Ag Carbon Tracking and Monitoring Workshop

7.19.2022

Post-Workshop Report

Kimber Farm, Dakota County, MN. Photo credit Queenan Productions.

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Workshop background and purpose

On July 19, 2022, an Ag Carbon Tracking and Monitoring virtual workshop was held. The workshop was a collaboration between the Soil Carbon LLC, Institute on the Environment, Green Lands Blue Waters and other University of Minnesota partners, and others. For a full list of the steering team members and organizations see **Appendix B**. The seven-hour Zoom workshop was attended by roughly 60 participants, who stayed engaged and active. Significant intention went into recruiting attendees ahead of the workshop, resulting in an effective mix of participants - university faculty and staff, farmer and policy focused nonprofits, state agency staff, national ag/ climate experts, several farmers and other community voices engaged in agriculture and actively working toward ag climate solutions.

This post-workshop report documents the opening talks and deep participant engagement in breakout session conversations that occurred across the day. Based on comprehensive workshop notes, this report was compiled by Green Lands Blue Waters.

The purpose of this report is to provide a record of conversations to be referenced by workshop attendees and others, as well as to serve as a building block for synthesis outputs that will be written collaboratively by attendees that chose to participate following the workshop.

The following background was shared in the invite to the workshop.

> *Minnesota's agriculture adds an estimated 24% to the state's overall greenhouse gas emissions. This workshop will advance progress toward reduced emissions from Minnesota's agricultural and food systems by generating ideas for systematic tracking and monitoring that includes social and environmental outcomes. Increasing living cover, reducing disturbance to soils, and building soil health boost resilience to climate impacts and may sequester carbon in the soil. Alongside other strategies such as nutrient/manure management, these could enable agriculture to reduce emissions and may potentially reduce future production costs. Markets are starting to respond through the creation of carbon markets for paying farmers to implement various carbon sequestering practices, sometimes paying price premiums for regeneratively or "climate friendly" sourced products. Publicly funded incentives are being expanded. If goals 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 in it. However, the agricultural sector has historically excluded or underserved women, young, and Black, Indigenous, and People of Color (BIPOC) farmers. Therefore, including diverse perspectives is essential as we consider sustainability goals and tracking methods that seek to advance equity.*

Goals and Needs for Minnesota Agriculture's Greenhouse Gas Reductions

Minnesota's Next Generation Energy Act set goals for GHG reductions across all sectors of the economy of 30% by 2025 and 80% by 2050, compared to 2005. However, the state has only achieved an 8% reduction as described in a 2021 report. In fact, emissions from animal and cropping agriculture increased by 11% through 2018, not including forestry or other land-uses. While many agricultural climate solutions can result from improving continuous living cover and soil health, the adoption of those practices is not moving fast enough or providing deep enough cuts in emissions to achieve the goals required to avoid dramatic consequences of climate change (see IPCC February 2022 Working Group II report). Furthermore, soil health improvements alone will not achieve the reduction goals set out by the Next Generation Energy Act. Minnesota lacks goals for the adoption of living cover on good cropland or economically marginal lands. Together with no till, managed rotational grazing, and other nutrient/manure management approaches, such practices can avoid some emissions, potentially sequester carbon, and generate important co-benefits. These practices can also produce environmental benefits in line with Minnesota's existing goals for nitrogen reduction and habitat improvement, benefits which also need to be tracked and better understood. Goals and tracking systems will be needed. In addition to environmental benefits, there are social benefits to consider for the agricultural sector. Potential benefits from expanded markets include enhanced rural vitality and economic development. Entrepreneurs in food and non-food uses, and tourism may benefit from new products and more diverse landscapes. Valuing the ability for small- and medium-sized farms and agricultural enterprises to thrive, and for emerging young, female, and/or BIPOC farmers to enter and succeed in agriculture are all social co-benefits that could possibly come alongside emissions reductions and other environmental co-benefits. Goals and tracking systems will be needed. What goals should be set for avoiding emissions and carbon sequestration on "marginal" cropped fields, "good" cropped fields, and livestock operations so that agriculture might achieve net emission reductions of 30% in five to six years? What related goals could advance equitable participation in small- and medium-sized farming and agricultural enterprises, including those led by young, female, and/or BIPOC individuals?

Tools to Achieve Outcomes

Through this workshop we are offering an opportunity to: (1) Explicitly set out intentions on what we value; and (2) Advance a more systematized approach to measure and monitor progress in what we value. This project is designed to consider both the technical and the social metrics, the interplay between them, and propose ways to implement such a systematized approach. Two broad methodologies offer limitations and promise when assessing natural and social capital.

- *Social capital includes relationships and social networks, as well as the social norms and values that shape behavior.*
- *Natural capital includes the air, water, soil, geology, ecosystems and creatures that*

provide us with the building blocks of all other forms of capital.

Negative (and sometimes positive) impacts of production on natural and social capital are typically not included in the direct cost of a product. Methods of tracking impacts and progress toward goals include Life Cycle Assessment (a framework for considering the impact of a production system) and True Cost Accounting (an emerging body of research and applications to understand more about the scale and nature of these external impacts). Both of these frameworks have advantages and disadvantages. There is no one agreed upon framework, scientific consensus is lacking on aspects of the systems, and data is missing for aspects of the systems that would allow full quantification or assessment in only one framework. It necessarily involves examining trade-offs, e.g., from maximizing production or soil carbon sequestration in relation to water quality. Unintended consequences need to be anticipated, if possible. Therefore, we propose multiple frameworks for analysis.

The articulated workshop desired outcomes included:

I. Evaluate gaps in understanding the GHG reduction potential of regenerative agricultural strategies.
II. Clarity and recommendations around environmental and social co-benefits that should be tracked and monitored.
III. Recommend ways to apply systems analysis approaches (ex. True Cost Accounting or Life Cycle Analysis) to assess GHG reduction potentials with other co-benefits.
IV. Recommendations for a tracking system to monitor GHG reduction, environmental and social co-benefits, and implementation of GHG reduction strategies. Highlight those strategies that will achieve or exceed GHG reduction goals for MN.
V. Identify knowledge gaps and ways to fill gaps across the above outcomes.

Opening catalyst flash talks and warm up conversations

Five guest speakers were invited to give flash talks to kick off the day with a goal of providing background on each major topic area and information to support the discussions. A short summary of each catalyst speaker's main points is below, and slide decks from presenters that used and shared slides can be found in **Appendix C.**

1. Update from MN climate subcabinet: State of MN emissions reduction goals

John Jaschke, *Executive Director, Minnesota Board of Water and Soil Resources*

- Highlights from draft climate framework including goals and measures of progress
- The goal is to be able to store more carbon on working lands (since MN has a LOT of ag land) by scaling up adoption of practices like no-till and cover cropping
- Scaling up and tracking progress will be key; one example is the daily erosion Project (DEP) that tracks field soil loss. Another example is cover crop emergence data.
- Barriers include the low cover crop adoption rate. Even with the best ideas, farmer adoption and implementation is key and needs progress

- The private sector will be important for carbon markets because this is taking place largely on private land
- Soil health in the 2022 Minnesota Legislative Session:
    - Clean Water Fund: $4M in FY22-23 to enhance cover crop adoption
    - General fund: $1.35M for climate-focused soil health practices
    - Funding for Forever Green and the businesses that comprise the value chain for continuous living cover crops

2. Implementation (Ecosystem Service Markets)

***Leif Fixen**, Strategy Manager, The Nature Conservancy*

- Offsetting (reducing negative impacts by purchasing carbon credits, regulation, permits) vs. insetting (reducing emissions from your own supply chain, increasing positive impacts with nature-based solutions; voluntary)
- Trends: emphasis on consumer forces; insetting as a sign of corporate involvement
- Ideally, ecosystem service markets will be transitional: functioning as a medium-term incentive for 5-10 years, until regenerative ag (hopefully) becomes the new norm. Cost share from state and federal sources can work as a short term incentive
- Shared info on Ecosystem Service Market Consortium & Minnesota pilot
    - $20 acre incentive, 50,000 acre goal, currently 9,000 acres enrolled, $250/ac signing bonus for eligible edge of field practices.
- Federal standardization in GHG and C measurement is one of the biggest needs.
    - What is the minimum standard for tracking and verification?
- Farmers are interested if the price is right, but are overwhelmed with options with different payment systems. They also want standardization.
- Need to avoid a race to the bottom resulting in meaningless actions with short contracts and no validation.

3. Tracking and monitoring the reduction potentials of different management or cropping strategies

***Joel Tallaksen**, Scientist, Renewable Energy, West Central Research and Outreach Center*

- The importance of soil for climate change has previously been underestimated.
- It is difficult to accurately model C change at the field level. Using national/regional averages is easy but inaccurate; direct measuring is harder and more expensive, but most accurate.
- It is also difficult to estimate GHG reductions by management method because each field and farm is so different. General, relative comparisons are more reasonable
- The nitrogen cycle is also impacted by management. Nitrous oxide is a very important GHG that can actually be just as impactful as carbon.
- Long term implementation is key because SOC only temporarily stores C.
    - Important consideration: the rate of accumulation can slow after ~10 years
- Implementing good farm management is essential. Even if we can't give highly accurate C predictions, it is better than doing nothing and has other benefits

4. Environmental Co-benefits

***Hannah Bernhardt**, Medicine Creek Farm*

- Hannah raises grass-fed beef and lamb and pastured pork using managed rotational grazing; uses guard dogs (to allow predator habitat), agrotourism, farm stays
- Research suggests that well-managed rotational grazing can sequester carbon

- Continuous Living Cover can be a part of the climate solution
- Practices that support C sequestration tend to have many other benefits, including improved soil health (water holding capacity, stability, erosion and nutrient loss reduction, resiliency to large rain events and drought), water quality, bird and pollinator habitat, on-farm benefits such as birds for insect control
- Animal, human, and soil health are all connected.
    - For example, grazing vs. feedlots for air quality
- "If we pollute the air, water and soil that keeps us alive, and destroy the biodiversity that allows natural systems to function, no amount of money will save us." - David Suzuki

5. Social co-benefits

***Patrice Bailey**, Assistant Commissioner, Minnesota Department of Agriculture*

- Commissioner Bailey works in many spaces including with emerging farmers, trying to make the space more equitable for all Minnesotans
- Barriers for BIPOC (Black, Indigenous and people of color), women, and other emerging farmers include land access, finances, racial profiling in lending, student loans, belonging and being seen as a part of the space
    - Bailey encourages new farmers to become part of farmer organizations such as the Minnesota Farmers Union (MFU), Land Stewardship Project (LSP) and many others
    - Bailey also suggested that organizations such as MFU create an emerging farmer category to encourage membership, and they did
- We need programs designed, led by, benefitting and engaging BIPOC participants.
- Both land access and market access need to be considered for BIPOC farmers
    - For example, there are very few BIPOC farmers in hemp production. It is not too hard to produce, but marketing can be very difficult. Being in production does not equate to being able to actually sell the crop

Breakout Session 1: Discussion and commentary around the current MN emissions reduction goals in agriculture and food systems.

Breakout session 1 was a warm up activity to get people talking and thinking together. Participants were broken out into small groups for a Jamboard (virtual post-it note) activity with discussion prompts:

- *How are we thinking about the current scope of MN emissions reduction goals in Agriculture and Food Systems?*
- *Are they getting us where we need to go? What strategies are needed for us to get there?*

Near-term and long-term:

- *Are current goals enough in terms of the level of emissions reduction or carbon sequestration?*
- *Do we need to consider marginal land and prime farmland differently?*
- *How do we consider easy entry points in the existing commodity framework versus promoting systems change?*
- *How is equity represented in current goals (ex. race, ethnicity, gender, farm size, landowner status)*

Across the Jamboard activity, the following themes and sub-themes of discussion emerged:

- ➔ Tracking and monitoring themes
  - ◆ Goal setting and prioritization
  - ◆ Tracking and monitoring challenges and considerations
  - ◆ Standardization
  - ◆ Input considerations and reducing nitrous oxide emissions
  - ◆ Farmers and on-farm data
  - ◆ Equity in tracking and monitoring
  - ◆ Co-benefits

- ➔ Farmer and equity-related themes
  - ◆ Farmer compensation
  - ◆ Balancing different scales and practice types
  - ◆ Emerging farmers and equity considerations
  - ◆ Farmer adoption and implementation

- ➔ Market driver themes
  - ◆ Carbon and ecosystem service markets
  - ◆ Agricultural product markets and supply chains

- ➔ Other strategic themes (framing, strategic tensions, policy and other levers)
  - ◆ Framing
  - ◆ Big-picture considerations
  - ◆ Current incentives and opportunities; specific thoughts and recommendations
  - ◆ Balancing strategic tensions

For a detailed look at the ideas that surfaced during the Jamboard discussions, refer to Appendix D.

Breakout Session 2: A deep dive into our focus areas

In Session 2, attendees were asked to do an in-depth exploration of four focus areas: tracking & monitoring, environmental co-benefits, social co-benefits, and implementation. Attendees were broken into small groups organized around the four areas and asked to describe:

1. Knowns, unknowns, levels of certainty, and what's missing from the conversation.
2. Needs for new learning or action, and recommendations for tracking and monitoring.

Below, a record of each breakout session conversation summarizes themes, unknowns, needs, questions and what was identified as missing from the conversation.

Area 1: Understanding Tracking and Monitoring

Unknowns: Developing science and the balance between measuring and modeling

- There are still fundamental gaps in carbon measuring and quantification capabilities
    - It is hard to report GHG for the purpose of C markets for a given acreage, and harder to gather data on small diverse farms than large homogeneous farms
- We need a long-term monitoring framework, involving more sites, cheaper soil sampling, and better scientific minds in startups
    - Cost is a limiting factor; there is a tradeoff between labor time and data quality
    - Remote sensing, automation, and more effective sensors could help
        - There are engineering challenges
    - Who verifies and how? SWCDs? With spot checks?
- How much measuring vs modeling do we need?
    - Models and estimation tools are not a replacement for on the ground testing
    - The COMET tool from USDA tries to predict soil carbon without as many on the ground measurements but is new and doesn't reflect things like orchard planting or waterway restoration very well
    - Different methods between different agencies and markets make things challenging.
    - Nitrous oxide emissions are very difficult to model; sensitive to precipitation
- We must accept some level of uncertainty and imperfect tools, knowledge, and strategies and move ahead because time is critical. How much can we tolerate?
- What other aspects (outside of soil) are important in carbon monitoring and tracking? For example, how do livestock and grazing fit into carbon monitoring and tracking?
- How do we scale practices and programs equitably for emerging, small farms and large commodity farms (towards whom programs tend to be geared)?

Missing from conversation: Permanence of sequestered soil carbon

- There is a lot of uncertainty still about amount of C sequestered and residence time. For example, dynamic persistence of carbon in diverse systems may suggest needed changes to models related to the concept of long-term carbon storage in systems.
- Soil carbon residency time needs to be decades to offset 1 ton of emissions, according to Cibrowski's Minnesota Pollution Control Agency 2019 report.
- A lot of papers don't acknowledge the saturation effect; they imply that we are going to keep sequestering 1% per year

Missing from conversation: Who will collect and own data? Who pays for collection?

- All farmers cannot be data collectors; it is an especially unfair burden for small farms
- Farmers need to be a part of the process and want to know who the buyers are
- We need greater transparency and trust about data use and ownership

Missing from conversation: How do soil-based changes compare with other potential reductions?

- Project Drawdown (PD) identifies changing diets and reducing food waste as having the third and fourth largest potential global reduction across all economic sectors
- Literature from the U.S. and Minnesota found lower estimates of emissions reduction for soil health-based solutions compared to other agricultural practices. However, within the global agriculture sector (including related land management), Project Drawdown calculated that soil

health-based solutions such as regenerative annual cropping and managed grazing have similar or more potential than conservation agriculture, improved cattle feed, and manure management.

Theme: There is skepticism and some fundamental concerns about carbon markets

- Society paying for carbon that might not actually be accruing
- There is wariness of large institutions and commodifying soil health
- Farmers actually doing the work and other people are profiting from it
- Carbon markets becoming a form of greenwashing for large corporations
- Creating a race to the bottom
- Ag soil carbon sequestration does not negate the need to reduce GHG emissions
- Carbon markets currently focus on commodity crops, many of which go to animal feed and ethanol, not the "specialty" products (vegetable, pastured livestock) that directly benefit consumers
- Will the emission happen regardless of the offset? (Is the offset just facilitating more emissions?)

Area 2: Environmental Co-benefits

Need: Carbon markets should be designed with other ecosystem services in mind

- Practices that benefit soil and water quality, such as perennials, can also reduce emissions and may sequester carbon - these programs should be clearly linked
- State and federal programs could add incentives/compensation for co-benefits like water quality and soil health into an existing program
- Stack co-benefits to enable and encourage practices and offer a sliding scale of incentives based on water quality and other models, such as partial crop insurance
- Considerations for balancing carbon goals and co-benefits
    - There are concerns that co-benefits are not recognized and compensated enough, and that too much focus on co-benefits will weaken climate focus
    - Soil health actions are not always climate actions, for example legume cover crops can benefit soil health but also increase nitrous oxide emissions
    - It is complex to implement stacked benefit programs - tracking is more difficult and expensive

Known: Some agricultural land must be taken out of production or shifted to perennials

- Reforestation is needed to meet climate and watershed protection goals
- Need to integrate reforestation practices into the ag landscape as well, since the climate benefits are more long-term and quantifiable. Shelterbelts, windbreaks, woodlots, silvopasture
- Questions
    - ➢ How do we decide which land is converted back to wetland, prairie, or forest?
    - ➢ How do we compensate individuals whose land is ideal for conversion?

Unknown: the science around soil carbon co-benefits is still developing

- We need more data on how benefits stack
- We could be using more remote sensing - allows for short and long term tracking, examining soil surface conditions, residues amounts, etc.

Missing from Conversation: Less meat, better meat

- We need to reduce demand for meat and move to more crops directly feeding people
- Proponents of grazing sometimes promote 'eating more beef,' but this misrepresents the need to both reduce total beef consumption and shift to more sustainable sources
- This is often a non-starter for ag industry groups
- Well-managed rotational grazing has shown the potential in some studies and on some farms to both reduce emissions and store more carbon than in heavily grazed or beef feedlot systems. This should be further researched for MN.

Need: Not all relevant and willing groups are involved

- Some landowners would be willing to do something about climate change; they may need funding but are open to tree planting and more
- Only 2% of people in rural areas are farmers; only 6% are related to ag professions - they are a meaningful group that wants clean air and water
- We are not leveraging consumers enough to educate them on how they could help shape public policy

Theme: Compensating for environmental co-benefits

- By basing ecosystem services payments by acreage, we are missing adequate compensation for extensive ecosystem services provided on smaller farms.
- We need to get away from per/acre eco markets payments. ESMC is using it during this pilot phase to minimize the risk to the farmer, but their standard program will be outcome-based. Unfortunately, farmers will receive less when paid by the ton. It's hard to sequester more than .3-.5 ton/acre C, so even at $30/ton C it is just $15/acre.

Area 3: Social Co-benefits

Need: There is currently great iniquity in agriculture that extends to farmers' ability to participate in and benefit from carbon markets

- BIPOC farmers may not have good access to information including equity pieces.
- Payments per acre disproportionately favor large landowners and disadvantage young/BIPOC farmers with less acreage
    - It will be difficult to add social co-benefits to an acre-based system
- Small, sustainable farmers may feel that the ecosystem services they provide are not recognized, and in C markets, they don't get credit for practices they are already doing
- Discussion in farmers union about advocating for a carbon bank (within USDA) so that smaller farmers can participate/have lower barrier to entry
- A lot of farmland is owned by elderly widows or by other family members of those who previously farmed, much of that will be sold to very large farms with limited opportunities for new/BIPOC farmers to access it.
- A lack of infrastructure for speciality products and small farmers further limits their ability to implement climate-smart practices and fully participate in carbon markets
    - Small livestock producers need farmland, local processors or mobile abattoirs, connections to markets
    - Some midsize crop farmers have long distances to sale points (e.g. wheat farmers in Southern MN might bring grain 100 miles)
- We should be looking for ways that BIPOC can benefit from other parts of the ecosystem services value chain, including processors and other post-farmgate actors

- Ecosystems are made healthier by diversity, and that includes people. If we don't have diverse people on the land, we don't have diverse practices.

Theme: Conflict between scaling and equity

- The urgency of action creates tension between working with largest landowners (typically incremental changes in corn-soy systems) vs. addressing the full range of opportunities for change including small, transformative, and diversified farms
- We won't create diversity and equity without focusing on smaller producers AND cannot make the biggest difference without larger producers; it must be both/and
- We need both broad in-the-system change and structural change for carbon neutrality
- TNC was working with a lot of smaller farmers when developing ambitious climate goals, but shifted to larger farmers to get most impact
- Programs and transformative visions need to have entry points for different farmers and views, and be designed to both capture scale and support groups that need help

Need: Strategies to bring conventional farmers onboard

- Many conventional farmers think that they are doing more than they are, and see themselves as providing food and stewarding land, regardless of actual outcomes.
- Many farmers are sensitive to new ideas because it can imply that they are doing something wrong or that they will be blamed for poor environmental practices.
- We need people who can understand norms and motivations to communicate and work with farmers, regardless of their own values.
- We need to meet farmers where they are at socially, culturally, and economically
    - Climate change can be divisive, so correct framing and language is key
    - Build trust and communication, then introduce new ideas
    - Acknowledge that new practices might represent a big complication compared to a corn-soy rotation
- We need to address the social risk of change - this is their home and livelihood; if a new crop or system fails, it can affect their standing in the community
- It's not just about education: Many "get it" yet don't see a connection to their life.
- Farmers need to be able to understand the system of payments. It is currently very confusing for farmers to compare different companies.
- Guaranteed market access for new crops would be a strong driver
- It would be good for farmers to collaborate on a national scale to avoid competing
- It is important for farmers to own the data

Questions:

➢ How do we define what social benefits are? Who gets to define them?
    - Access to culturally appropriate foods might be a major social benefit for immigrant farmers, but might not occur to others.
    - Research institutions and the state are not necessarily the best entities to define social benefits.
    - For food crops, increasing nutrition is a health co-benefit; resiliency is an economic co-benefit.

➢ Have any carbon markets explored a subcategory for social benefits?

Area 4: Implementation

Known: There are barriers to implementation, including equity issues

- Payments alone are not enough; land access is key for equity
    - Land access is especially difficult for young BIPOC farmers
- Concern that small regenerative farmers are not going to be treated fairly; their small-scale but transformative impacts won't be recognized and compensated
- Markets don't recognize when the farmer is already doing the work
- Infrastructure to process and market products from small farmers/climate-smart products is lacking in many communities
- Federal cost shares and ag water quality certification work; the issue is achieving them at scale.
- Many farmers want change and more options, but are limited by economic concerns
    - Cover crops are difficult to establish in full-season corn and soy; small grains and canning crops offer larger windows, but may not be as profitable
    - Equipment such as strip-till machinery is critical to facilitate change
- Farmers can be put off by perceived criticism, lack of financial and technical support for new practices, and framings that don't connect to their worldview
- Who will provide funding and knowledge for long-term shifts to new systems? (Such as grain to trees?)

Theme: Limitations and larger GHG context

- A shift to perennials reduces GHG emission, but we need to know more about other practices in between; full scale perennial farming is not currently feasible
- We need row-crop management strategies such as cover crops and limited disturbance, but we ultimately must shift away from row crops for climate benefits
- There is no silver bullet; this will require "silver buckshot"

Theme: Getting industry on board

- Corporations are beginning to accept regenerative agriculture - General Mills and Cargill's efforts have gone well - but it will take time to get them to act.
- Aligning business goals with co-benefit goals works internationally

Need: What should programs and policies deliver?

- For maximum benefits, we need a holistic approach to C markets. Models include:
    - Crop insurance policies
    - Conservation Stewardship Program
    - Minnesota Agricultural Water Quality Certification Program (MAWQCP)
    - Reinvest in Minnesota program took land out of production to create water quality habitats; there was a base payment for one species, more payment for having a diversity of species. The program is in law but was not funded.
    - Some of these also have set asides and pay more for beginning farmers
- Continued support for crops and systems with climate and co-benefits, including Forever Green Initiative crops
- Using MRV, LCA or True Cost Accounting can help convince policymakers that these programs are good investments
- Programs need to have strong standards, maintained over time - there is concern about weak and short-term standards; some are very low bars, like minimal tillage
- Coordination of climate-smart landscape use that considers outcomes beyond yield

- Midwest provides an opportunity to drive innovative policy with community support; a national incubator?
- Any policy will need institutional, community, and funding support
- We need to consider spillover effects of any policy

Breakout Session 3: Integrative dialogue and learning across the four focus areas

After participating in focus-area breakout groups, attendees were put into small groups and asked to keep those discussions in mind and give their most actionable recommendations on:

- Environmental and social co-benefits that should be tracked and monitored
- Carbon and GHG tracking and monitoring
- Policy and market development and incentives

This breakout session mixed participants integratively across the four previous focus areas, generating wide-ranging discussions. In some cases, discussions surfaced particular themes including needs or questions and in other cases small group discussion led to specific recommendations. Responses are organized into Knowns, Needs, Questions, and Recommendations.

Knowns

Current state of private sector

The lack of standardization is problematic, but a government-led regulatory system is not likely to happen soon, and will not be a part of the 2023 Farm Bill. The private sector is stepping in but it is not as equitable of a space. Despite skepticism of corporate sustainability initiatives, the private sector can move faster than policy and is driven by investors seeing climate change as a long-term risk. However, companies are promising carbon benefits beyond what science can confirm right now, and are leaning on modeling instead of testing and sampling. We must also ensure that the private sector bears a fair share of the costs. In Europe many products require carbon labeling; export markets may require it or it could begin here. Many companies are trying to develop a sustainable image in advance of this.

Needs

Increasing consumer engagement and creating value

- Consumers want climate-friendly food but are not necessarily willing to pay
    - We need to create consumer value for climate smart products by reporting the true externalities of food products and communicating stacked benefits
    - Good labeling can help differentiate a product from similarly priced products
    - Some are willing to pay and seek it out - there is already informal insetting occurring

Alternative framings to help motivate climate change action

- Present agriculture as an impacted sector: as a producer of GHG, it must participate in GHG reduction, but will also experience major consequences
- Think about the climate debt as a taxpayer funded bailout - we should be mitigating that cost/risk somehow; a foreign insurance broker mentioned to Jessica Hellman that it won't be long before they won't be financing American agriculture any more, at all

- Framing it as an environmental and economic crisis and being clear about the costs associated with not acting that will trickle down to producers and consumers
- Emphasize water storage and runoff reduction as essential for disaster mitigation
- Appeal to everyone's interests - clean air and water, access to nature; this messaging can appeal to more rural communities and help combat climate politicization
- Make climate adaptations a more baseline concept like sanitation or public health

Research and Monitoring

- Food systems planning as a new area of research to meet climate goals
- Reducing nitrous oxide and methane emissions remain a major concern; we don't fully understand how to do that
- Peat soils are primary emitters in Minnesota and would be a good target for transitioning out of ag, but we don't have a good sense of where they are
- We need similar support for monitoring ecosystem service benefits as we do crop insurance.
- Invest in Forever Green cropping systems that facilitate perennials, cover crops, and other forms of Continuous Living Cover
- Develop sequestration and avoided emissions rates for intensively managed rotational grazing and multi-species cover crops applicable to Minnesota.

Questions

- ➢ Are there approaches to other issues that have worked well and would be transferable to address climate change?
    - Water quality of FGI crops → Climate change benefits of FGI crops
- ➢ Has anyone put forth an investment fund or C market corollary where if you take action in your operations to facilitate C storage or other services you gain benefits for mitigating risks?
- ➢ How will prices be determined? Selling to individuals who are willing to pay premiums for sustainability is different than selling on the open market
- ➢ Who carries the burden of data collection, demonstrating impact, risk? Who owns data from a given farm?
- ➢ What are the key messages to communicate about regenerative and sustainable agriculture? What are the methods?
- ➢ What is the transition point for wide-spread adoption – similar to technology adoption?
- ➢ What is the goal of 21st century agriculture?
    - Robust ecosystem services, not just yield
    - Human food production for regional use over commodities and exports.
- ➢ How could we create a market for social benefits, similar to environmental benefits?
- ➢ How can we target BIPOC farmers with these programs?
- ➢ How can we ensure that people are informed about these programs, especially BIPOC and other emerging farmers?
    - The state often has little or no funding for education/promotion related to these programs and relies on ag and conservation nonprofits to promote them.
- ➢ How can we integrate small to midsize farms that are doing scalable low emission, high C sequestration practices into conversation/marketplace/strategy?
- ➢ How can we ensure fairness to farmers who have already implemented practices with environmental and social co-benefits, and still incentivize new implementation?
- ➢ Are there ways other than payments that farms can benefit from changing practices? For example, some small farms might benefit from their direct to consumer markets.

Recommendations

Design programs to benefit both small and large farms

- Create programs that equitably benefit smaller farms and early adopters and include emerging farmers, supporting diversity in agriculture
    - Make programs more impact- or practice-based, rather than per-acre
        - Could use a point system to scale size of operation and practices (such as trees added) that is tied to direct payments to farmers
    - Incentivize different production in different ways
    - Payment caps (They are achievable and do work: Land Stewardship Project advocated for a cap on cover crop acreage payments – most were going to sugar beet producers)
    - Offer incentives for BIPOC and young farmers to sign up
    - Have payments for different types of land (e.g. marginal)
    - Recognize different types of benefits
    - In designing programs, Include people who traditionally weren't listened to about farming policies and programs.
- Keep monitoring role off farmers - it places an unfair burden on small farms especially
- Provide more support for accessing grower support programs
- Include local processing and markets in development plans to address the lack of infrastructure facing small farmers and livestock producers, to facilitate their full participation in the food system and carbon markets
    - More sale points for crops; mobile abattoirs/local processors for livestock

Address land access for emerging farmers

- Testing land access models will require significant investment; could be done through partnership between institutions, non-profits, state and federal governments
- Farm Bill programs can be expanded to support both land access and carbon tracking for emerging farmers, but we need more engagement in shaping them
- Strategies to increase access could include:
    - Co-operative farming
    - Generational transfer opportunities - supporting sales of land from elderly/retirees to new/BIPOC farmers rather than large farmers
    - Zoning law changes could support land access; they tend to be fairly local and thus could potentially be changed with a relatively small group of people
    - Conservation and farmland easements supported by state and federal governments
    - Making state and federally-owned land available to emerging farmers
    - Policies like a tax advantage or a long-term lease or land transfer
- Models
    - Native Farm Bill Coalition and Native Agriculture fund. They have a report on needed infrastructure changes to support indigenous food systems around the country, including locations and dollar amounts. A similar report for MN could be very helpful.
    - The Hmong American Farmers Association is a good model of shared land use

Engage farmers to shape policy and implement practices

- Seek producer input on how to tie policy ideas to an incentive system
- Use trusted sources of information
    - Crop consultants and co-op dealers are the most trusted sources

    - Peer networks with farmer-led learning and sharing also work
    - Explore possibilities with Marbleseed, Extension, and Practical Farmers of Iowa
- Ensure an appropriate/impactful level of direct support to farmers for optimal program adoption - cost-sharing and incentivizing are effective
- The US has an older farming population; we need to involve younger farmers
- Farmers are not a homogenous group. Find out what is relevant to different groups:
    - Early adopters and retirees may have higher risk tolerance
    - Farmers in watershed are more attracted to regenerative practices
    - Payments or incentives may be a deciding factor
- Reach out to landowners who share values around conservation
    - Absentee landowners may or may not care about practices
    - Consider renter-landlord dynamics and opportunities for landowner to encourage practices
- Don't assume that farmers will take on responsibility for public goods out of the goodness of their hearts (though some will)
    - Avoid values conversations and liberal, environmentalist framings
    - Connecting it to finances, profit margin, diversification, quality of life and new market opportunities can encourage alternative crops and practices
    - Emphasize resilience to extreme weather and market fluctuations
- Find ways to increase community support and reduce the social risk
- Create a transformational narrative around food and ecosystem services that helps farmers see themselves as a part of positive change and is welcoming to a broad spectrum of people
- Farmers need to be involved in the primary objective of GHG reduction and made aware of the costs of climate disaster and market destabilization
- Winter annuals can be helpful in reducing soil erosion, since they are in place from April to June when the soil is most vulnerable to erosion.

Programs and Policy

- Requiring reporting on these topics: it triggers meetings and brings the topic into focus. Reporting is a way to make systems change from within using bureaucratic tools
- Include resilience in crop insurance terms - the government already pays for crop insurance, recognizing farm performance in the form of yield, but not resilience
- Work through existing programs, such as crop insurance policy changes, tax rebates, or property tax increases for failure to implement
- Provide transition payments to help growers shift to climate-smart systems, similar to organic transition payments; some growers are waiting for this kind of assurance
- A user-centered design could tie practices to payments, supporting producers at any scale to make decisions based on their land and cropping systems
- A more streamlined, standardized approach would improve adoption
- A Freedom to Farm Act could allow farmers to grow other things with the same security as commodity crops; farmers have lost many options in the current system
- Incentivize short-season summer crops that are more compatible with winter annuals and other cover crops
- Provide additional payments for restoring marginal lands to healthy soils; otherwise, these lands emit more because farmers plant corn/soybean and fertilize heavily
- Shift policy from a focus on pernamance to one of "dynamic persistence" - permanence is based on an industrialized way of understanding ecosystem complexity and dynamics. It needs updating to reflect the biological realities of carbon.

- Many current programs and policies are incremental. Ultimately, we need radical change to protect the biosphere.

Breakout Session 4: Where do we go from here? Ideas for integrative recommendations across the four focus areas

For this session, attendees were organized back into the same small groups as session 2 (grouped by the four focus areas) and asked to discuss actionable recommendations that could be shared with policy groups and lawmakers: "*Following this workshop we will co-write a set of recommendations for state lawmakers and potentially other audiences. In your group, focus on moving to solutions to recommend now*."

Each group was asked to offer, for their topic area, thoughts on:

1. Top three most actionable recommendations
2. Most important aspects to measure
3. How to scale equitably to get to the change we need ASAP
4. Biggest challenges and tensions you're hearing across the breakouts

The understanding tracking and monitoring group was also asked:

1. What balance is needed between direct measurements vs. monitoring and modeling?
2. What resources and/or programs already exist to get us to your recommendations?

The following background assumptions led into this breakout:
Immediate action is essential. Knowledge is incomplete but we cannot wait; we must find ways to move forward in the face of uncertainty. State and federal action may lag, but there is money moving through the private sector and it is currently leading the way. There is a need for large-scale and local planning. Land access and differences in farm size and type present major obstacles to equity in participating in carbon and co-benefit markets.

The recommendations related to each of the four focus areas are documented below.

Area 1: Tracking and monitoring - Top Recommendations

1. **Ensure standardization and transparency in tracking and modeling**
    a. Build accessible databases with long-term, site-specific GHG emission data
    b. Standardization must still recognize the diversity of geology, crop types, farm size, proxy vs farm-scale data
    c. Allow for comparison and verification to help reduce greenwashing
    d. We must address methane and nitrous oxide emissions in addition to carbon
2. **Make tracking practically and financially accessible to growers and landowners**
    a. Invest in education and county-level positions (e.g. USDA, NRCS, extension) that are devoted to providing growers support (organize data, provide education) in tracking and monitoring GHG and SOC dynamics on their land
    b. Added research to make standardized tracking of carbon and ecosystem services more user-friendly for farm level monitoring.

c. Continued/increased investment in county-level resources for soil testing
d. Meet people at their levels in terms of values and culture and appropriate for different audiences, e.g, absentee landowners

3. **Fund incentive structures and farmer compensation**
    a. Develop and fund a national researcher/farmer monitoring partnership program to build a database for model parameterization, validation, and verification
    b. Demand more funding from USDA and MN legislature
    c. Compensate farmers for data collection and monitoring *in addition to* payments for implementing practices and carbon/ecosystem services
    d. Use the Farm Bill as a policy and funding tool
4. **Fund research**
    a. Fund more research station experiments (diverse in geography and cropping rotations) that support process based modeling to inform soil carbon credits
    b. View benefits of stacking practices as a research priority
5. **Identify key groups and target information to specific groups**
    a. We need elected officials to start acting on this
    b. Absentee landowners may be an important audience to engage; some have shared values around this work and would support it
6. **Support and refine monitoring strategies for maximum accuracy and efficiency**
    a. Remote monitoring of living cover, soil carbon (by drone with ground penetrating capabilities) could be very helpful
    b. Simultaneously monitor "stacked services"/co-benefits even if not all are directly related to GHG mitigation
    c. Build long-term MN-specific modeling capability, county or sub-county level
7. **Consider and address challenges**
    a. Equitable access to markets and programs
    b. Tradeoffs of different monitoring/data systems

Area 2: Environmental co-benefits - Top Recommendations

1. **Clearly connect climate practices with water quality and soil health practices**
    a. Systems like CLC can help with both adaptation and mitigation, resilience + sequestration
    b. Perennials offer possibilities for GHG reduction and soil & water health
2. **Prioritize measuring:**
    a. Soil erosion
    b. Surface and groundwater quality
    c. Habitat production and increased biodiversity
    d. Parameters that can be tied to the market and turned into cash payments
    e. Things that can be certified for producers to increase the value of products.
3. **Account for ecosystem service tradeoffs with GHG reductions**
    a. Environmental co-benefits are often best practices for climate too, but sometimes climate benefits are overestimated.
    b. Cover crops can increase nitrous oxide emissions, negating a carbon benefit
4. **To capture environmental co-benefits, ag carbon programs should:**
    a. Pay for a suite of practices for soil health
    b. Tie resilience to insurance practices

c. Incentivize shorter-season summer crops (small grains, canning crops), since they are easier to implement with cover crops than full-season corn and soy, but economic returns may not be as good
d. Set high, meaningful standards - then branch out to make sure more people are eligible; very low bars like minimal tillage won't be very impactful
e. Be maintained over time
f. Draw from models such as Water Quality Trading and BWSR Wetland Restoration Credits
g. Use diverse strategies to implement co-benefits such as agrovoltaics and prairie and contour strips

5. **Support investment in marketable crops that have both climate and ecosystem service benefits**
    a. Advocate for robust funding for Forever Green crop research including Kernza, winter camelina, hazelnuts, silphium and others
6. **Works towards transformative change**
    a. We need significant transformation of diets, energy production, and consumption to allow for re-wilding of land and prevention of erosion

Area 3: Social co-benefits - Top Recommendations

1. **Engage farmers in an equitable, transparent and culturally appropriate way**
    a. Identify and define social co-benefits for different groups of farmers based on their input
    b. Be clear about what is being measured and ensure that farmers own the data
    c. Use a positive call to action rather than criticism
    d. Use concepts of soil health, erosion reduction, cover crops & winter annuals as diversification and new market strategies as bridges to connect
2. **Policy actions should include:**
    a. Integration of beginner farmer credit (in MN) to federal level agricultural bill
    b. Land access infrastructure piece in bills
    c. Support for small producers through local mills, bakeries, and processors
    d. Program that rewards absentee landowners for lending land to emerging farmers instead of larger farmers expanding their farm
    e. Shift land appraisal concept of corn and soybeans as highest and best use to including other metrics like SOM and ecosystem services
    f. Reporting on land access to see how much more land is being made available to emerging/BIPOC farmers
    g. MDA reporting on integrating social co-benefits in carbon markets, resulting in staff time dedicated, communities engaged, and good information
3. **Use community-level food systems and GHG-reduction planning approaches**
    a. Can use water quality planning and Tribal nation and community food systems and food sovereignty plans as models
4. **Develop a True Cost Accounting Approach**
    a. Set goals that for social equity, landscape-level living cover, and other metrics related to these issues
    b. 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.
    c. Invest in developing longer-term methods to identify and value what is harder to accomplish with current understanding

Area 4: Implementation - Top Recommendations

1. **Focus on practices/GHG sources with high per acre GHG-avoidance rate**
    a. Remove most vulnerable land from production, especially peat soils, former wetlands, and highly erodible lands
        i. Convert to forest or other perennial systems
            1. Main costs are planting and management
        ii. Key challenge is identifying land types and current use, GIS can help
        iii. Easements can help retire land from production
        iv. CRP can help but is also affected by commodity prices
        v. If returns on marginal land are smaller, lower payments needed
    b. Be honest about the limitations of different land uses- where can we realistically reach carbon-neutral?
2. **Address farm size differences and land access barriers to support equity**
    a. Use legislation, cooperatives, and more to work for land access for emerging and BIPOC farmers and prevent consolidation and development
    b. Create separate incentive structures for commodities and specialty crops/small operations, including both per-acre payments and other options such as:
        i. Higher payment for first increment; using 250 acre increments
        ii. Percentages, reverse sliding scales, floors and caps
        iii. Scale-neutral, points-based streamlined program tied to support and payments; MN Ag Water Quality program a great model to build from
    c. Keep the monitoring and reporting burden on the program rather than farmers
    d. Clarify in messaging how land access connects with the climate crisis since emerging farmers may be more likely to use beneficial practices
    e. Design policies to help bring new people to the land, rather than just changing costs/incentives for people who are already there
3. **Identify ways to accelerate the implementation of information into on-farm action and state policymaking**
    a. Use appropriate communication for audiences with different values and cultural norms
    b. Educate consumers about ecosystem services related to food production and how climate change will impact food costs to drive consumer support
    c. Develop education and Researcher/Farmer Partnerships
4. **Design climate-smart incentive programs that:**
    a. Build on existing policies by tying practices to tax rate or crop insurance
    b. Target sites with largest potential impact such at peatlands
    c. Include a temporal component to account for carbon residence time
    d. Leverage the Clean Fuel Standard to incentivize cover crop adoption.
    e. Support farmers during a 3-5 year transition period.
    f. Auto-enrollment could help create a more level playing field
    g. Allow public comments on annual budget recommendations for the governor.
    h. Direct funds to programs with proven success, such as NRCS, state programs
    i. Are flexible in the face of great uncertainties and evolving science
5. **Recognize the limitations of current science and ag carbon as a whole**
    a. Ag carbon sequestration does not negate need for other emissions reduction
    b. We must address methane and nitrous oxide emissions
    c. Measurement of every single field is not necessary or viable, but purely prediction-based is not adequate

Workshop summary

The Ag Carbon Tracking and Monitoring Workshop resulted in an effective convening of diverse stakeholders who contributed thoughtful, well-informed background, promising models as well as gaps in policy and programs, and recommendations for ongoing efforts related to agricultural carbon sequestration. An important shared understanding from participants was the view that 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 and cropping systems and that 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 opportunities and the trend towards consolidation that disadvantages small farms. 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 ultimately, 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 GHG 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.

A hopeful area of ag carbon work is the potential to stack climate benefits with social and environmental co-benefits through practices such as perennial cropping systems and local value chain investments. This area is not without its challenges either, such as the complexity of measuring multiple environmental co-benefits or the difficulty of designing programs to support social benefits.

Finally, 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 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 current dominant, extractive cropping systems, especially when built by and for players with significant existing power in agricultural systems and policy.

Instead, workshop participants hope that markets and policy can be built 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 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.

An important goal of this workshop was to generate written outputs that will be actively used to guide stakeholder action, for policymakers, policy- and farmer-focused NGOs, researchers, and others. At the time of this writing, synthesis teams were convening to work on final outputs, and updates will be provided on where to find the final publications.

Appendices

List of Appendices

A. Ag climate overview Invite
B. Pre and post workshop planning and organizing
C. Catalyst flash talk slides
D. Jamboards
E. Resources shared ahead of the workshop
F. Resources shared by attendees during and after the workshop

Appendix A. Ag Climate Overview Invite

The following invite document was sent to potential attendees.

A collaboration between the University of Minnesota, Soil Carbon LLC, Institute on the Environment, Green Lands Blue Waters, and others.

Carbon Tracking and Monitoring Virtual Workshop
July 19, 2022

Minnesota's agriculture adds an estimated 24% to the state's overall greenhouse gas emissions. This workshop will advance progress toward reduced emissions from Minnesota's agricultural and food systems by generating ideas for systematic tracking and monitoring that includes social and environmental outcomes.

Increasing living cover, reducing disturbance to soils, and building soil health boost resilience to climate impacts and may sequester carbon in the soil. Alongside other strategies such as nutrient/manure management, these could enable agriculture to reduce emissions and may potentially reduce future production costs.

Markets are starting to respond through the creation of carbon markets for paying farmers to implement various carbon sequestering practices, sometimes paying price premiums for regeneratively or "climate friendly" sourced products. Publicly funded incentives are being expanded. If goals 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 in it. However, the agricultural sector has historically excluded or underserved women, young, and Black, Indigenous, and People of Color (BIPOC) farmers. Therefore, including diverse perspectives is essential as we consider sustainability goals and tracking methods that seek to to advance equity.

Register Now!

The workshop is free but we can offer a participant stipend to invitees who are not affiliated with universities, for-profit organizations, or government agencies

Workshop Agenda Overview

9:00 am to 4:30 pm – *ample breaks included*

9:00 a.m. – Opening Catalyst flash talks and warm up conversation

10:40 a.m. – Breakout Session 1: Discussion and commentary around the current scope of MN emissions reduction goals in agriculture and food systems. Are they getting us where we need to go?

11:30 a.m. – Breakout Session 2: A deep dive into 4 focus areas (see descriptions below)

- Area 1: Understanding tracking and monitoring (what we know and gaps)
- Area 2: Environmental co-benefits
- Area 3: Social co-benefits
- Area 4: Implementation

1:15 p.m. – Breakout Session 3: Integrative dialogue and learning across the 4 focus areas *(small groups)*

2:45 p.m. – Breakout Session 4: Where do we go from here? Ideas for integrative recommendations across the 4 focus areas *(same small groups)*

4:00 p.m. – Wrap-up and next steps: Share out plans for synthesis across small group discussion into a set of sharable recommendations

Farmer Tom Cotter showing soybeans planted into cover crop stubble to capture carbon and water *(LSP Photo)*

Brief Background on Workshop Focus Areas

Goals and Needs for Minnesota Agriculture's Greenhouse Gas Reductions

Minnesota's Next Generation Energy Act set goals for GHG reductions across all sectors of the economy of 30% by 2025 and 80% by 2050, compared to 2005. However, the state has only achieved an 8% reduction as described in a 2021 report. In fact, emissions from animal and cropping agriculture increased by 11% through 2018, not including forestry or other land-uses.

While many agricultural climate solutions can result from improving continuous living cover and soil health, the adoption of those practices is not moving fast enough or providing deep enough cuts in emissions to achieve the goals required to avoid dramatic consequences of climate change (see IPCC February 2022 Working Group II report). Furthermore, soil health improvements alone will not achieve the reduction goals set out by the Next Generation Energy Act.

Minnesota lacks goals for the adoption of living cover on good cropland or economically marginal lands. Together with no till, managed rotational grazing, and other nutrient/manure management approaches, such practices can avoid some emissions, potentially sequester carbon, and generate important co-benefits. These practices can also produce environmental benefits in line with Minnesota's existing goals for nitrogen reduction and habitat improvement, benefits which also need to be tracked and better understood. Goals and tracking systems will be needed.

In addition to environmental benefits, there are social benefits to consider for the agricultural sector. Potential benefits from expanded markets include enhanced rural vitality and economic development. Entrepreneurs in food and non-food uses, and tourism may benefit from new products and more diverse landscapes. Valuing the ability for small- and medium-sized farms and agricultural enterprises to thrive, and for emerging young, female, and/or BIPOC farmers to enter and succeed in agriculture are all social co-benefits that could possibly come alongside emissions reductions and other environmental co-benefits. Goals and tracking systems will be needed.

What goals should be set for avoiding emissions and carbon sequestration on "marginal" cropped fields, "good" cropped fields, and livestock operations so that agriculture might achieve net emission reductions of 30% in five to six years? What related goals could advance equitable participation in small- and medium-sized farming and agricultural enterprises, including those led by young, female, and/or BIPOC individuals?

U of M researcher Jake Jungers and farmer Kaleb Anderson talk about Kernza® *(LSP Photo)*

Farmer Ella Robertson says Indigenous food production is "just waiting or us to find it and to breathe life back into it." ***(LSP Photo)***

Farmer Mark Erickson moving fence for managed rotational grazing on rented pasture converted from cropland *(LSP Photo)*

(LSP Photos: used with permission and do not imply endorsement)

Four Focus Areas of Discussion

Goal: To assess progress and recommend next steps toward tracking climate and related equity goals.

Area 1: Understanding tracking and monitoring (what we know and gaps)
Robust metrics developed in a true cost accounting framework will help evaluate baseline status and trend lines from implementing ACS.

Example Workshop Questions:

- How can uncertainty due to measurement, management of practices, and weather perturbations be managed? What are the gaps in our knowledge?
- Do we have the monitoring capability to track changes in land-use and practices, GHG emissions reduction potentials over time and spatially? If not, what is lacking?

Area 2: Tracking other environmental co-benefits
Public gains from landscape-scale adoption of agricultural climate solutions following soil health improvement, nutrient reduction, and other strategies include reduced agricultural runoff, gains in stream water quality, habitat restoration, and net GHG emission reductions from both avoided emissions and carbon storage in the soil.

Example Workshop Questions:

- How can other statewide goals (such as the Minnesota Nutrient Reduction Strategy, drinking water standards for nitrogen, watershed protection and restoration plans, and habitat goals such as the Minnesota Prairie Plan) be included in a tracking system?
- How are incentives allocated for stacked benefits?

Area 3: Tracking social co-benefits
The ability for small- and medium-sized farms and agricultural enterprises to thrive, including for emerging young, female, and/or BIPOC people, as well as larger farms and businesses, are potential social co-benefits from ACS. Farming offers a powerful path to build community wealth and resilience to challenges such as water pollution, droughts and floods, and lack of access to healthy food. However, many obstacles exist for smaller operations and emerging farmers. Challenges include how to invest in these historically underserved communities, and build community among farmers and other people in rural communities.

Example Workshop Questions:

- What are current system inequities and how might various GHG and co-benefit goals lead to further inequities or help advance equity and opportunity?
- Some farmers may be left out of government programs in practice; Who benefits most from these programs and who does the state intend to benefit?
- Who and what needs to be included in markets and policies to create equity for underserved people?

Area 4: Implementation of tracking, programs, and markets
The Legislature and agencies will be examining the broad recommendations from the Governor's Climate Sub-cabinet and developing implementation steps. Corporations are moving quickly in the carbon payments arena. Ideas for rapid expansion of incentives and technical assistance for soil health building are emerging.

Example Workshop Questions:

- What are the current directions of payment system development? What is missing, what is working, what is needed for the next generation?
- What levels of public incentives, technical assistance, support for market development, and research are needed?
- Who or what agency(s) or group(s) would set landscape-level and equity goals, as well as develop and administer more systematized tracking?

Tools to Achieve Outcomes

Through this workshop we are offering an opportunity to: (1) Explicitly set out intentions on what we value; and (2) Advance a more systematized approach to measure and monitor progress in what we value. This project is designed to consider both the technical and the social metrics, the interplay between them, and propose ways to implement such a systematized approach. Two broad methodologies offer limitations and promise when assessing natural and social capital.

- Social capital includes relationships and social networks, as well as the social norms and values that shape behavior.
- Natural capital includes the air, water, soil, geology, ecosystems and creatures that provide us with the building blocks of all other forms of capital.

Negative (and sometimes positive) impacts of production on natural and social capital are typically not included in the direct cost of a product. Methods of tracking impacts and progress toward goals include Life Cycle Assessment (a framework for considering the impact of a production system) and True Cost Accounting (an emerging body of research and applications to understand more about the scale and nature of these external impacts). Both of these frameworks have advantages and disadvantages. There is no one agreed upon framework, scientific consensus is lacking on aspects of the systems, and data is missing for aspects of the systems that would allow full quantification or assessment in only one framework. It necessarily involves examining trade-offs, e.g., from maximizing production or soil carbon sequestration in relation to water quality. Unintended consequences need to be anticipated, if possible. Therefore, we propose multiple frameworks for analysis.

Organized by:
- Jessica Gutknecht and Zachary Buell: Department of Soil Water and Climate, U of M
- George Boody: Soil Carbon LLC
- Peter Ciborowski: Retired from Minnesota Pollution Control Agency and Minnesota state government
- Colin Cureton: Department of Agronomy and Plant Genetics, U of M
- Joel Tallaksen: West Central Research and Outreach Center, U of M
- Jennifer Schmitt and Kimberly Long: Institute on the Environment, U of M

With assistance from Erin Meier and Aaron Reser: Green Lands Blue Waters

This project was supported by a joint award for an Impact Goal Grant from the Agricultural Climate Solutions workshop, which was supported by the University of Minnesota's Institute on the Environment and the McKnight Foundation.

Appendix B. Notes on workshop planning and organizing

Notes on the organizing approach taken while planning this workshop.

While not everything can or should be measured or considered in monetary terms, it is also true that we value what we measure and give voice to. Therefore, it is essential that diverse voices involved in MN farming and food help construct what and how we measure, and what and how monetary value is assigned to “climate solutions” and other co-benefits. Over time, tracking should illuminate progress toward addressing disparities by race, gender, and farm size as to who has stable, affordable, and secure access to MN farmland, and gets paid for climate solutions and other co-benefits in addition to or in lieu of market prices for products.

Through grant funding from IonE, the Steering Team, listed below, guided the development of the workshop by refining its purpose, determining the focal areas, and planning for post-workshop synthesis. Organizers engaged nine people, affiliated with BIPOC-led organizations and agencies, in conversations about the project. We heard that while this effort could be useful to them, it wasn’t necessarily closely aligned with their work. We received helpful feedback on drafts that were subsequently incorporated into planning and invite materials for April 2022 distribution. An extensive list of background references for each of the four workshop focal areas and overall workshop topics covered by catalyst presenters was assembled and provided to invitees. Five catalyst presenters were identified and recruited to make presentations. The invitee list grew to about 140 people 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. An effort was made to invite at least 25% BIPOC individuals. A total of about 47 people registered and were asked to rank interest in focal areas upon registration. They were then assigned into focal area groups of up to eight or so people based on their preferences and achieving a balance among focal areas. Moderators and note-takers were pre-identified and provided guidance. This post workshop discussion summary along with background materials will inform the next phase of synthesis and outputs. which workshop participants could volunteer to support these additional initiatives.

Workshop Steering Team

- Jessica Gutknecht and Zachary Buell: Department of Soil Water and Climate, U of M
- George Boody: Soil Carbon LLC
- Peter Ciborowski: Retired from Minnesota Pollution Control Agency and Minnesota state government
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With assistance from Erin Meier, Aaron Reser and Evelyn Reilly: Green Lands Blue Waters

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Appendix C. Catalyst Flash Talk Slides

The slides from the Catalyst Flash talks shared with organizers are below.

Tracking and Monitoring Ag Management Impacts on Soil Carbon

Joel Tallaksen
West Central Research and Outreach Center

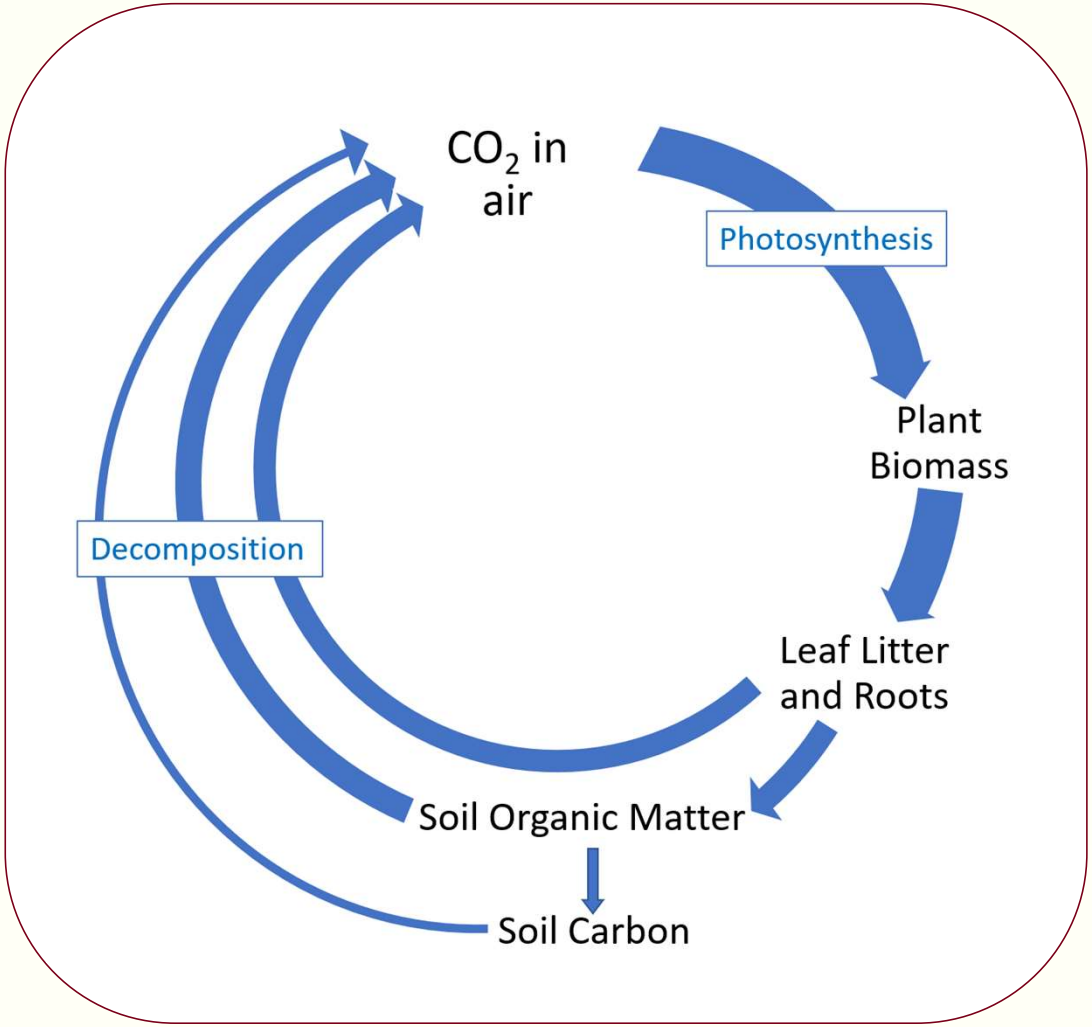
UNIVERSITY OF MINNESOTA
Driven to Discover®

Soil Carbon Overview

The Carbon Cycle and Soil Building

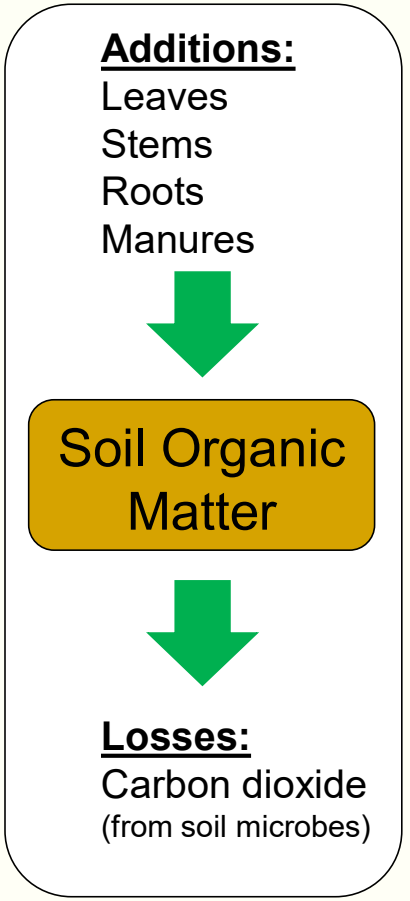
- Plants take up CO_2 from air
- Carbon is added to plant tissues
- Plant leaves, stems, and roots die and become part of the soil organic matter
- Most of the soil organic matter will decompose and release CO_2 back to the air

- Dynamic process that temporarily store atmospheric carbon in the soil



Good Management Increases Soil Organic Matter

- Addition of root and shoot biomass to the soil
  - Cover crops
  - Leaving residues on the field
  - Planting crops that produce more residues and roots
  - Manure addition
- Reduction in soil disturbances to reduce losses
  - No till crop systems
  - Perennials
  - Selecting the least impactful operations to get the job done
  - Reduced erosion



Understanding Soil Carbon Changes

- The soil carbon cycle is driven by micro-organisms

Soil decomposition by micro-organisms is changed by their environment

Oxygen levels	Existing carbon
Moisture levels	Climate
Soil Nutrients	Existing carbon
Soil Texture	Soil depth
Other crops in the rotation	Treatment depths, intensities

Difficult to estimate how a particular management treatment might work

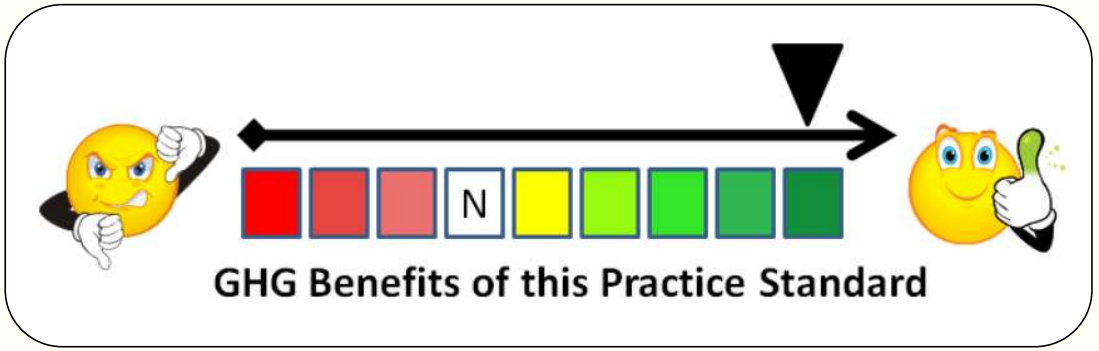
Estimating Carbon Change at Field Level

Estimation Method	Accuracy	Effort	Expense
Modeling	Varies	Varies	Inexpensive
National/Regional Av.	Very Inaccurate	Easy	Cheap
Direct Measuring	Accurate	Harder	Expensive

More accurate, easy to use models can be built with more field measurements

GHG Reductions by Management Method

- Direct management comparison can't really be made because
  - Each farm and field is so different
- General comparisons are more reasonable at this time
- Relative changes in carbon due to management are more realistic
- NRCS rates ag GHG management categories using this graphic:

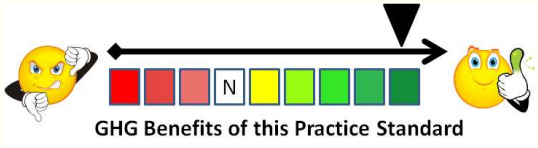


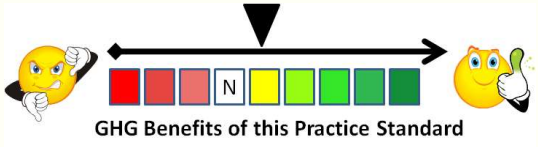
General Management Reduction Potentials

Management Options
Silvopasture Establishment
Forage and Biomass Planting
Contour Buffer Strips
Vegetative Barrier
Riparian Herbaceous Cover
Herbaceous Wind Barriers
Residue and Tillage Management, Ridge Till
Solid/Liquid Waste Separation Facility
Residue Management, Seasonal
Filter Strip

From NRCS online guide

Relative Rating



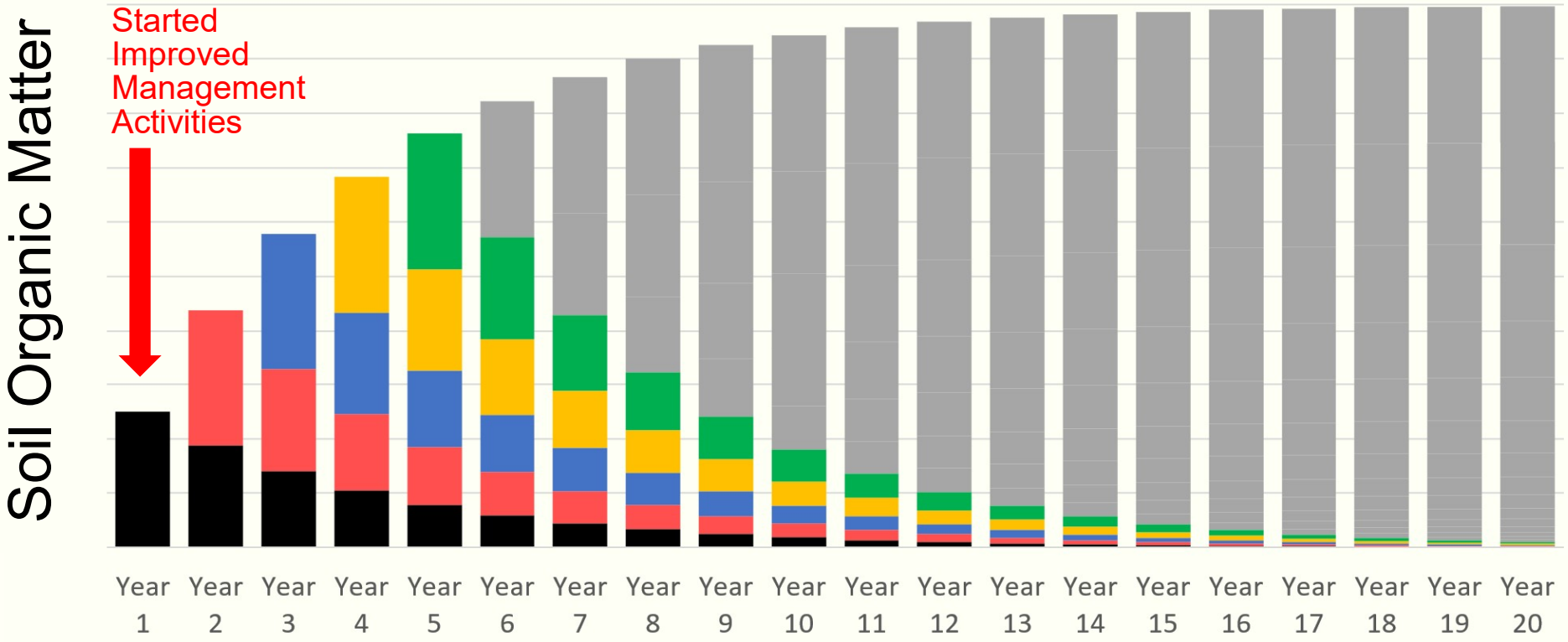


Other GHG Considerations

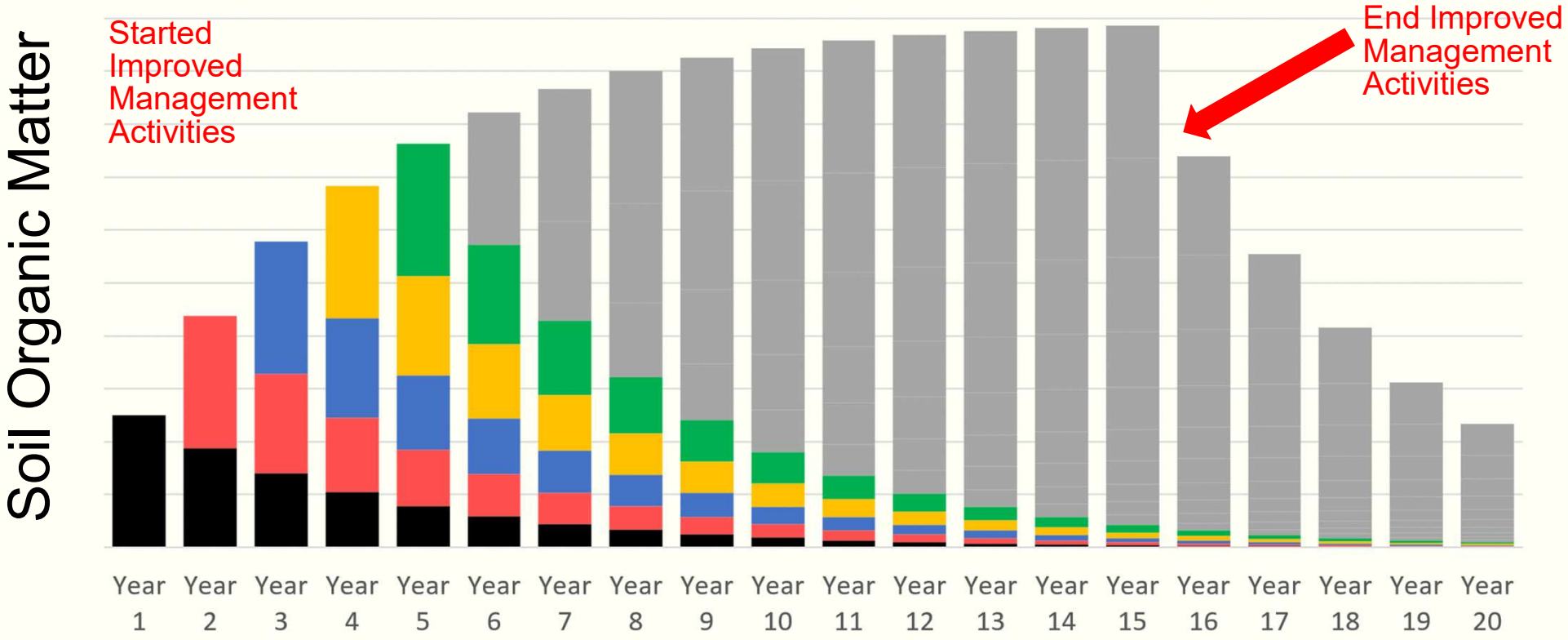
- The Nitrogen Cycle is also impacted by management
  - N_2O (nitrogen monoxide) is a potent greenhouse gas
    - Roughly 290 times more impact on climate than CO_2

- The issue of permanence of soil carbon changes
  - Soil organic matter only temporarily stores carbon
  - The pool of organic matter is replenished every year
  - Failure to promote that replenishment will lead to loss of carbon

Soil Carbon Increases Are Not Permanent



Soil Carbon Increases Are Not Permanent



Final Thoughts

- Implementing good farm management is important even if we can't give highly accurate carbon predictions. It is better than doing nothing while waiting.

Promotes Resilient Soils

- Increased drought and water tolerance
- Increased ability to retail soil nutrients
- Overall increase in productivity

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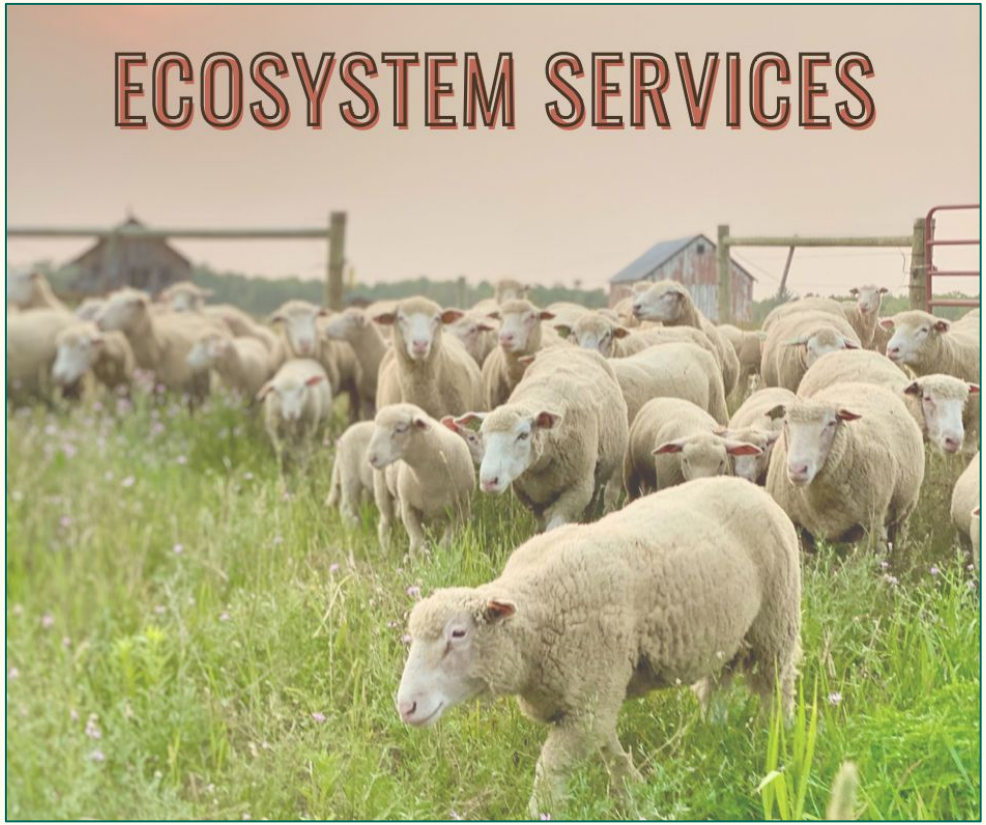
UNIVERSITY OF MINNESOTA
Driven to Discover®

NRCS rating for activities

- https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/air/quality/?cid=stelprdb1044982



MEDICINE CREEK FARM

Hannah Bernhardt

Carbon Tracking & Monitoring Workshop

July 19, 2022

sustainable farming association

sfa

FARMER-TO-FARMER NETWORK

CLIMATE LAND LEADERS™

PRACTICAL FARMERS of Iowa

LAND STEWARDSHIP PROJECT

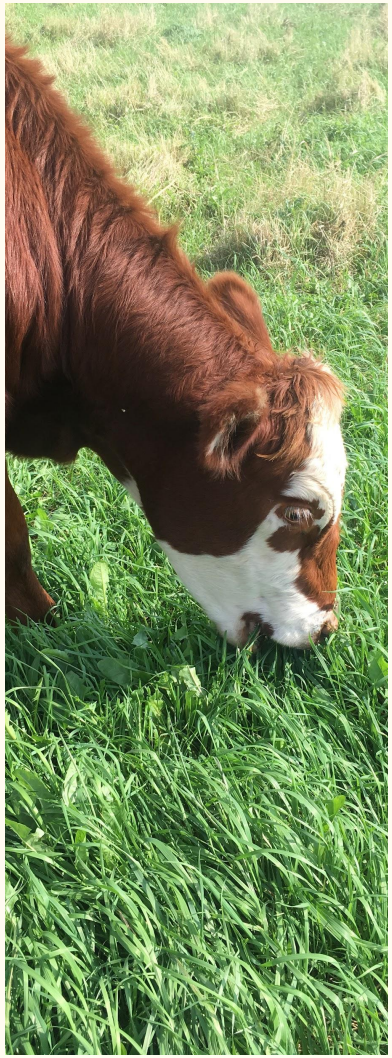
MOSES

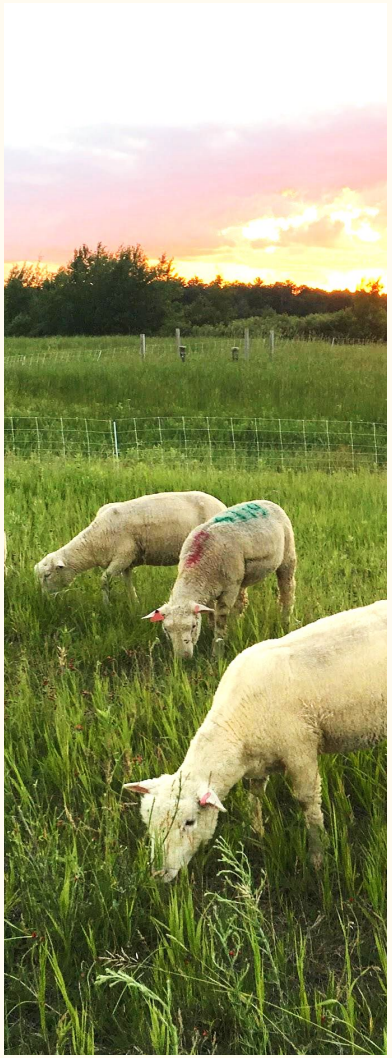
Midwest Organic & Sustainable Education Service

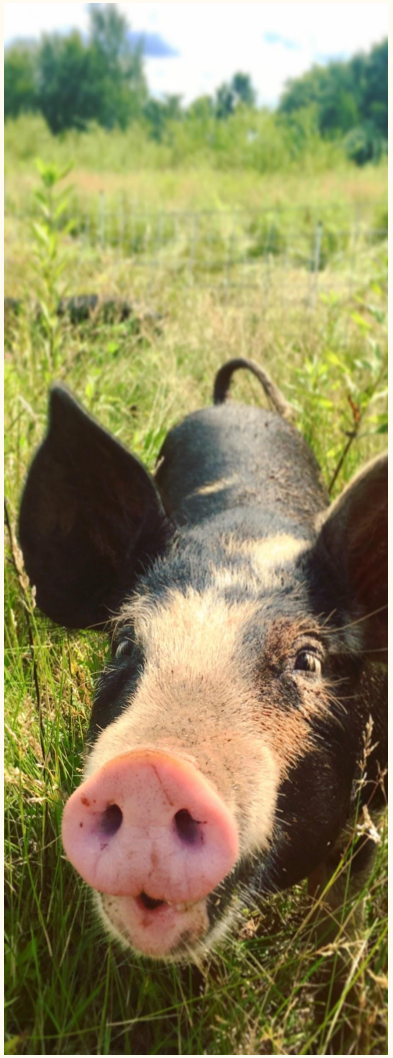
KISS the GROUND

Farmland Program

April 2015 - Finlayson, MN







Grass Fed Beef
and Lamb
Pastured Pork

and
livestock guardian dogs
agritourism/farmstays

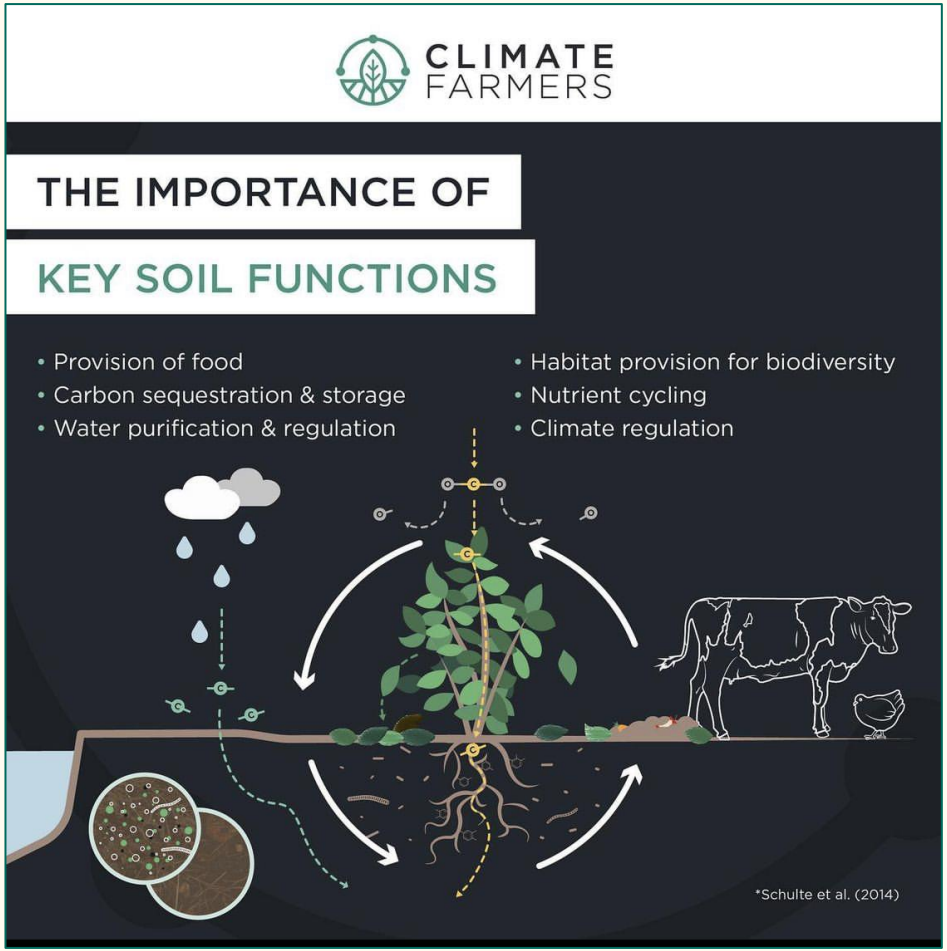
REGENERATIVE AGRICULTURE

Managed Rotational Grazing

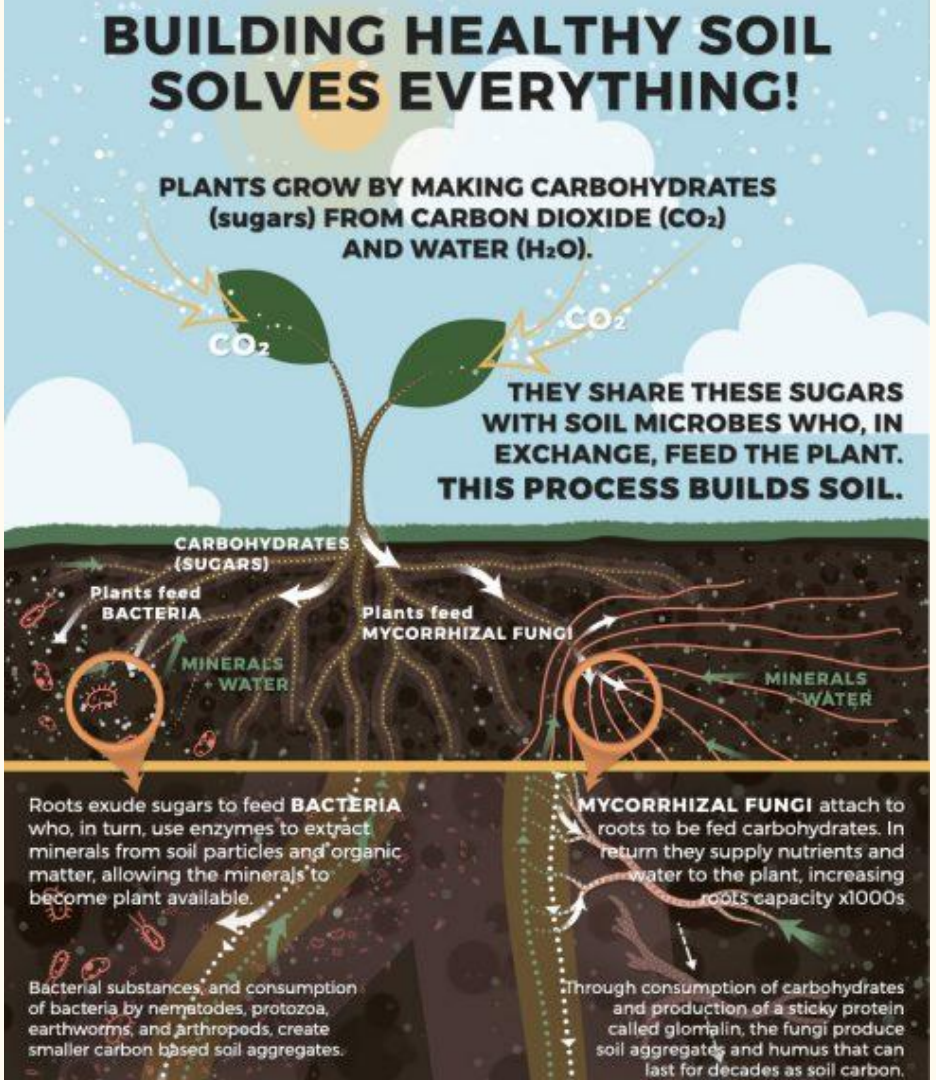
ECOSYSTEM SERVICES

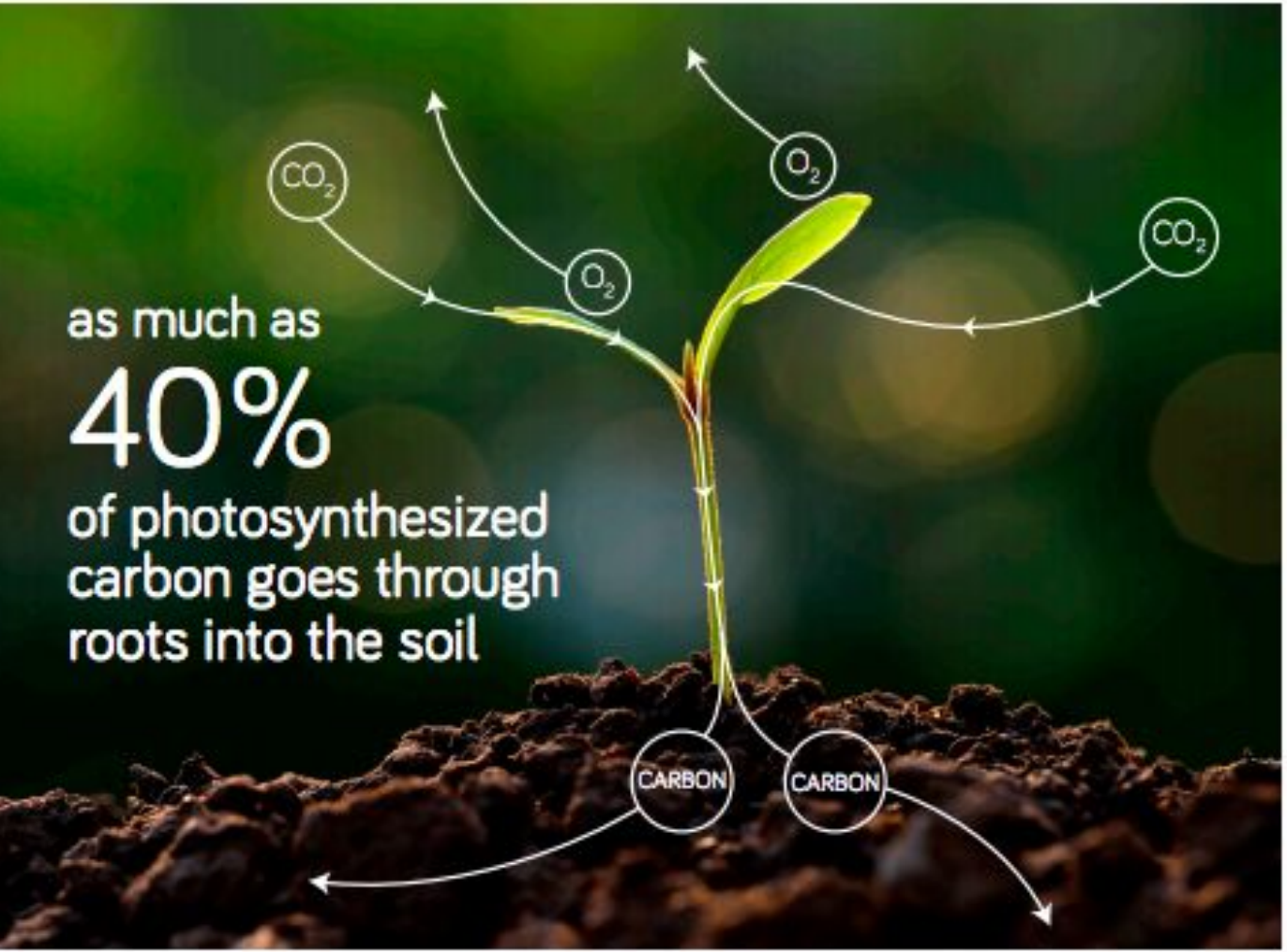
Ecosystem Services

- Carbon Cycling
- Nutrient cycling
- Water cycling
- Air quality
- Biological Diversity



Carbon Cycling

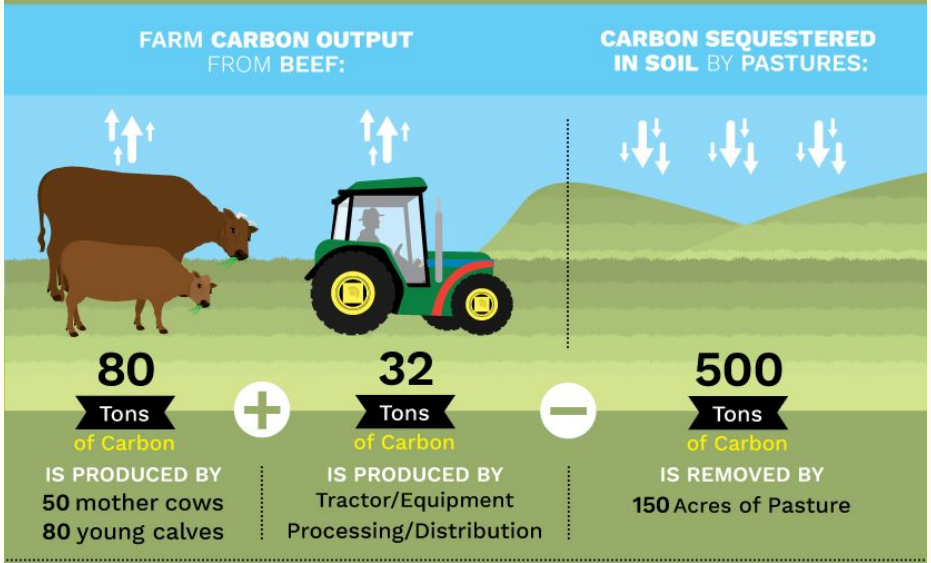




The process that actually removes CO_2 from atmospheric circulation is photosynthesis.

- Christine Jones, Soil Ecologist

GRASS-FED BEEF
THE CARBON FARMPRINT



Total Output

112 Tons of Carbon

Total Sequestration

500 Tons of Carbon

NUTRIENT CYCLING

Soil health =
Animal/Plant health=
Human health

Water Cycling

CLIMATE FARMERS

Clean Air

BIOLOGICAL DIVERSITY

Biodiversity Creates Healthy Ecosystems

Healthy Ecosystems Provide Ecosystem Services*

Ecosystem Services Help Keep Us Alive!

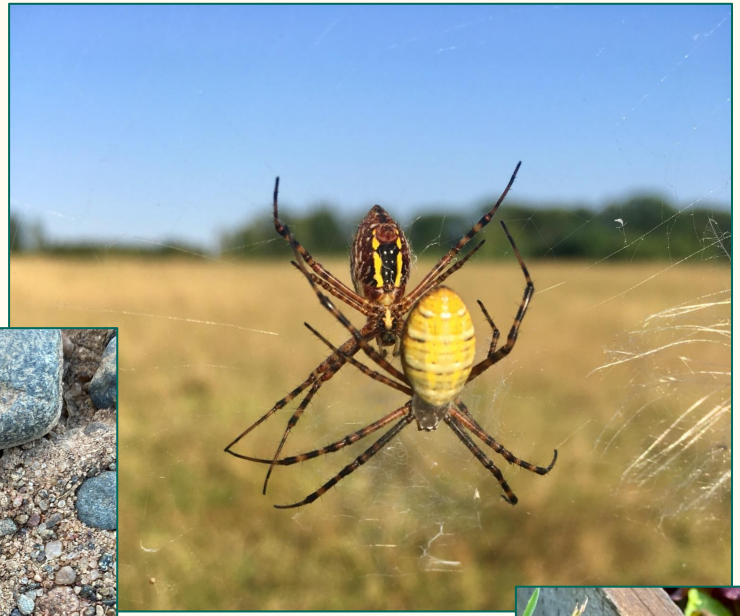
*Ecosystem Services = clean air, clean water, pollination, carbon storage, etc.

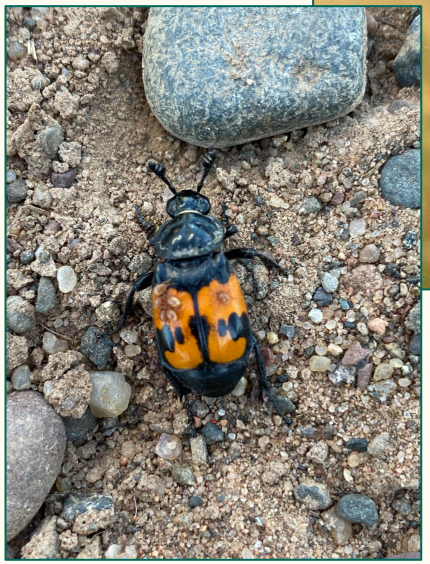
Bird Habitat

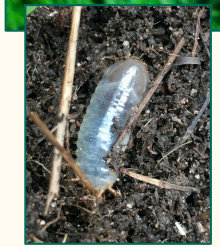
Pollinator Habitat

XERCES SOCIETY
for Invertebrate Conservation

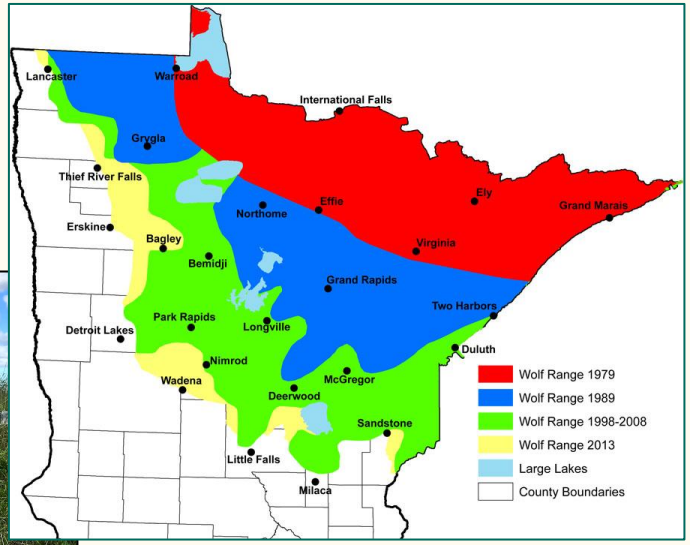
Ecological Diversity



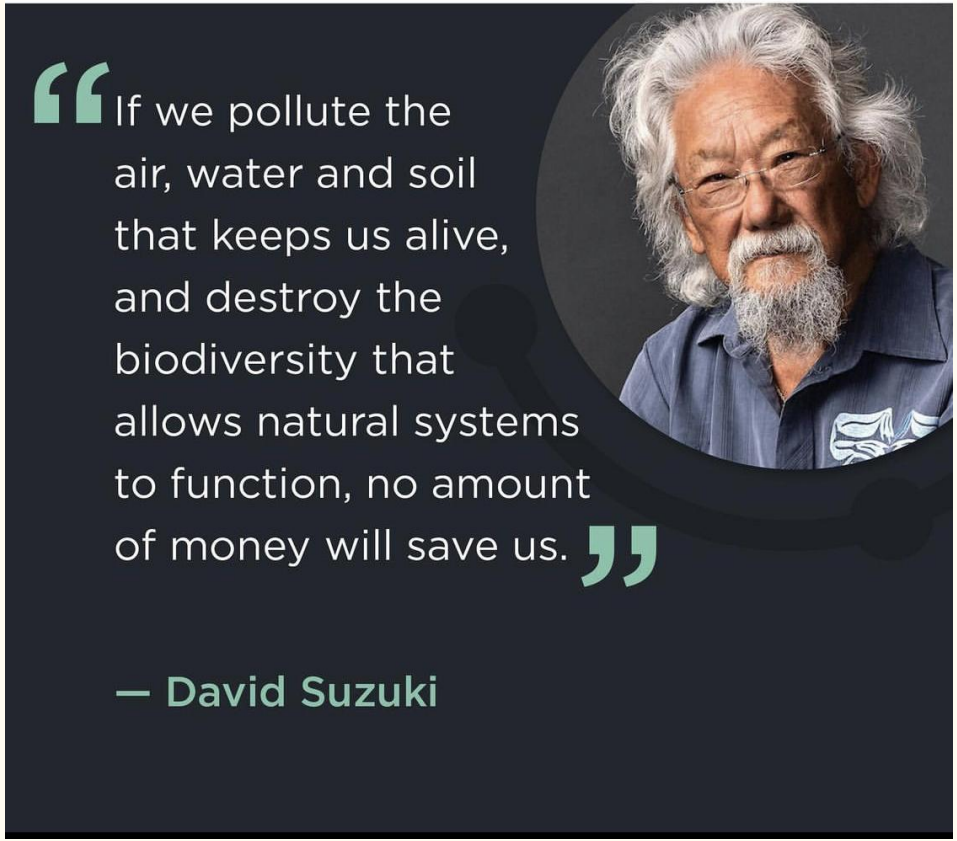




Predator Habitat



CLIMATE FARMERS



MEDICINE CREEK FARM

www.medicinecreekfarm.com

grass fed beef and lamb
pastured pork

Hannah Bernhardt & Jason Misik

hannah@medicinecreekfarm.com
Hannah: 612-483-5121
Jason: 262-758-1061

Finlayson, MN

Appendix D. Jamboards

PDFs of the Jamboard activity are available below.

FARMER AND EQUITY-RELATED THEMES (1 of 2)

farmer compensation

Returns on investment - not as clear as it looks. Corn is rarely profitable. Margins razor thin even on big farms.

Farmers are not necessarily calculating profitability (which could include things like "decreased input costs") so much as yield acre by acre

What is considered productive? can vary with different cultural understanding

Pay farmers an equitable amount up-front, then engage in markets later

Private sector is highly confusing for farmers - many are waiting on sidelines while things are sorted out

an important way to get smaller farms to be competitive and be compensated for their work is health insurance.

cost share for transitions ? cost so low to provide incentive. look into establishing things like rye -- $200/acre!!

balancing different scales & practice types

create entry points for farmers at all scales with all types of operations

need both incremental change within the existing system AND long-term transformative change

Many farmers believe they are already doing what they need to do. We need to work within existing system, but also think about who is going to own that land in the future and what it will look like.

How do we consider easy entry points in the existing commodity framework versus promoting systems change?

Connecting row crop farmers and livestock producers can help support greater integration and more regenerative practices

Often ignore smaller farmers that are leading with ecosystem service improvement and coddle larger corn/soy farmers to do anything.

Cooperative models on east coast for smaller acreages

Inputs and outputs for small farmers? nontraditional/"unconventional" crops, livestock, growing methods?

Balancing for a diversity of farms when have lots of similar farms and focusing on those might yield larger benefits is a struggle.

FARMER AND EQUITY-RELATED THEMES (2 of 2)

emerging farmers & equity considerations

Land access big barrier for underserved farmers

Huge challenges for emerging farmers (and even established ones!) to navigate the agricultural support system (federal and state)

Programs and incentives not currently inclusive to entire farming community

EQUITY AND DIVERSITY: the main participants in C markets are big farms, white farms. NORI has 1 alfalfa farm, 1 female farmer. Needs to be better.

Water quality programs may also not have been distributed equitably (BWSR point of view), needs intention to make that happen. More front and center in the granting process would help.

Key equity question -- equitable access to emerging markets.

The economic uncertainties of new cropping systems makes for higher risk which may be a burden for emerging farmers

Farmers with smaller holderings may be more flexible and emerging farmers could be leverage point for change.

Research showing that who farms affects how land is farmed & what markets are engaged. leads to bigger Q of land reform (redistribution? "land back"?) to open opps for new/emerging farmers

Look for how women land owners could be targeted as a way to gain leverage in driving change in cropping practices on the land they rent out.

farmer adoption & implementation

Risk of making change! That's the big barrier.

Need resources and information to get out to farms, small operations

How can we facilitate these shifts by making growers feel supported in adopting new practices and agricultural systems?

Many benefits not quantified -- how can farmers invest in them when already strapped for cash?

Having good land owners and not having to bid in open market on the rental agreement.

non-operator land ownership/corporate land ownership (specific extension and outreach to this population? programs/education around renting to beginning farmers?)

TRACKING & MONITORING (1 of 3)

goal setting & prioritization

Are current goals enough in terms of the level of emissions reduction or carbon sequestration?

need to define land "quality"

What are the biggest wedges? (Nitrogen fertilizer, grain-drying, tractor fuels, other inputs)

Could/should ag emissions be offset from other sectors?

Ecosystem service lit often reports impact in calories per GHG output; more accurate measure would be in human calories per output. Redefining agricultural yields: from tonnes to ppl nourished per hectare

estimate that we need to shift 7.5 million acres

What is the focus and what do you report on, because that drives programs and staff allocation.

Or should we collectively figure out how to zero out Ag related emissions?

Emissions as a point system, consistent no matter the scale - rather than focusing on tonnage

Soil erosion is a major factor that is often not considered in climate change impacts

TRACKING & MONITORING (2 of 3)

tracking & monitoring challenges/considerations

Monitoring GHG on small diverse farms is harder than measuring it on relatively homogenous row crop fields.

Marketplace is practice focused, Assessment is analysis based

Sequestration potential/rates are pretty well understood - Impermanence is big question

Do we need to consider marginal land and prime farmland differently?

Flux (seasonal, climate, etc.) and inconsistencies are major characteristics of ag systems that need to be accounted for

Problems with insetting and avoiding double-counting.

Acreage and output are prioritized - results in neglect of smaller systems - One 20 acre farm is useless to Indigo/NORI

input consideration & reducing N20

Is there a path toward a broader crediting system that takes N2O and methane into account?

Conversations on ag and climate change must include methane and nitrous oxide

as much of a focus is that the models for emissions are really terrible. We are not really able to make predictions overall or based on different management practices. In part due to the fact that it can happen through multiple pathways

Focusing on regen ag over reduced inputs, but inputs are important

At MDA, N management for crops and drinking water is done well, but there is not much emphasis on the climate impact of N, despite nitrous oxide being agriculture's main GHG

standardization

need federal standards for C markets

Lack of standardization across tracking & monitoring

Unclear how the working lands goals sync with the internationally recognized scientific reduction goals of 45% C by 2030

TRACKING & MONITORING (3 of 3)

farmers & on-farm data

Takeaway - need more on farm measurement

Land owners are looking for on farm measurements, models like comet farm are not motivating to farmers. (so trying things like 1,000 Farms, working with MadAg etc.)

Farmers need to own the data

1000 farm effort - data collection expensive and not asking for much management data so anticipate holes in findings b/c of this.

Working with co-ops. Co-ops can collect data for farmers. But then where to go with it?

equity in tracking & monitoring

In measuring and tracking - how is equity represented in current goals (ex. race, ethnicity, gender, farm size, landowner status)

how do we get new cultural groups bought into MN's carbon goals too?

co-benefits

How to identify best qualities of a given piece of land and incentivize leveraging of those qualities - whether that's food production or ecosystem services (habitat, water storage, flood mitigation, etc.)

Someday Kernza may be a viable crop with higher yields; but for the moment it can be emphasized for other benefits.

MARKET DRIVERS (1 of 2)

carbon & ecosystem services markets

Lack of standardization across carbon/ ecosystem service markets

The legislature is not going to pass more regulation on this; so we are really starting to look more to the market, but regulation of the market will be important.

We thought that the Federal government would create a C market, but that happened in CA and nowhere else.

analogy of NYSE; it started as private and federal regulation came in later. This could work similarly. Federal government priorities have varied based on administration.

There is a lot of attention to what industry wants, but policy should be driven by what consumers want; and consumers want healthy soil, air, and water.

Ecosystem markets - Reduced input costs as an incentive?

MN corn, TNC, Cargill, created program in SW MN to give 30 farmers ability to scale up conservation practices. Cost-share program. Other commodities providing in kind support (beef & pork).

Ecosystem markets -Do startup costs scale?

There are many barriers to entry for emerging farmers, but they are often more likely to be using regenerative practices.

Level the playing field - different buyers for carbon credits -- make sure they aren't competing against each other (b/c credit for carbon will be driven down).

Smaller landowners and practices like perennialization, agroforestry, and rotational grazing are neglected

Ecosystem markets - Payments represented right now ($20/acre?) enough for small farmers?

Large companies' strong interests in this topic will allow us to leverage multiple co-benefits. Climate is an entry point for public engagement.

MARKET DRIVERS (1 of 2)

ag product markets and supply chains

corporate drivers, corporate/investor accountability, objectives, reporting for their own risk management as well as community/ environmental goals

Focus on finished product - or align with buyers wanting to get the "type" of farming as well as the product.

Transparency on how farming and why. That transparency gets passed along.

Think and support the opportunities for engaging emerging farmers in the full value chain of new crops and markets? What are the supply or utilization and marketing opportunities?

policymakers seem to understanding diversity of landscape = diversity of markets; lots to unravel in established market/supply chains

There is a lack of support for direct marketing in MN. The next big thing is direct marketing food - no shortage in MN of demand/customers for food that delivers these ecosystem services.

use capitalism to drive change; explore state power in this regard?

In animal ag, how do you translate consumer interest back to farmers in an equitable way? Will consumer pay increased food prices for more sustainably-produced food?

from fed'l/international perspective - a big lever continues to be institutional procurement policies driving sustainably raised foods; in a true cost accounting frame - include health outcomes & other

What's the next big thing? (What do consumers want? Cargill is responding to what consumers want.)

Kernza - value of crop itself compensates the farmer (so company would have to buy kernza to get any benefit)

change/redirect markets to shift cropping - away from markets for industrial supply chains - ethanol, high fructose corn syrup, animal feed

Most industrial ag acres go to feeding animals. If consumers switched to more plant-based diet, would reduce # tilled acres. Acres taken out of prod could be allowed to re-wild (re-wilded acres = good carbon sinks!)

STRATEGY (1 of 4)
(framing, strategic tensions, policy & other levers)

framing

Balancing- economics, environment, and expectations

Feels like a social problem, not biological. -- comes down to profits (so an econ problem?)

expected pushback to challenging a model of values

need to emphasize resilience (to extreme weather) as a communication strategy -- rather than 'climate change'

Dealing with politicization of climate change

Yield is a factor -- how are we defining yield? (Right now -- bushels/acre of corn) Should expand in definition to include ecosystem services

we are at hour zero!

Can't just look at acres.

Framing of the issue around climate is backwards; co-benefits should be more central.

"Losing strategy" to siphon everything through a carbon lens -- need to broader the scope of benefits

Climate change needs to become a normal part of the conversation on ecosystem benefits of agriculture

Focus could shift towards water quality and avoided costs/emissions reductions

Decisionmaking up front about "what is the most 'productive' use of this land"? Farmers are managing an immensely complex system and making huge financial bets

Different cultural expectations of "what is beneficial" in different cultural groups

farmers are making tricky decisions like -- -- is retiring this acre from production or growing soy or growing a specialty crop or putting a solar panel on it "best"? Economically? culturally? time management/stress?

Need to balance & bake into policy the yield - impact issues. Transition from yield/output of marketable commodities framework to resilience framework, account for externalities.

STRATEGY (2 of 4)
(framing, strategic tensions, policy & other levers)

big picture considerations

Long-term goals have been widely set with little follow-through

The goals are not enough, but we are falling far short of meeting these goals already.

25% reduction in emissions in the ag sector, transparency in avoidance and reduction is important

There are more and more players, but not necessarily more organization

The goals are more based on what is envisioned as possible not what needs to be done to meet scientific goals

need a statewide approach

integrated framework needs to be maintained in implementation, as articulated in the current state climate action plan; where does this work really sit? and who is responsible for driving it forward?

We need to connect the dots among different climate and water health policy frameworks; how to state actions relate to national and international policies; how do we look at the public and policy goal setting?

be careful that it doesn't get pulled by agenda of one agency or another

We've made food too cheap to fairly compensate costs of production.

Business model is set up to push small farmers out of business

Farmer-led, grassroots action is essential in overall policy strategy

STRATEGY (3 of 4)
(framing, strategic tensions, policy & other levers)

current incenties and opportunities; specific thoughts or recommendations

USDA climate smart commodity $1B announced in next month, results of that will likely set path forward.

What is the next big thing like ethanol? Ethanol can be a part of the climate change solution, but what is the next big thing we have to go after?

Crop insurance is the "invisible hand" that directs current production system -- difficult to turn the battleship

Farm Bureau as an example of org that explicitly is prioritizing climate action

NRCS - costshare programs are working - but need to give higher incentives

CSP - isn't inspiring people to make long term changes.

Local NRCS office, more support, more policing of the programs. They are under sourced/staffed.

Equip - CRP -- impossible problem -- program gets gamed or used for doing the same thing just to get payments.

Targeting restoration of peat lands would have outsized impacts.

note - SEC's Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors; what can MN do at the state level re corporate entities?

Land loss is rampant in all agricultural systems -- if we're losing land, we need to get it to newer farmers rather than losing it to housing development
Concern for productive land being "lost" to solar panels

Are we exporting more corn and soy than we need to? One of the governor's major goals was increasing ag exports. They had to report quarterly on increases in exports.

There was a lot of power in those goals. It is a good time to establish some new goals and what we would want to report on.

STRATEGY (4 of 4)
(framing, strategic tensions, policy & other levers)

balancing strategic tensions

carrot or stick

How do we best get $ on the table? Carrots or sticks?

Goals in Climate Action Framework are great, question is will try to 'voluntary adopt' (unlikely to be effective) or regulate actions counter to these goals- much harder but probably necessary

Currently it's all carrot, no stick in the sense of incentivizing action; there is little emphasis on penalties.

Top-down or bottom-up as better approaches?-Politicall y/policy-wise, top-down isn't working so far

needing to move to sticks rather than so many carrots. emergency responses will continue and so we need to dev impactful policy structure to drive the changes we need

scale - lg conventional or small transformational

Balancing "need to create conditions for small farms" versus "do CAFOs (for example) have better carbon outcomes overall?"

Both impact w/ current commodities and system change will need to be done concurrently.

aspirational vs incremental

Problem of scale -- carbon credits targeted to large commodity farms, not enough incentives for smaller specialty farmers

bigger impact if fewer conventional ag acres; for ex. no till for water quality

Conventional practices need to be more refined, efficient - they aren't going away overnight

timescale

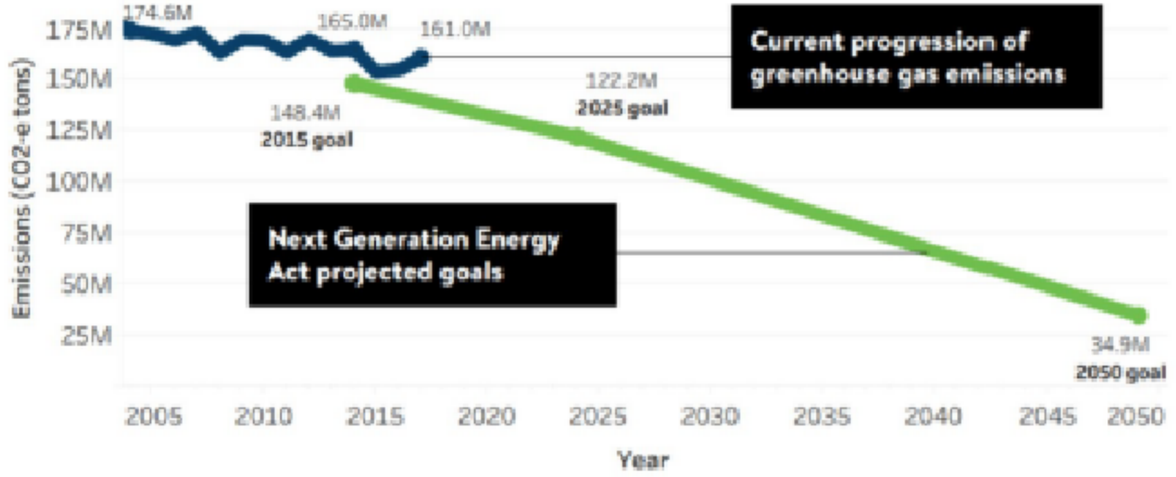
Balance near-term and long-term strategies and programs

Pay attention to timescale - Much of food and ag industry company goals relating to food and ag supply chains are set through 2030, some through 2050 aiming to get to long-term levels

Hello everyone! We were asked for more clarity on MN's reduction goals. Here is a link to the MN Climate Action Framework, see page 12 for a concise summary.
https://drive.google.com/file/d/1n3yIIQnEFp3EiM-lwyP6fERmjy68fU3P/view?usp=sharing

We are not a leader anymore, and not on track.

In 2007, Minnesota was a national leader in climate action with the adoption of the bipartisan Next Generation Energy Act, setting statutory goals to reduce GHG emissions by 15% from 2005 levels by 2015, 30% by 2025, and 80% by 2050. Minnesota missed its goal in 2015, and currently is not on track to meet future goals, either. Since 2005, overall GHG emissions have declined just eight percent.



In Minnesota, the largest sources of GHG emissions are transportation, electricity generation, and agriculture, forestry, and land use. While Minnesota has made important progress towards these goals in some sectors, in particular the electricity generation sector, we must do more to achieve our Next Generation Energy Act goals and reduce our contribution to global climate change.

We've done research and planning, and engaged Minnesotans.

Since the adoption of the Next Generation Energy Act, the state has completed several significant planning and modeling efforts to understand critical opportunities and challenges for reducing GHG emissions and adapting to climate change. The state agencies and the Governor's Advisory Council on Climate Change have engaged Minnesotans from all across the state in conversations about climate challenges and priorities in their communities.

Appendix E. Resources shared ahead of the workshop (linked)

Greenhouse Gas Emission Reduction Goals/Frameworks (MN and others)

Tracking GHG Reduction Potentials

Environmental Co-Benefits

Social Co-Benefits

Implementation

Appendix F. Resources shared in breakout sessions and after the workshop

During the workshop, many participants recommended informational and technical resources, collected here.

Project Drawdown: Farming our way out of the climate crisis
https://drawdown.org/sites/default/files/pdfs/DrawdownPrimer_FoodAgLandUse_Dec2020_01c.pdf
(Table 6.1 is a succinct summary comparing the pros and cons of "Emissions Reduction" vs "Biosequestration" [above ground and below ground])

Available Easement Programs from the Board of Soil and Water Resources
https://bwsr.state.mn.us/what-programs-are-available

MPCA: Water Quality Trading
https://www.pca.state.mn.us/water/water-quality-trading

MPCA: Tracking BMP Progress
https://www.pca.state.mn.us/water/tracking-bmp-progress

Five financial incentives to revive the Gulf of Mexico dead zone and Mississippi basin soils (Tallis et al. 2019). https://www.sciencedirect.com/science/article/pii/S0301479718314051

Redefining agricultural yields: from tonnes to people nourished per hectare (Cassidy et al. 2013).
https://iopscience.iop.org/article/10.1088/1748-9326/8/3/034015

Insetting and corporate initiatives
https://agfundernews.com/as-regenerative-agriculture-takes-root-lets-hold-corporates-accountable

Hmong American Farmers Association
https://www.hmongfarmers.com/

1,000 Farms Initiative - Ecdysis Foundation

https://www.ecdysis.bio/featured-project

Native Farm Bill Coalition and Native Agriculture fund. They have a report on needed infrastructure changes to support indigenous food systems around the country, including locations and dollar amounts.

Developing farmer typologies to inform conservation outreach in agricultural landscapes. Upadhaya, S., Arbuckle Jr, J., & Schulte, L. (2020). Land Use Policy. 101. 10.1016/j.landusepol.2020.105157. https://doi.org/10.1016/j.landusepol.2020.105157

The Farmer's Guide to Climate Markets (A private market contracts analysis product that Minnesota Farmers Union and Farmers Legal Action Group are building with McKnight support and MAWQCP participation - coming later this summer and fall.)

Dynamic Stability of Soil Carbon: Reassessing the "Permanence" of Soil Carbon Sequestration. Dynarski KA, Bossio DA and Scow KM (2020). Frontiers in Environmental Science. 8:514701. doi: 10.3389/fenvs.2020.514701

Shared by Leif Fixen in Flash Talk: "As regenerative agriculture takes root, let's hold corporates accountable."