Agricultural soil carbon sequestration

Farmer interest and equity concerns in the "Wild West" of emerging voluntary markets

ACES Conference, Austin, December 2024
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Photos: Rademacher and Hamilton farms, Indiana

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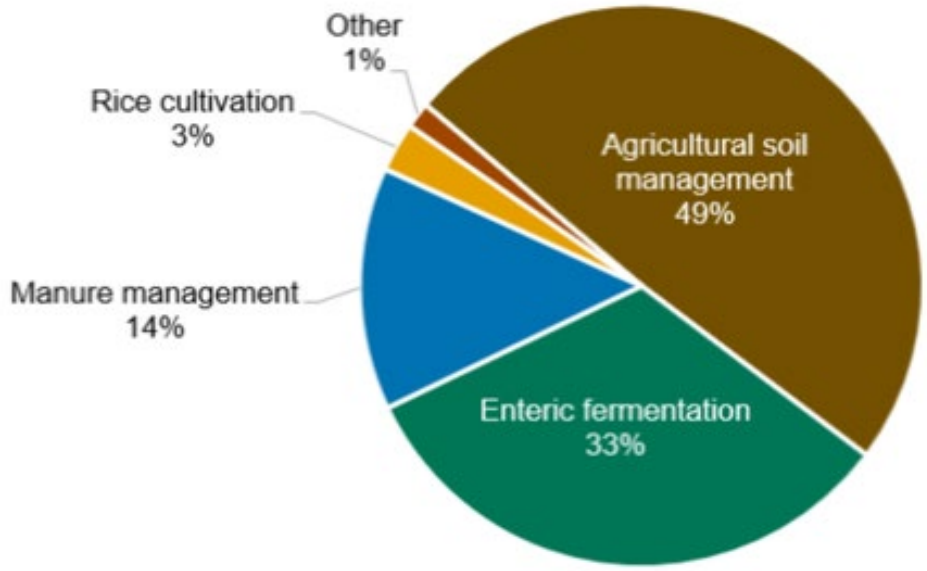
Environmental Defense Fund

USDA NIFA

GHG mitigation and US agriculture

US contributes ~13% of global emissions;
10% of that is from agriculture

Total U.S. agriculture emissions by activity in 2021 =
598.1 million metric tons of carbon-dioxide equivalent



Note: Other includes urea fertilizer, liming, and field burning of agricultural residues.
Source: U.S. EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021*.

Photo: NRCS-USDA

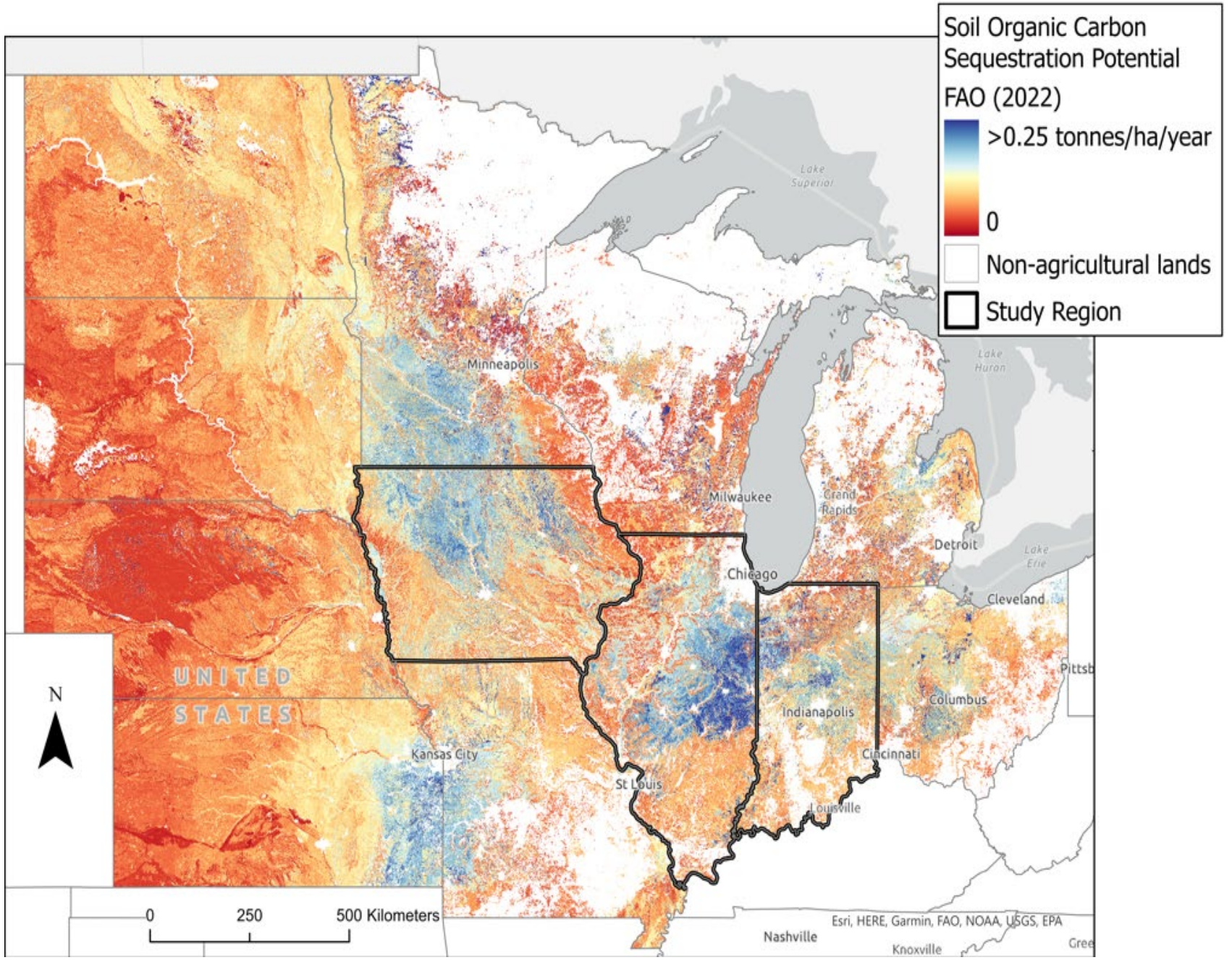
Climate-smart farming practices
for mitigation through SOC sequestration

- conservation tillage
- cover cropping
- grazing management
- nutrient management
- biochar application

Soil organic carbon (SOC) sequestration potential

(Data: FAO GSOCmap)

- Midwest produces ~80% of corn and soybeans in US, 25% of global
- Soils also have high potential to mitigate emissions

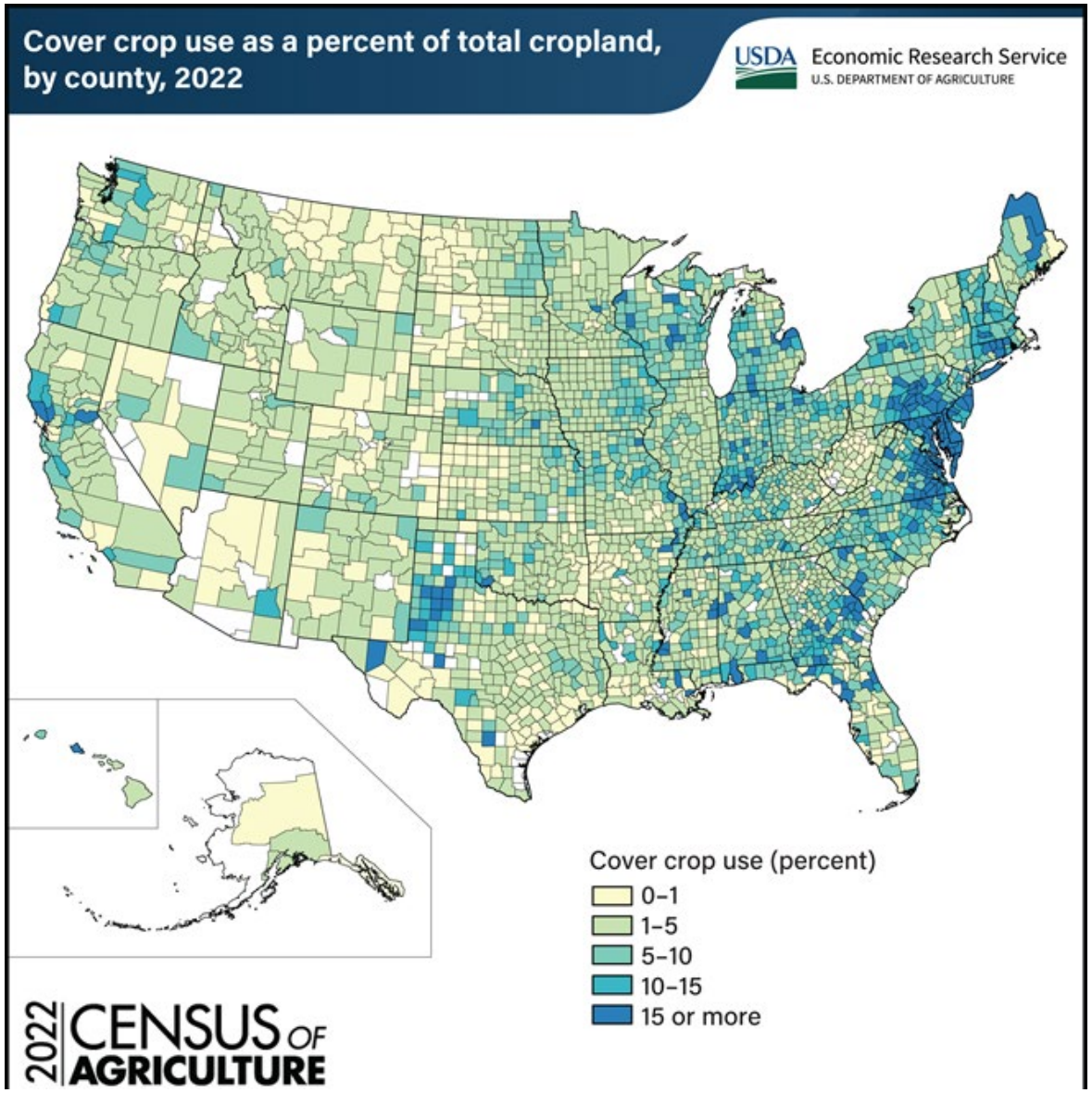


Stats from USDA, FAO, EPA

Traditional incentive programs

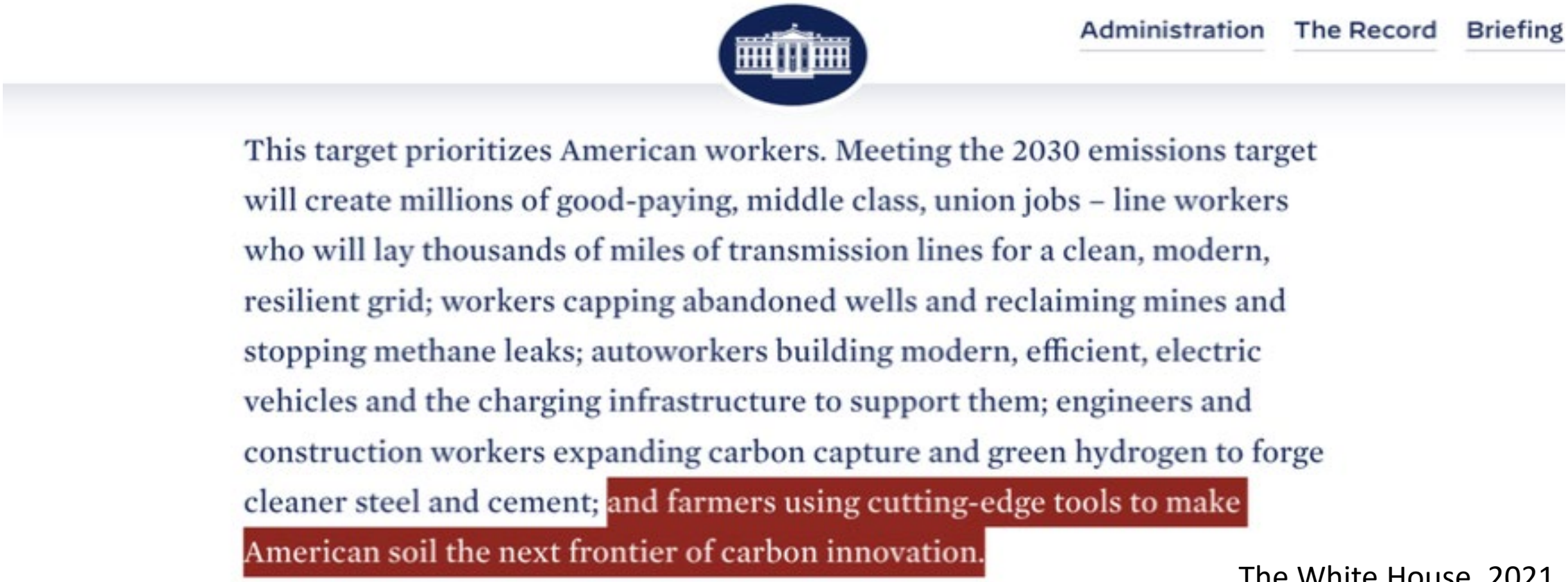
Spending on traditional programs to support climate smart practices has increased, but adoption has not increased accordingly.

- Cover crop adoption has plateaued at ~5% of total cropland



ERS 2024

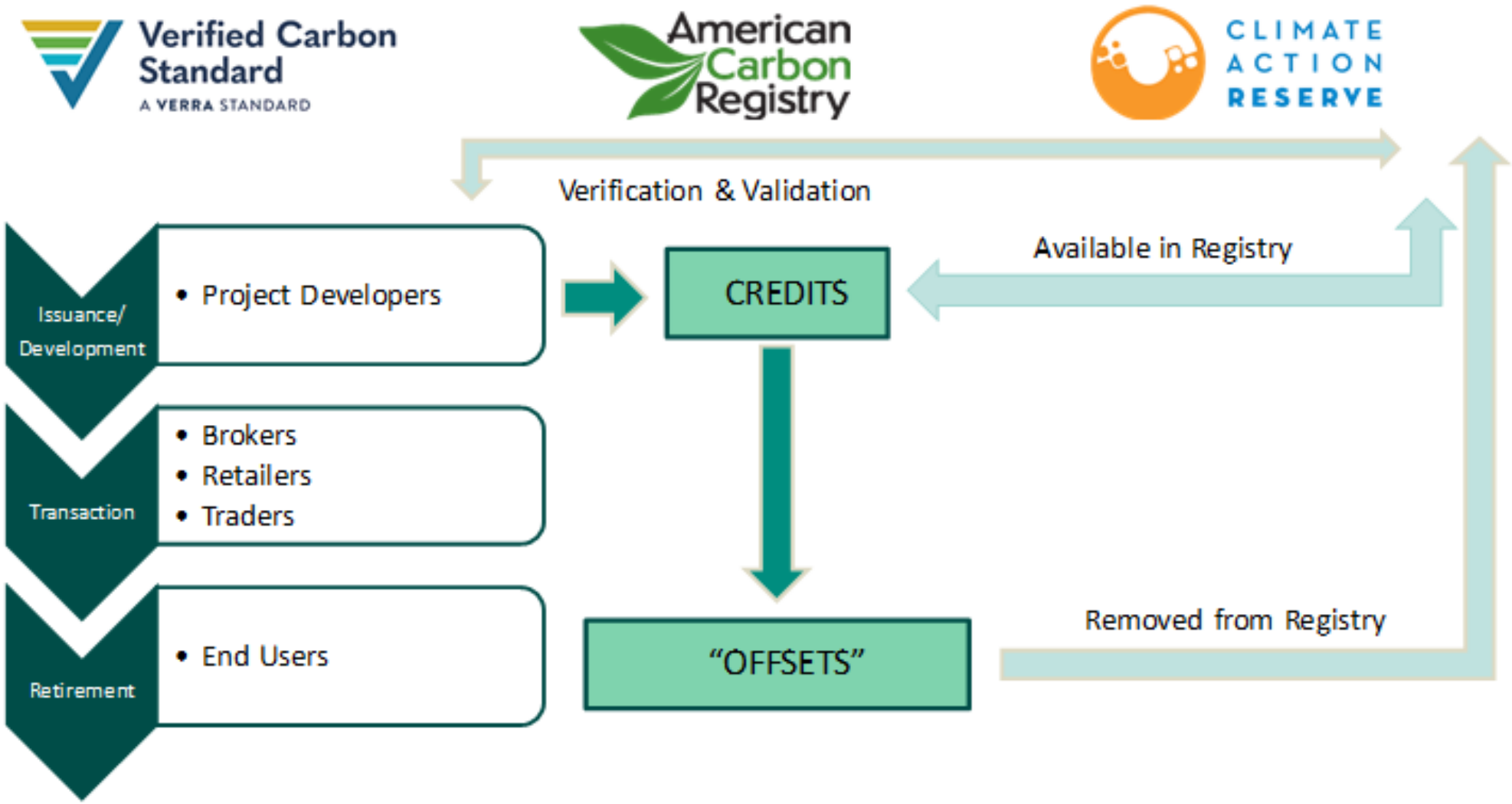
New frontier: Agricultural soils and carbon markets



Administration The Record Briefing

This target prioritizes American workers. Meeting the 2030 emissions target will create millions of good-paying, middle class, union jobs – line workers who will lay thousands of miles of transmission lines for a clean, modern, resilient grid; workers capping abandoned wells and reclaiming mines and stopping methane leaks; autoworkers building modern, efficient, electric vehicles and the charging infrastructure to support them; engineers and construction workers expanding carbon capture and green hydrogen to forge cleaner steel and cement; and farmers using cutting-edge tools to make American soil the next frontier of carbon innovation.

The White House, 2021



Source: S&P Global Commodity Insights. Chart is provided for illustrative purposes.

Critiques

- Additionality
- Equity

The Guardian

US

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Energy Politics Environment Green Living

The Farming Lobby's Cunning Plan to Fi Climate Change—and Regulation

The American Farm Bureau Federation has recast itself as a clima warrior, pushing for private offset markets relying on the fraught soil sequestration.

Modern Farmer

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CONSUMPTION

Environmental Groups Call Biden's Carbon Bank Plan a 'Scam'

A letter from dozens of organizations pleads not to enact this strategy.

by Dan Nosowitz · April 22, 2021

Project Aims and Methods

In the US Midwest,
How do market actors describe carbon markets?
Which farmers already participate and who wants to?
Who is left out?

Project Aims and Methods

Aim 1:
Understand how project developers conduct and frame their work

Project Aims and Methods

Aim 2:
Assess farmer willingness to accept market payments and barriers through survey

N=14, others?

indigo, Nori, ESMC, Soil and Water Outcomes Fund, CIBO, Bayer, Gradable, Corteva agriscience, Western Sustainability Exchange, TruTerra, agoro Carbon Alliance, Nutrien, Rabobank, Grassroots Carbon

Aim 1:
Understand current institutions and perceptions of market actors

Aim 2 Methods:

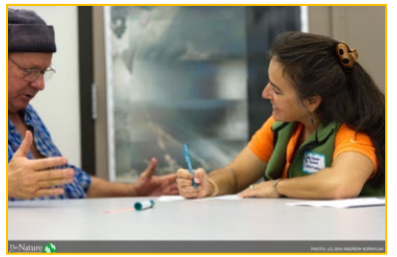
- Paper survey sent by ISU Survey Center with farmer sample from Dynata
- Sample=4500 from 7 Midwest states, oversampled small farms (≤150 acres), non-white, female
- 414 responses (~9%)
- Weights applied to adjust for non-response bias by group
- Analysis: Descriptive and Willingness-to-Accept

Project Aims and Methods

Aim 3 Methods:

- 30 interviews across 7 states
- Snowball sampling within 2x2 plan
  - Underrepresented (BIPOC, Woman, Beginning Farmer) vs. Represented (White, Man)
  - Conventional farm and practices vs. Non-conventional (Organic, Regenerative, <40 acres)
- Analysis: Understanding market perceptions within an environmental justice framework

Aim 1:
Understand current institutions and perceptions of market actors



Aim 3:
Contextualize survey responses farmer perceptions through interviews

Aim 2: Survey (Preliminary analysis!)
Farmer knowledge of, participation in VCMs

- 3% participation in VCMs

  (51% in public program)
- VCMs: very low for small farms & minority farmers
- Female, small farm, minority farmers less likely to be contacted by VCMs

		Female		Small farm		Minority	
	Overall	(1) No	(2) Yes	(1) No	(2) Yes	(1) No	(2) Yes
Have you participated in and/or sold carbon credits or offsets in a voluntary carbon market?	0.030	0.030	0.018	0.051	0.013**	0.033	0.000***
	(0.171)	(0.172)	(0.133)	(0.219)	(0.115)	(0.178)	(0.000)
# of Responses	367	303	46	291	76	334	16
Have you ever enrolled in a state or federal program?	0.505	0.497	0.548	0.662	0.375***	0.506	0.629
	(0.501)	(0.501)	(0.503)	(0.474)	(0.487)	(0.501)	(0.498)
# of Responses	390	307	52	310	80	342	17

		Female		Small farm		Minority	
	Overall	(1) No	(2) Yes	(1) No	(2) Yes	(1) No	(2) Yes
Has a company or buyer of voluntary carbon credits approached you and/or your farm managers about participating in a voluntary carbon market?	0.080	0.085	0.017***	0.146	0.026***	0.082	0.003***
	(0.272)	(0.279)	(0.132)	(0.354)	(0.161)	(0.275)	(0.056)
# of Responses	365	301	47	289	76	334	15

Notes: Standard errors are in parentheses. * p<0.1, ** p<0.05, and *** p<0.01 for mean difference between (1) and (2). 1= Yes.

Aim 2:
Farmer willingness to accept

Willingness to Accept program features
($$ not yet final)

Attribute	Levels for Option A: Contract	Option B: No Contract
Organization	Federal government Private Company	You do not enter into a new contract
Technical assistance & business planning?	Yes No	
Up-front data required	1 year of data 5 years of data	
Outcome verification	Yes No	
Annual payment per acre	$20/acre $50/acre $100/acre $200/acre	

Aim 2:
Farmer willingness to accept

Overall:

- 27% affirmation rate (compared to 3% current participation); small farms sig. lower
- Require significantly higher payment per acre for VCM vs. status quo, and even higher for underrepresented groups (minority, female, small, beginning)

Attribute	Levels for Option A: Contract
Organization	Federal government Private Company
Technical assistance & business planning?	Yes No
Up-front data required	1 year of 5 years of
Outcome verification	Yes No
Annual payment per acre	$20/acre $50/acre $100/acre $200/acre

* Underrepresented groups prefer

* Higher payment required

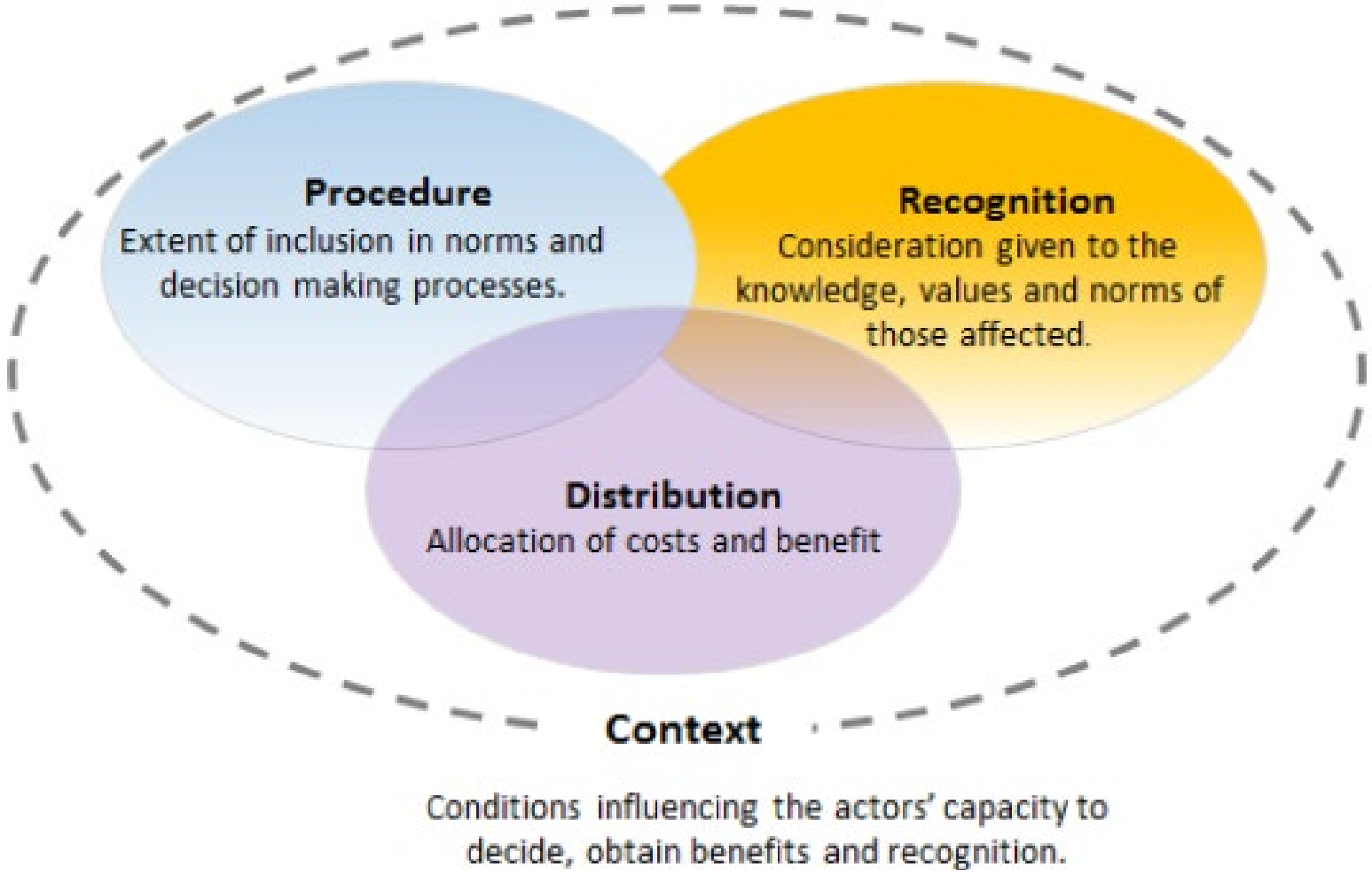
not enter into a new contract

Aim 2:
Barriers

- <30% believe they can join
- 24% already do the qualifying practices, so wouldn’t qualify
- High agreement: don’t know what the payment is and concerned about loss of management decision flexibility
- Low agreement that VCMs are a fair way to provide farmers with payments for managing soil

Aim 3: Interviews (Preliminary analysis!)
Understand farmer perceptions

How do Midwest farmers perceive the justice implications of VCMs?



Garmendia et al. 2015;
Carolan 2019; Fraser 2005

Aim 3:
Recognition

- Only certain types of farms and farmers recognized within carbon markets, due to
  - Networks
  - Efficiency
  - Capacity

"I had already known the contacts at Cargill [...] They just called me up and say, 'Hey, you want to sit down and talk about some carbon?' and I said, sure."
– Chris, conventional

[Markets are geared toward] "operations that have the wherewithal and capacity to… make the operational changes. Eat the overhead necessary…. I don't think they're geared at this stage to the, you know, 400-acre Organic farmer."
– Cameron, Organic

"I only know one other Black farmer and we pretty much do whatever each other does."
– John, conventional

Aim 3:
Distributional

- Benefits only available to certain farmers recognized by these programs
- Perception of benefits going to project developers and companies, not farmers

"No offense, but it's a bunch of young, ambitious people that don't know anything about agriculture writing these sustainability rules for these major corporations. They don't have a clue about farming."

– Ryan, conventional

"My concern with the carbon markets is they have gotten so big, so fast that … if you actually ask [project developers], 'Can you tell me about what could I do?'… they don't have a clue."

– Tucker, conventional

Recommendations from participants

- Farmers want more education and active recruiting, higher payment
- Farmers and project developers both want stronger verification standards
  - tension: most farmers prefer less farm-level verification
- Transformational opportunities
  - cooperatives of small farms to allow participation
  - broader ecosystem markets (adding other ES to payment bundle)

Thank you!

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Photos: Rademacher and Hamilton farms, Indiana

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