Challenges to the Ag Carbon Industry

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Farm Foundation Forum
Solving the Barriers to Agricultural Carbon Markets
April 12, 2022

Carbon Credit

- A tradable asset (like a certificate or permit) that gives the buyer the right to offset the emission of GHGs into the atmosphere
- Carbon credits are created when entities reduce their carbon emissions or remove carbon from the atmosphere (compared to a set baseline)
- Typically, each credit represents one metric ton (2,204 pounds) of carbon dioxide or an equivalent amount of another GHG emissions removed or avoided

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Credit Buyers seek:

a. **Additionality**: pay only for new changes in ag practices
b. **Permanence**: long-term removal/avoidance of GHG emissions
c. **Realness**: actual and quantifiable amounts of GHG emission removal/avoidance
d. **Leakage avoidance**: prevent increases in GHG emissions outside of the project area in response to decreases in production within the project area

❖ Challenge: the **quality** of a carbon credit cannot be ascertained by consumers even after consumption ("credence good")

→ **Certification** to verify claims on carbon credits

Measuring, Reporting, and Verification (MRV) Systems

- Robust MRV systems are key to convince buyers that the implemented changes in agricultural practices actually removed carbon from the atmosphere or avoided carbon emissions
- A robust MRV system is a necessary condition for the development of a strong ag carbon market

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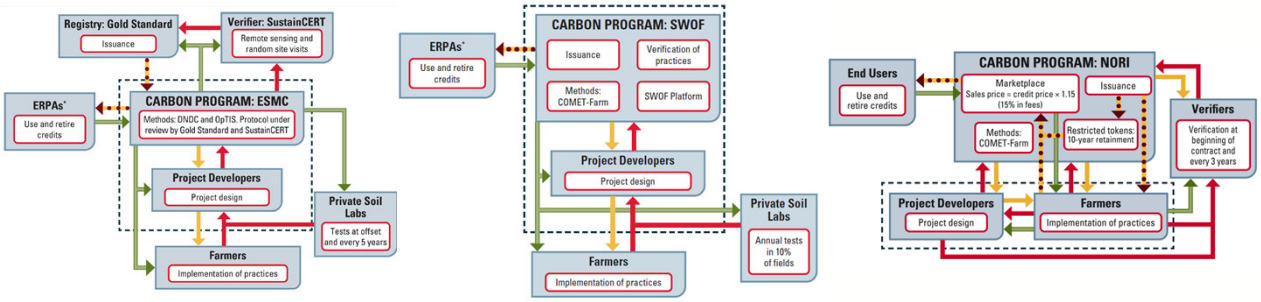
- Lack of consistent and **uniform guidelines** across MRV systems→ high "search costs" for credit buyers



https://www.extension.iastate.edu/agdm/crops/pdf/a1-77.pdf

- Low degree of **independence** between verifiers and carbon programs → could undermine buyers' trust in certification

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- Pledges of carbon neutrality place the target date a decade or more into the future → disconnect between long-term plans and short-, medium-term demand for carbon credits

Microsoft will be carbon negative by 2030

Jan 16, 2020 | Brad Smith - President & Vice Chair

Sustainability

Smithfield Foods to Become Carbon Negative by 2030

Company commits to bold climate action with industry-leading pledge

Wednesday, December 15, 2021 5:05 PM

Kraft Heinz Cements Climate Ambition, Commits to Carbon Neutrality by 2050

FORD COMMITS TO CARBON NEUTRALITY BY 2050

FORD MOTOR COMPANY INTENDS TO ACHIEVE CARBON NEUTRALITY GLOBALLY BY 2050, WHILE SETTING INTERIM TARGETS TO MORE URGENTLY ADDRESS CLIMATE CHANGE CHALLENGES.

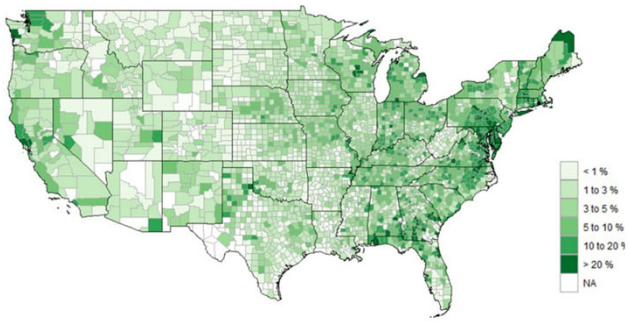
Exxon Pledges to Reduce Carbon Emissions From Operations to 'Net Zero'

Oil giant said it would zero out emissions from assets it operates by 2050, but didn't commit to reducing emissions from use of its fuels

Challenges to the Ag Carbon Industry

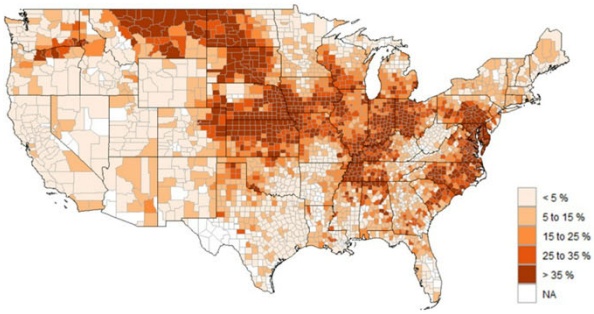
❖ Changing farming practices is **costly** to farmers

Figure 1. Cover Crop Area by County



Panel A. Cover Crop Adoption Rate by County, 2017

Figure 2. No-Till Area by County



Panel A. No-Till Adoption Rate by County, 2017

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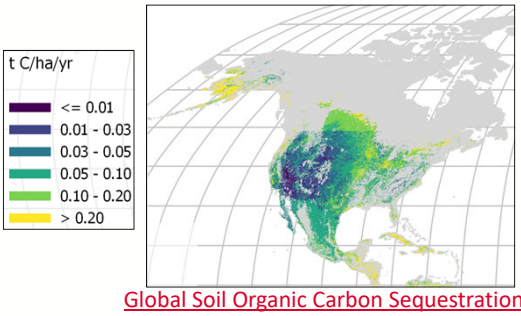
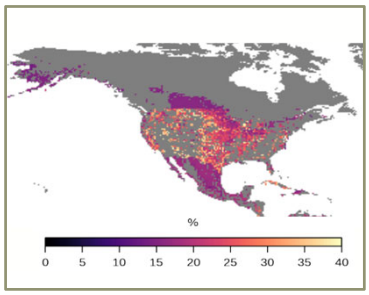
❖ **Science Gap 1:** Uncertainty in the **projected** volume of carbon credits that can be produced by a farmer

Relative Soil Organic Carbon Sequestration Rates



Uncertainty in Estimation



Global Soil Organic Carbon Sequestration Potential Map – GSOCseq v.1.1 (fao.org)

→ projected vs. actual volume of credits: weather, timeliness of practices, weed pressure, etc.

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- **Science Gap 2:** Measuring the **actual** volume of carbon removed/avoided in a farm is challenging and costly:
  - Soil tests can produce more accurate measurements than remote sensing in some cases, but they are cost-prohibitive at large scale
  - Remote sensing technologies could produce very uncertain estimates of actual changes in GHG emissions at farm level
  - Lack of scientific consensus on linkages between soil dynamics, agricultural practices, and GHG dynamics at farm level

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- **Science Gap 3:** Impossible to **compare** carbon credits generated by one change in practices in one farm across carbon programs

Carbon Program	Carbon Model
CIBO Impact	SALUS (system approach to land use sustainability)
Nori; Soil and Water Outcomes Fund	COMET-farm
Ecosystem Services Market Consortium (ESMC)	DNDC (DeNitrification-DeComposition) and OpTIS (operational tillage information system)
Agoro; Indigo; Gradable	Own proprietary models

→ What is the most suitable carbon program for a farm?

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❖ Evolution of carbon prices? → **Revenue uncertainty** for participating farmers

EUA Futures contract Dec 22
(Euros per metric ton of carbon offsets, theice.com)

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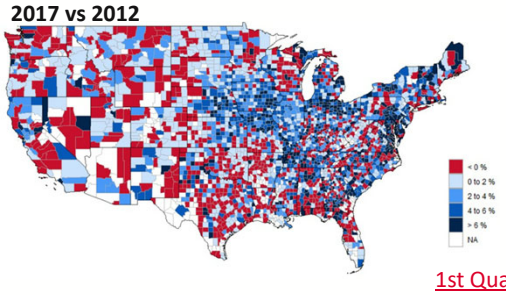
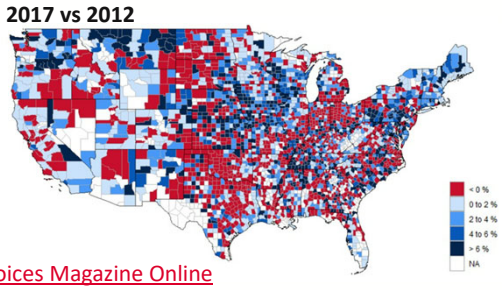
❖ **Disadoption** of conservation practices and carbon **reversals**

% Change in Cover Crop Adoption Rate by County: 2017 vs 2012



% Change in No-Till Adoption Rate by County: 2017 vs 2012



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- Penalties to disadopting farmers vary across programs
- Use of carbon credits in buffer to offset carbon reversals?
- Overall industry credibility?

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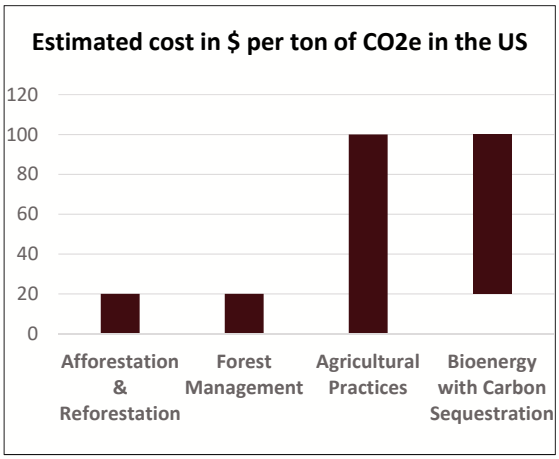
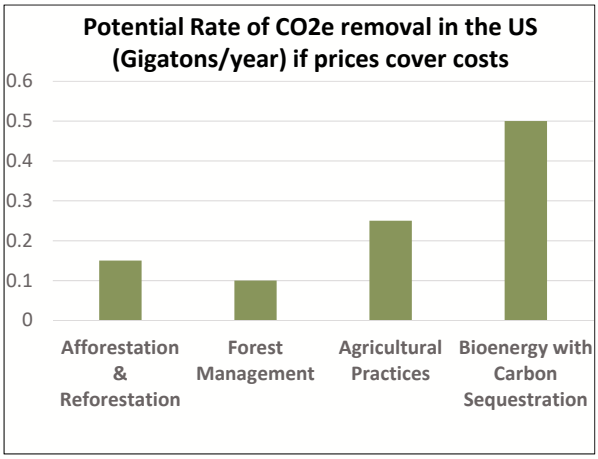
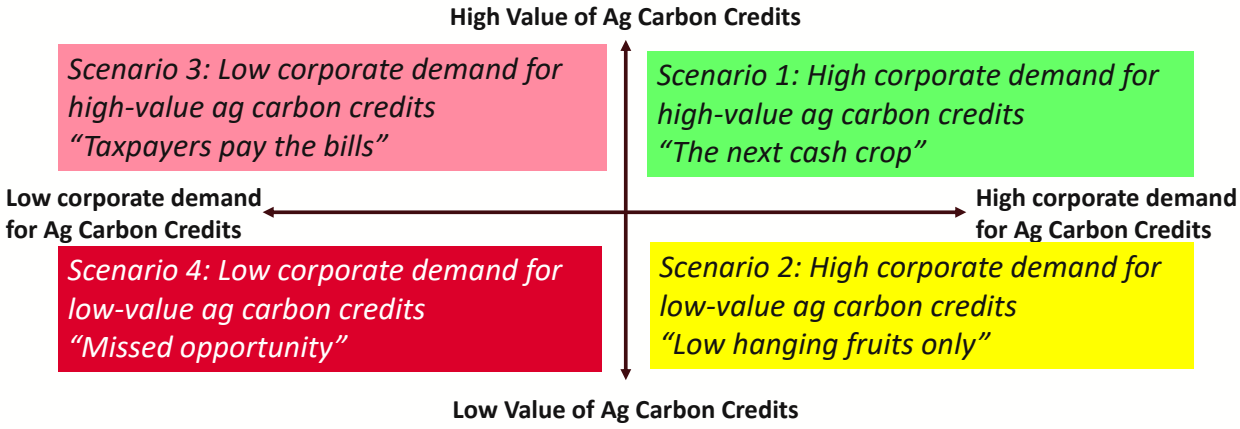
- Competition in supply of carbon credits from forestry, industrial carbon sequestration, and international agriculture





National Academy of Sciences, Engineering, and Medicine (2019)

Possible Scenarios for Ag Carbon



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Wongpiyabovorn, Plastina, & Crespi. 2022.
https://doi.org/10.1002/aepp.13254

S1: High demand for high-value ag carbon credits "The next cash crop"

- ❑ Valuable and stable source of revenue for participating farmers
- ❑ Needs a credible measuring, reporting, and verification (MRV) system
- ❑ Limited competition from industrial carbon sinks, forestry, and other sources
- ❑ Large-scale adoption of practice changes that generate high-quality credits
- ❑ Liquid markets for agricultural carbon credits, with moderate price volatility
- ❑ Robust financing and adequate risk-management services for farmers and buyers of credits
- ❑ Reinforced by: value chains for low-carbon commodities, articulated protocols (migration across carbon programs).

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S.2: High demand for low-value ag carbon credits "Low-hanging fruits only"

- ❑ Weak credibility of the measuring, reporting, and verification (MRV) system
- ❑ Perceived quality of ag carbon credits is low
- ❑ Needs limited competition from industrial carbon sinks, forestry, and other sources
- ❑ Agricultural carbon markets small and underdeveloped
- ❑ Farmers implement only the least-cost practices to generate carbon credits or changes in practices that would be implemented even in the absence of carbon payments

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How to move from S2 to S1?

- Address science gaps 1-3 to reduce the uncertainty in the production of ag carbon credits, increase the transparency of the system, and improve the credibility of agricultural carbon credits against other carbon credits

- Develop and enforce minimum standards for carbon credits, and let the market define premiums and discounts with respect to the standard (example: organic markets before/after certification)

How to move from S2 to S1?

- Develop tools to manage production, price, and legal risks for participating farmers:
  - Develop suggested language to include in contractual agreements to protect the balance of powers between carbon programs, farmers, and credit buyers
  - Insurance of carbon production? (similar to crop insurance)?
  - Minimum payment for program participation plus performance-based premium?
  - Stacking payments from carbon programs (all private), and USDA/NRCS programs?
  - Subsidized soil tests through EQIP?
  - Future role of non-additional practices?

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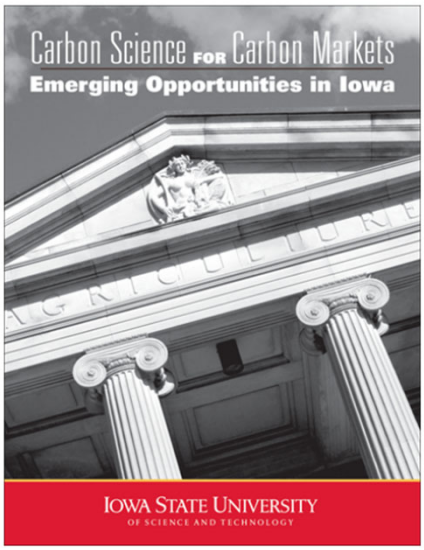
Carbon Science for Carbon Markets: Emerging Opportunities in Iowa

Lisa Schulte Moore, Jim Jordahl



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