. A diversity of solutions should be implemented now and into the future.

Participants outlined barriers to immediate action. Feasibility of farmer adoption is one of the most significant, including economic, cultural, technical knowledge, and infrastructure barriers to adoption of climate-smart practices. Pathways to adoption should be prioritized in strategy and measurement protocol development. Small-scale, BIPOC and emerging farmers experience additional adoption challenges given the structural inequities of agriculture that present many barriers, including limited land access. The ongoing trend towards consolidation disadvantages smaller farmers.

These challenges also limit the ability of small-scale farmers to participate in and benefit from carbon markets, which are typically designed for large row crop operations. Since new farmers, BIPOC farmers, and small farmers tend to be more likely to implement diversified production systems, perennial crops and other regenerative practices, excluding them by omission or design is contradictory to maximizing climate change mitigation in agriculture.

There is often tension between large-scale incremental change and small-scale transformative change but we need both. Equity and land access must be addressed in any cost-share, incentivization, or payment programs to avoid compounding these existing inequalities. One way to help do this is to include farmers of all types in program design, communicate appropriately, acknowledge and respond to their needs and limitations, and build programs that address adoption barriers. Other challenges lie in the science of carbon itself. Soil carbon measurement is still somewhat inexact, and carbon dynamics are characterized by high spatial and temporal variability that makes accurate modeling difficult. The situation is complicated by the importance of nitrous oxide and methane in agriculture’s total greenhouse gas emissions impact, especially because nitrous oxide is even more difficult to measure and model than carbon. While we must avoid massively overestimating the impact of given practices, we also must find ways to proceed in the face of uncertainty, since time is critical.

Workshop participants addressed the limitations of carbon markets. Ag carbon sequestration does not negate the need for major reductions in carbon dioxide, methane, or nitrous oxide emissions. Many attendees referenced private sector corporate insetting[1] and other initiatives leading the way on Ag and climate. Yet many remain skeptical of the influence of corporations involved in carbon markets, asking who benefits, how, and why. Carbon markets run the risk of solidifying support for dominant cropping systems that can have significant environmental impacts, especially when built by and for players with significant existing power in agricultural systems and policy.

Instead, workshop participants offer recommendations to build markets and policy to better foster adoption of more diverse farmers and agricultural systems. Workshop participants provided many concrete recommendations, a critical piece in the development of these new markets. Program design should be dynamic, helping to ensure that the focus remains on intended impacts and beneficiaries, and that programs are both effective and inclusive. Combined with assessment throughout the adoption and implementation phases, it also ensures that they can be adjusted to avoid unintended negative consequences. State and federal regulation currently lags but should be supported along with current initiatives already moving through the private sector. Government standardization and regulation will ultimately be essential for verifiability and transparency to ensure that farmers have clear options and that companies deliver the promised climate benefits.

Workshop and Signatories

Five catalyst presenters were identified and recruited to make presentations. Invitees numbering 140 people were known to be interested in these issues, including about 30% farmers (row-crops, livestock, fruits and vegetables and grazers), as well as researchers, Minnesota agency leaders and scientists, nonprofit staff, and the corporate sector employees. We invited about 25% BIPOC individuals. A total of about 60 people attended . The [Workshop Report](#) provides a full description of the discussions.

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