

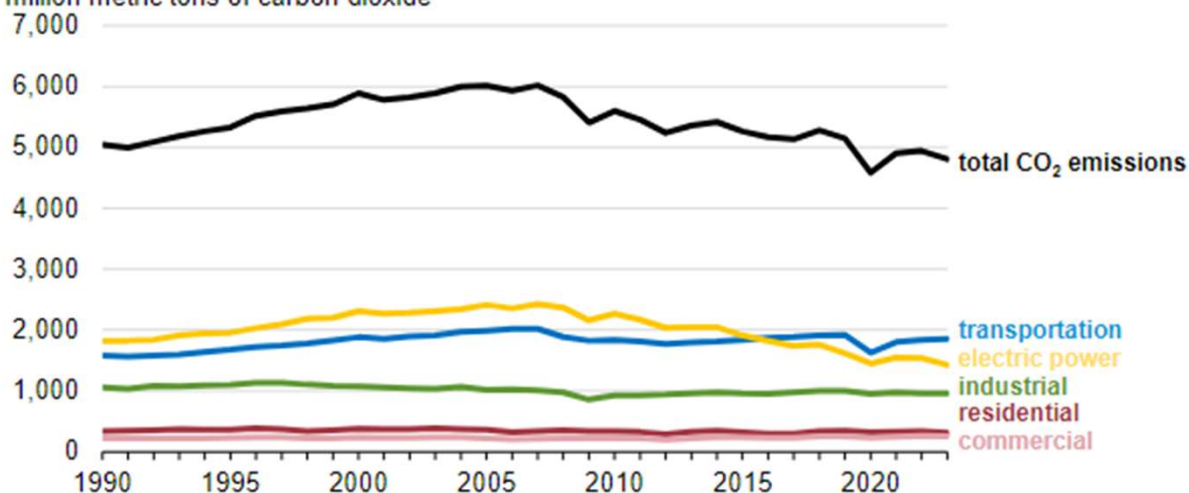
# Carbon Farming Programs Update

Iowa Farm Bureau Webinar  
May 29, 2024

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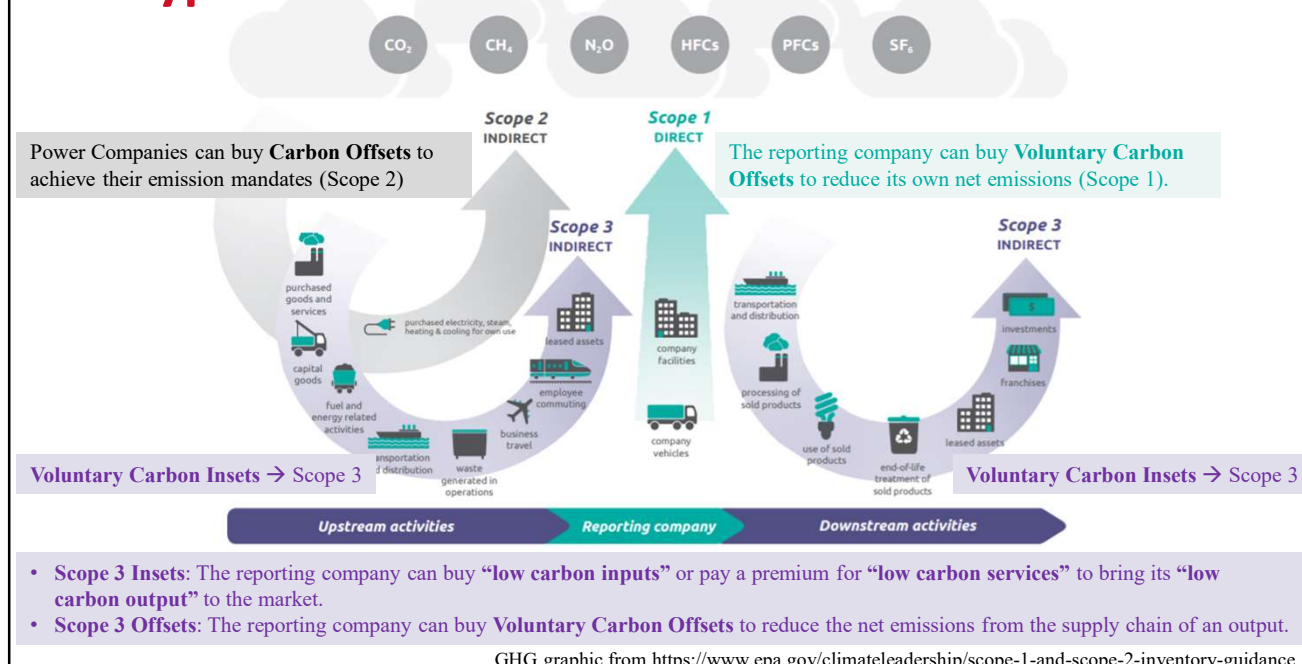
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U.S. annual energy-related CO<sub>2</sub> emissions by sector (1990–2023)  
million metric tons of carbon dioxide



Lower GHG emissions from the **electricity sector** drove down total US emissions. The next policy goal is to reduce **transportation** emissions.

## Types of GHG Emissions and Carbon Credits



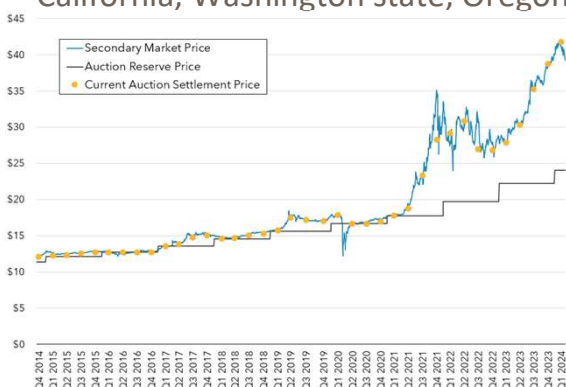
## Carbon Offsets → Scope 1, 2, and 3

- A tradable asset (like a certificate or permit) that gives the buyer the right to offset the emission of GHGs into the atmosphere
- Created when entities reduce their carbon emissions or remove carbon from the atmosphere (compared to a set baseline)
- 1 credit = one metric ton (2,204 pounds) of CO<sub>2</sub>e removed or avoided
- Uses:
  - Offsets for Compliance Markets in Electricity generation (Scope 2)
  - Offsets for Voluntary Carbon Markets (Scope 1)
  - Offsets for Voluntary but Policy-Incentivized markets (Scope 1 for fuel producers participating in LCFS, or Tax Credits 45Q, 40B, 45Z)
  - Offsets to Voluntarily reduce net emissions from a supply chain (Scope 3)

## Carbon Offsets for Regulated Markets (Scope 2)

### Mandatory Cap-and-Trade programs for power plants:

- Government regulated; small role for crop production; larger role for livestock production (methane capture)
- California, Washington state, Oregon, Regional Greenhouse Gas Initiative



**\$42/ton  
Q1 2024**

**RGGI Inc.**

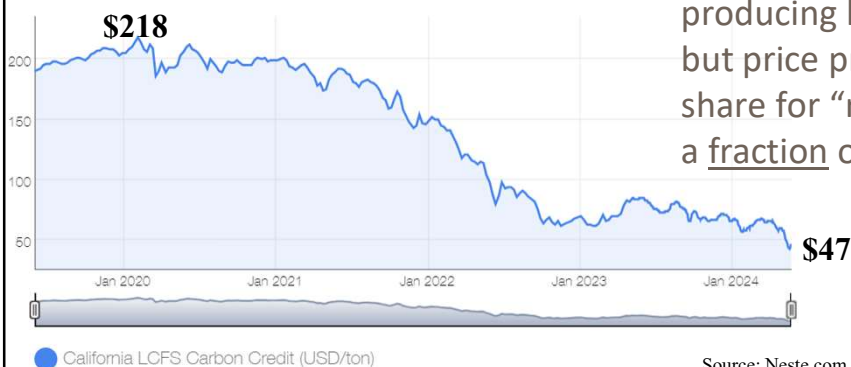
March 2024

#### Bid Prices:

<b>Minimum</b>	<b>\$2.56</b>
<b>Maximum</b>	<b>\$25.00</b>
<b>Average (Median)</b>	<b>\$16.00</b>
<b>Average (Mean)</b>	<b>\$15.91</b>
<b>Clearing Price:</b>	<b>\$16.00</b>

## California Low Carbon Fuel Standard Credit Price (Scope 1 for fuel producers)

### Price for Carbon-Intensity Credits in \$/ton (paid to fuel suppliers)



- Voluntary but Policy-driven market
- Prices received by fuel suppliers, not farmers
- Farmers could participate indirectly by producing low-carbon feedstocks, but price premiums and cost-share for “regenerative ag” are a fraction of these prices

Source: Neste.com

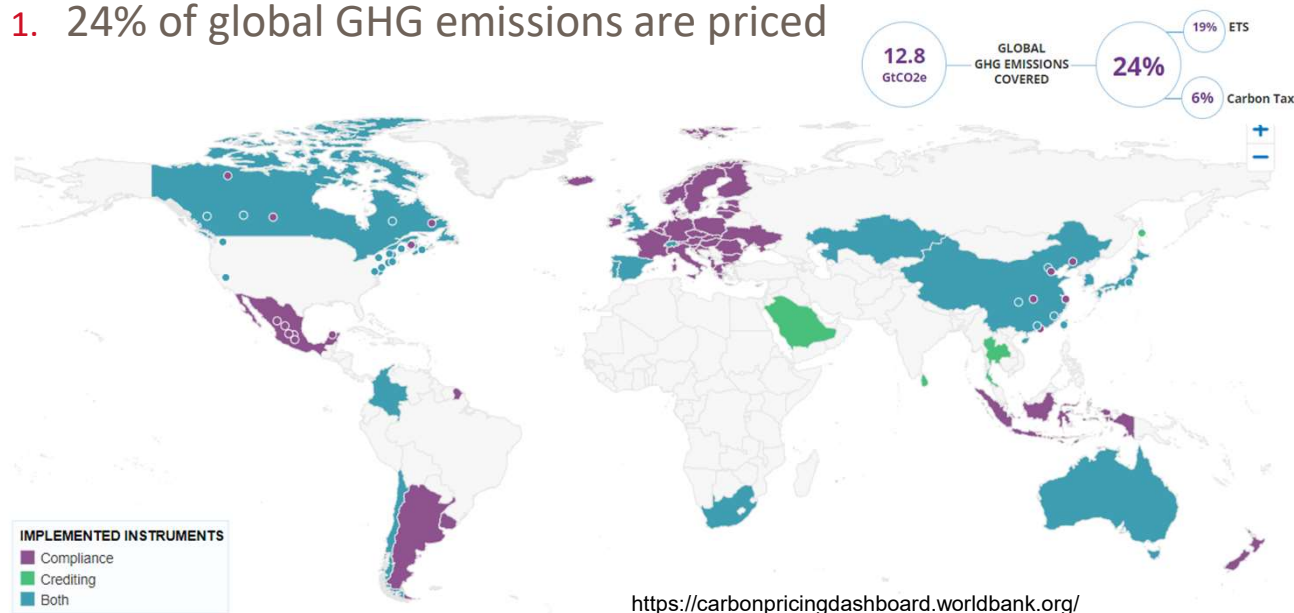
## Carbon Insets → Scope 3 Emissions “Low Carbon Intensity” outputs

- An output produced with a smaller carbon footprint than the same output produced with conventional methods
- Ag outputs: Created when farmers implement conservation practices that reduce or remove GHG emissions with respect to the conventional production method
- Carbon Insets can be claimed by all players in the supply chain
- Uses: Voluntary “low carbon” supply chains and products.



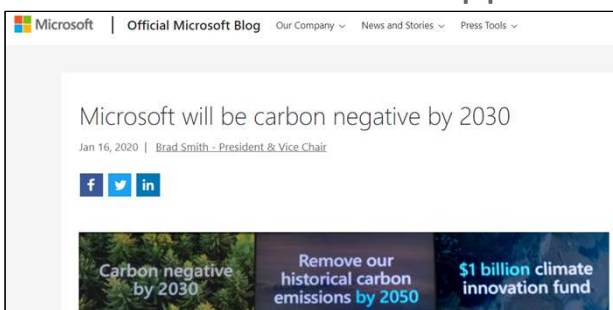
## What role for voluntary carbon markets?

1. 24% of global GHG emissions are priced



## What role for voluntary carbon markets?

- Corporations pledge to adopt low-emission technologies in the long run, and to offset/inset emissions with carbon credits until that happens



Wednesday, December 15, 2021 5:05 PM

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

Sustainability

### Smithfield Foods to Become Carbon Negative by 2030

Company commits to bold climate action with industry-leading pledge

### FORD COMMITS TO CARBON NEUTRALITY BY 2050

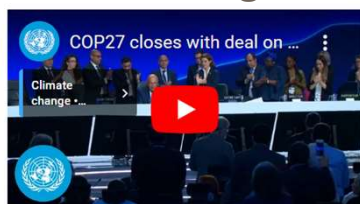
FORD MOTOR COMPANY INTENDS TO ACHIEVE CARBON NEUTRALITY GLOBALLY BY 2050, WHILE SETTING INTERIM TARGETS TO MORE URGENTLY ADDRESS CLIMATE CHANGE CHALLENGES.

### 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

## What role for voluntary carbon markets?

- The global financial industry, regulators, and investors pledge trillions in funding to reduce carbon emissions



COP27 closes with deal on loss and damage



### JPMorgan unveils fight climate change investment

The bank intends to become carbon neutral

By Alexandra Kelley | Oct. 7, 2020

#### CLIMATE & ENVIRONMENT

### COP27 highlights: In historic move, nations agree to pay to help vulnerable countries with climate disasters

All the latest updates from COP27 in Egypt, the United Nations climate change conference in its final hours.

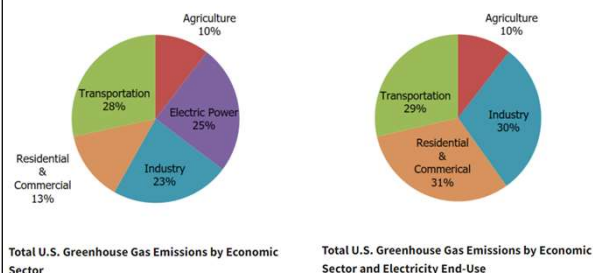
By Sarah Kaplan, Evan Halper, Timothy Puko, Brady Dennis and Michael Birnbaum • November 20, 2022





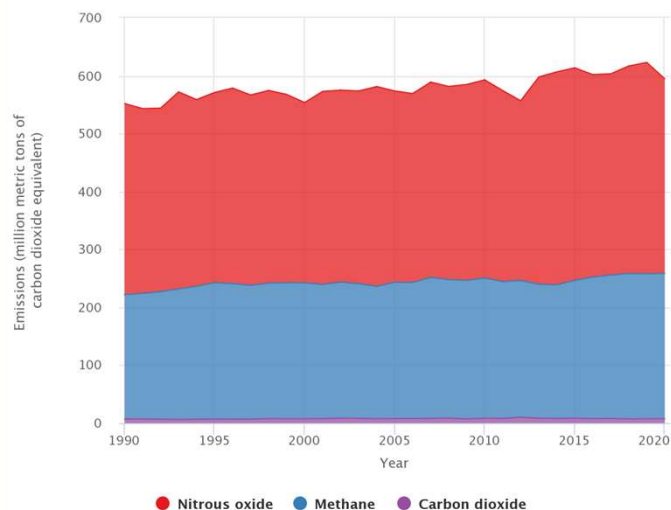
## What role for ag in voluntary carbon markets?

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2022



<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>

U.S. Greenhouse Gas Emissions from Agricultural Activities, by Gas, 1990-2020



## “Carbon Sequestration” in Agriculture

Some agricultural practices can **remove GHGs** (carbon dioxide, nitrous oxide, methane, etc.) from the atmosphere **or avoid emissions**:

- Reducing tillage intensity
- Planting cover crops
- Reducing fertilizer rates, switching from commercial fertilizer to compost
- Converting marginal cropland to grassland
- Planting trees
- Reducing stocking rates on pastures

# Multiple Agricultural Carbon Initiatives...

## ... connect carbon credit demand and supply



...using different models to quantify CO<sub>2</sub>e

## Plenty of Interest

Source: ESMC



## Voluntary Ag Carbon Initiatives

- **Payments per Output** (\$ per ton of CO<sub>2</sub>e removed/avoided)
  1. Carbon by Indigo   2. CIBO Carbon Credits   3. Corteva
  4. ESMC's Eco-Harvest   5. Nori   6. Cargill's RegenConnect
  7. Soil and Water Outcomes Fund   8. TruTerra Carbon
- **Payments per Practice** (\$ per acre, or \$ per N reduction)
  1. ADM's re:generations   2. Bayer Carbon   3. Indigo Ag:Market+ Source
  4. PepsiCo-PCM   5. TrueTerra N Mgmt Incentive   6. TruTerra Finan. Assist.
- **Practice- and Outcome-based payments**
  1. Agoro Carbon Alliance   2. Locus Ag CarbonNow
  3. CIBO Carbon Bridge   4. Nutrien's Sustainable Nitrogen Outcomes

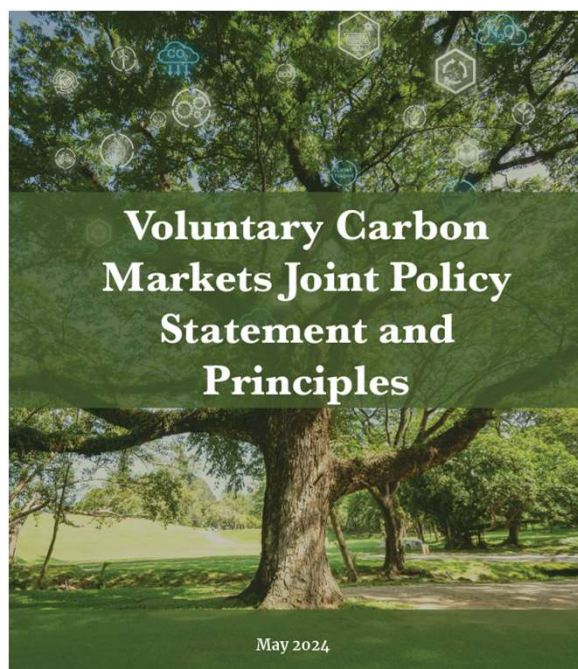
### Carbon Models

- COMET Farm, <https://comet-farm.com/>
- Soil Metrics Greenhouse Gas Inventory Tool (GGIT), <https://soilmetrics.eco/technology/> (based on COMET Farm)
- Operational Tillage Information System (OpTIS), <https://www.ctic.org/OpTIS>
- Denitrification-Decomposition (DNDC) Model, [https://ctic.org/DNDC Information](https://ctic.org/DNDC%20Information)
- Verra's VM0042, <https://verra.org/methodologies/vm0042-methodology-for-improved-agricultural-land-management-v1-0/>
- SALUS (system approach for land use sustainability) <https://www.cibotechnologies.com/salus-model/>

### Carbon Initiatives

- Soil and Water Outcomes Fund
- Indigo Ag
- NORI
- Corteva Carbon
- Cargill's RegenConnect™
- ESMC's Eco-Harvest
- Cargill's RegenConnect™
- Agoro Carbon Alliance
- CarbonNow
- CIBO Carbon Credits
- CIBO Carbon Credits





Signed,

Janet L. Yellen, United States Secretary of the Treasury

Thomas J. Vilsack, United States Secretary of Agriculture

Jennifer M. Granholm, United States Secretary of Energy

John Podesta, Senior Advisor to the President for International Climate Policy

Lael Brainard, National Economic Advisor

Ali Zaidi, National Climate Advisor

5/28/2024

<https://www.whitehouse.gov/wp-content/uploads/2024/05/VCM-Joint-Policy-Statement-and-Principles.pdf>

## USDA, Dept. of the Treasury, Dept. of Energy

We encourage the U.S. private sector and other stakeholders in the carbon credit value chain to responsibly participate in Voluntary Carbon Markets, consistent with the principles below. These principles recognize the need for:

- credit integrity (i.e., “supply integrity”);
- credible credit use (i.e., “demand integrity”);
- and market-level integrity, including facilitating efficient market participation and lowering transaction costs.

Voluntary Carbon  
Markets Joint Policy  
Statement and  
Principles

## Traits of “High-Integrity” Carbon Credits

- a. **Additional:** The activity would not have occurred in the absence of the incentives of the crediting mechanism and is not required by law or regulation.
- b. **Real and Quantifiable:** claimed emission reductions/removals represent genuine atmospheric impact determined in a transparent and replicable manner using robust, credible methodologies.
- c. **Permanence:** The emissions removed or reduced will be kept out of the atmosphere for a specified period of time during which any credited results that are released back into the atmosphere are fully remediated.

Voluntary Carbon  
Markets Joint Policy  
Statement and  
Principles

## Traits of “High-Integrity” Carbon Credits

- d. **Unique:** no double-counting
- e. **Robust baselines:** based on rigorous methodologies that avoid over-crediting, prioritizing the use of performance benchmarks where applicable, and that evolve over time to reflect advancements in national climate policy, emissions pathways and decarbonization practices, and technology.
- f. **Validation and verification:** Activity design is validated, and results are verified by a qualified, accredited, independent third party.

**GHG removal/avoidance cannot be assessed by buyers/users**

**→ Need for Strong MMRV Systems**

Voluntary Carbon  
Markets Joint Policy  
Statement and  
Principles

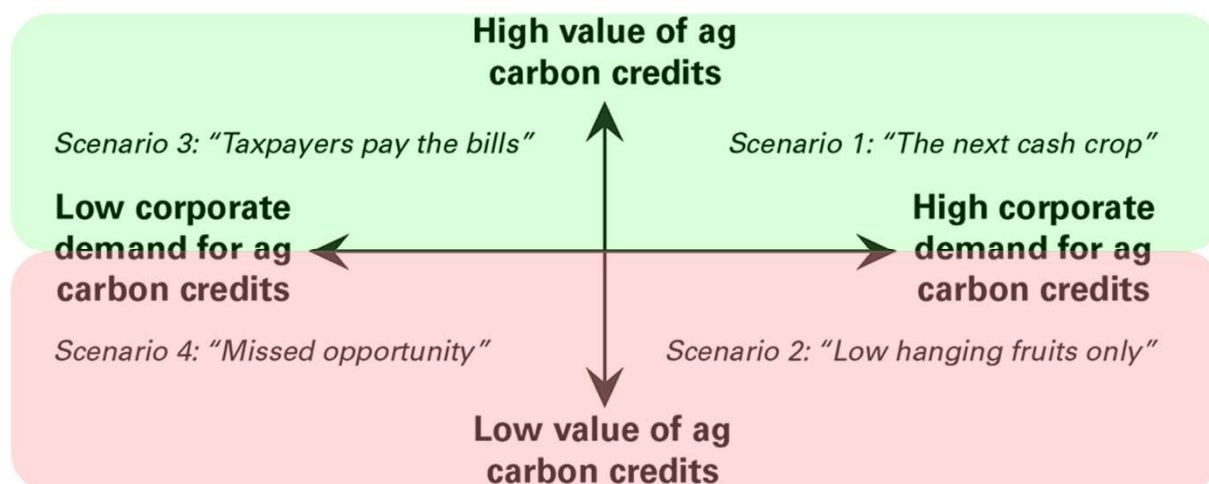
## Measuring, Monitoring, Reporting, and Verification (MMRV) Systems

→ Robust MMRV systems are key to:

- Ensure **integrity** of carbon credits
- Provide credibility to the ag carbon market

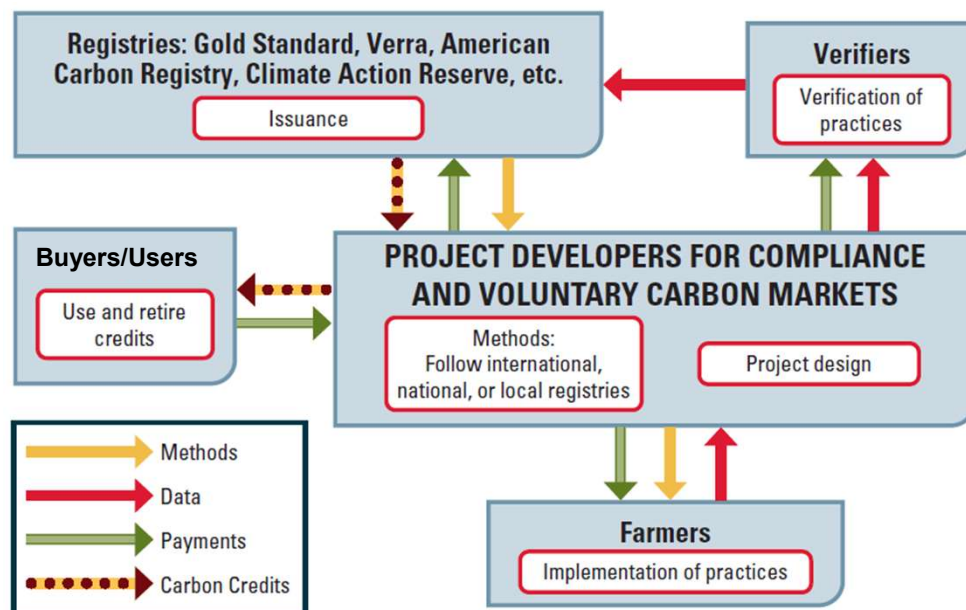
→ **Costly** to implement: wedge between price paid by buyers and participating farmers

**Integrity → Credibility → Credit Value → Net Returns to Farmers**



**Low Integrity → Low Credibility → Low Credit Value**

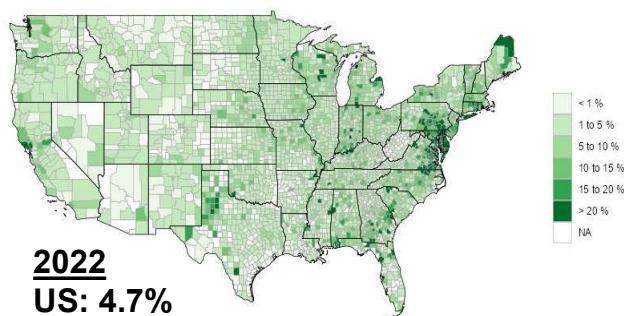
## “High-Integrity” Carbon Credit Framework



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

## Adoption of Cover Crops and No-Till as percent of Cropland Area in 2022 \*

Figure 1. Cover Crop Area by County

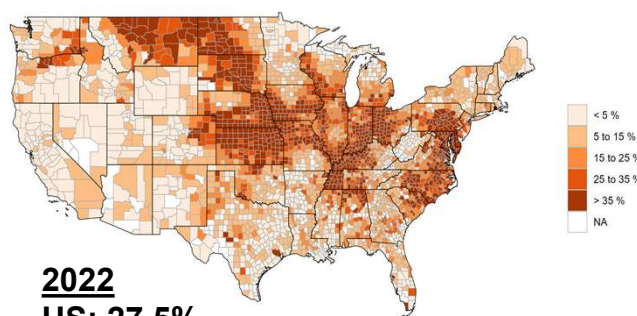


**2022**

**US: 4.7%**

**Iowa: 5.0%**

Figure 2. No-Till Area by County



**2022**

**US: 27.5%**

**Iowa: 32.7%**

\*Plastina, Sawadgo, and Okonkwo (forthcoming in *Choices*).

## Why...?

- ...is the adoption rate of Cover Crops so low?
- ...is the adoption rate of No-Till stagnant?

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

Iowa CC: \$61.65/acre      NT: \$16.39/acre (NRCS 2024)

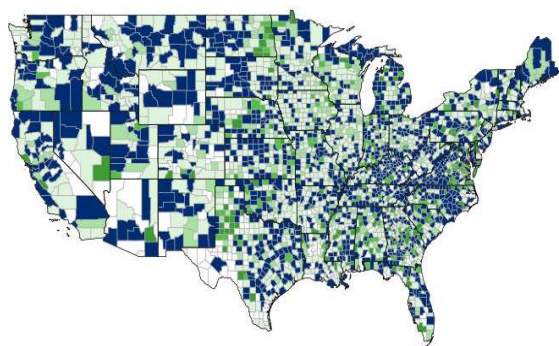
<https://www.nrcs.usda.gov/getting-assistance/payment-schedules>

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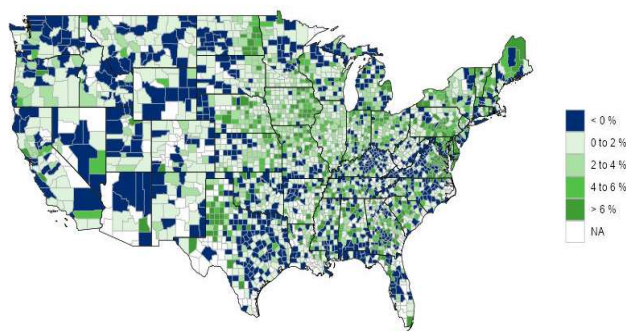
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## 2022 vs. 2017 Change in Conservation Practices (Blue = Disadoption)

%Change in Cover Crop Area by County



%Change in No-Till Area by County



\*Plastina, Sawadgo, and Okonkwo (forthcoming in *Choices*).

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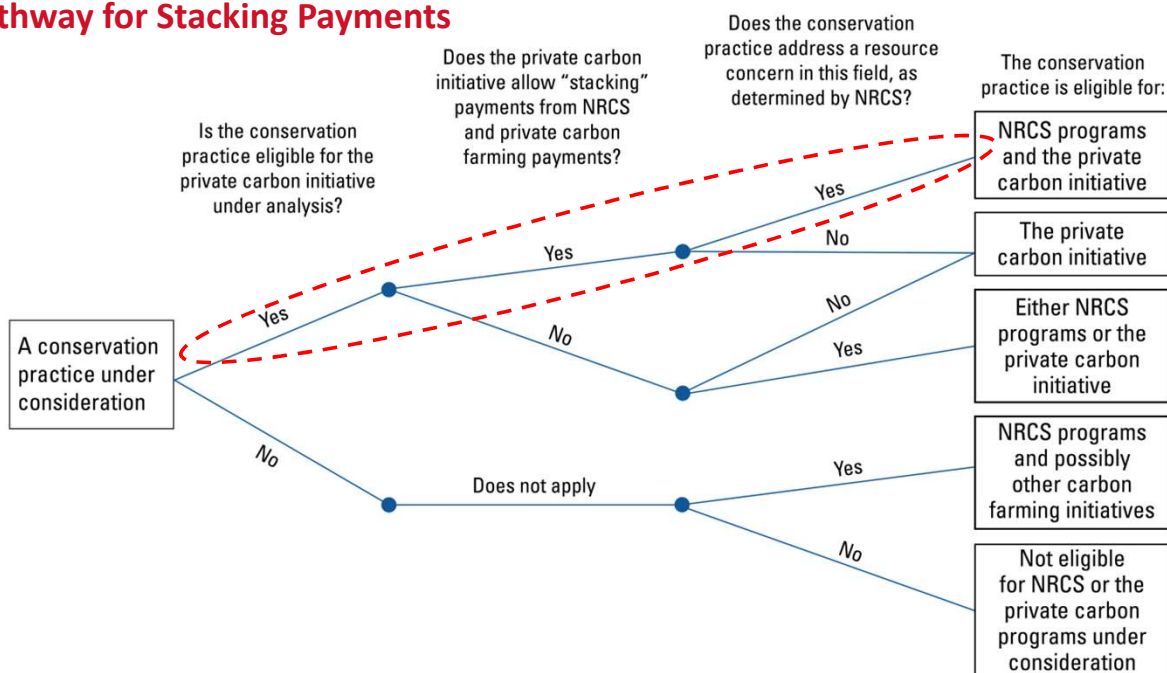
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## “Stacking” payments for carbon farming practices

- Some voluntary carbon farming initiatives allow participating farmers to receive USDA payments (EQIP/CSP) for the same practices in the same location (→ timing is critical)
- Example: Bayer, Corteva, CIBO, Truterra, RegenConnect, Indigo, Nori, and Eco-Harvest
- However, eligibility for USDA programs depends on “Resource Concerns” as determined by local NRCS Conservationist after a farm visit.

### Pathway for Stacking Payments



<https://www.extension.iastate.edu/agdm/crops/pdf/a1-40.pdf>

## Challenges to Carbon Farming

### Agriculture-specific

1. Changes in practices are costly to farmers
2. Multiple GHG removal/avoidance standards
3. Traceability of carbon credits: by field, farm, project, 'supply shed'? Co-mingling of "low carbon" and other commodities?
4. Payments-per-output (\$15-\$40/mtCO<sub>2</sub>e) based on statistical GHG models → model uncertainty → payment uncertainty
5. Payments-per-practice (\$5-\$15) insufficient to cover costs
6. Actual carbon removal might differ from model estimates

Other: Competition from other sectors, unstable demand, discredit from greenwashing, etc.

## How much CO<sub>2</sub>e can be sequestered through carbon farming in the United States?

- National Academy of Sciences (2019): agricultural lands can annually sequester **250 million MtCO<sub>2</sub>e/year** via conservation practices that enhance SOC storage, without jeopardizing food security and biodiversity of intact native ecosystems.
- About 40% of annual emissions from agricultural production

→ No economic analysis

## Potential annual carbon sequestration (COMET-P)



	Cover Crops (mtCO <sub>2</sub> e/acre)		
	Mean	Min	Max
Heartland	<b>0.282</b>	<b>-0.121</b>	<b>1.900</b>
Northern Crescent	0.089	-0.089	0.778
Northern Great Plains	0.047	-0.388	0.353
Prairie Gateway	0.146	-0.408	1.285
Eastern Uplands	0.353	-0.111	1.925
Southern Seaboard	0.297	-0.099	1.925
Fruitful Rim	0.188	-0.998	1.680
Basin and Range	0.027	-0.998	0.788
Mississippi Portal	0.615	-0.153	1.982
U.S. Total	<b>0.230</b>	<b>-0.998</b>	<b>1.979</b>

The net effect of cover cropping on GHGs is measured in metric tons of Carbon Dioxide Equivalent (CO<sub>2</sub>e) units per acre.

The net effect is measured by comparing GHG emissions without cover crops and GHG emissions with cover crops

All GHGs are expressed in CO<sub>2</sub>e units according to their relative global warming potential over 100 years. Ex.: CO<sub>2</sub>=1; N<sub>2</sub>O=298; CH<sub>4</sub>=28.

## Potential annual carbon sequestration (COMET-P)



	Cover Crops (mtCO <sub>2</sub> e/acre)			No-Till (mtCO <sub>2</sub> e/acre)		
	Mean	Min	Max	Mean	Min	Max
Heartland	<b>0.282</b>	<b>-0.121</b>	<b>1.900</b>	<b>0.549</b>	<b>-0.087</b>	<b>1.376</b>
Northern Crescent	0.089	-0.089	0.778	0.452	-0.087	1.199
Northern Great Plains	0.047	-0.388	0.353	0.274	-0.148	0.771
Prairie Gateway	0.146	-0.408	1.285	0.331	-0.255	1.359
Eastern Uplands	0.353	-0.111	1.925	0.502	-0.015	1.406
Southern Seaboard	0.297	-0.099	1.925	0.430	-0.015	1.362
Fruitful Rim	0.188	-0.998	1.680	0.287	-0.475	1.569
Basin and Range	0.027	-0.998	0.788	0.133	-0.475	1.307
Mississippi Portal	0.615	-0.153	1.982	0.504	-0.010	1.433
U.S. Total	<b>0.230</b>	<b>-0.998</b>	<b>1.979</b>	<b>0.413</b>	<b>-0.475</b>	<b>1.569</b>

## Projections using economic model and COMET-P\*

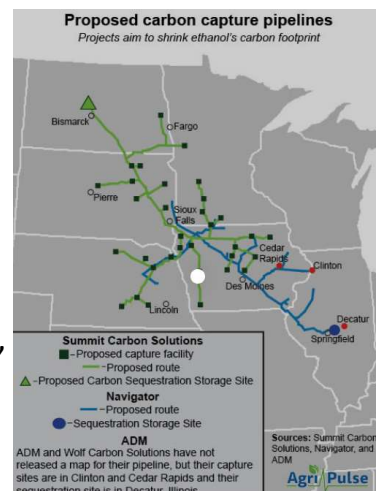
- Carbon farming using CC and NT could generate between \$700 million and \$1.2 billion in private net returns to U.S. farmers.
- CC adoption and NT adoption could reach up to 20% and 80%, respectively.
- **GHG sequestration potential less than half of previous projections**
- Results are very optimistic, consider as upper bound

\*Plastina, Jo, and Wongpiyabovorn. 2024. "The Business Case for Carbon Farming in the USA." *Carbon Balance and Management* 19:7. <https://doi.org/10.1186/s13021-024-00253-5>.

## Energy Tax Credits Under the Inflation Reduction Act of 2022

## Carbon Capture & Sequestration by Ethanol Plants: 45Q Federal Tax Credit

- Incentivizes carbon capture at the point of emissions and permanent sequestration by injecting the liquified carbon into underground saline formations.
- **45Q credit is \$85 per MT CO<sub>2</sub> geologically sequestered.**
- Potential additional annual revenue for US ethanol industry: \$3.75 billion (2X the after-tax income from ethanol production)\*
- Limitations: cost of CC&S, distance from saline formations, pipelines, actual income to offset tax credits against, discounted 45Q credits in secondary market.
- **How much passed through to Iowa farmers?**



\*Source: *farmdoc daily* (14): 34. Feb 19, 2024.

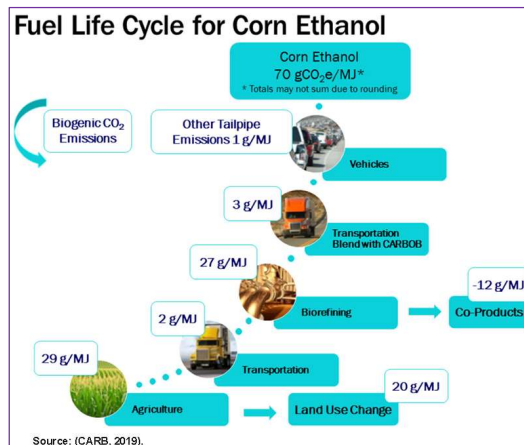
## Sustainable Aviation Fuel Credit: 40B Federal Tax Credit (2023 & 2024)

- Incentivizes the production of SAF that achieves a farm-to-fumes GHG emissions reduction of at least 50% as compared with petroleum-based jet fuel.
- **40B credit is \$1.25 to \$1.75 per gallon of SAF.**
- 1 GL SAF = 1.7 GL Ethanol
- Domestic airlines consume 15.8M GL SAF (2022)
- Goal: 200X to 3B GL SAF by 2030
- **Corn ethanol-to-jet fuel:** “bundle” no-till, cover crop, and enhanced efficiency fertilizer.
- **Soybean-to-jet fuel:** “bundle” no-till and cover crop.

→ **What % of tax credit will be passed on to farmers through price premiums for low CI grain?**

Sources: *US Dept. of the Treasury*; *farmdoc daily* (14):39.

Example: California GREET  
Ethanol < 42.3 gCO<sub>2</sub>e/MJ to qualify





## Clean Fuel Production Credit: 45Z Federal Tax Credit (2025-2027)

- 45Z credit = \$0.20 X tons of Clean Fuel sold X Emissions Factor (Note: \$0.35 for SAF)
- Emissions Factor = 1- (kg of CO<sub>2</sub>e per mmBTU/ 50)
- Bonus: base amount increases to \$1 (\$1.75 in the case of SAF) if certain wage and apprenticeship requirements are met.
- Federal agencies are developing rules and models for the 45Z tax credit.

**Table 1. Estimated §45Z Clean Fuel Production Credit Values**

Estimated credit per ton of fuel produced, by fuel type and compliance with wage and apprenticeship requirements, at assumed CO<sub>2</sub>e emissions rates

Assumed kilograms of CO <sub>2</sub> e per mmBTU	Emissions Factor	Does not meet W&A reqs	Meets W&A reqs
<b>Nonaviation Fuels</b>			
0 kg. / mmBTU	1.0	\$0.20	\$1.00
10 kg. / mmBTU	0.8	\$0.16	\$0.80
25 kg. / mmBTU	0.5	\$0.10	\$0.50
40 kg. / mmBTU	0.2	\$0.04	\$0.20

→ What % of tax credit will be passed on to farmers selling low CI corn and soybeans?

Sources: <https://crsreports.congress.gov/product/pdf/IF/IF12502>

## Is Carbon Farming Profitable in Your Farm?

- DECISION TOOL: Ag Decision Maker File A1-78
- <https://go.iastate.edu/B46UXX>
- 66 practices for working croplands
- Payments per practice vs. per sequestration
- Cost share payments
- By county for all U.S. states

pdf Net Returns to Carbon Farming in Iowa Other States

### Net Returns to Carbon Farming

The accompanying spreadsheet (AgDM Decision Tool A1-78, [Net Returns to Carbon Farming in Iowa](https://go.iastate.edu/B46UXX)) is a decision tool to evaluate the net returns to a carbon farming contract, based on the following attributes:

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## Questions to Ask before Signing a Carbon Contract

- What practice changes does the contract require?
- How is carbon sequestration, removal or avoidance measured?
- How are additionality and permanence defined?
- When are payments made?
- Can you “stack” cost-share payments from NRCS or IDALS with carbon payments for the same practices on the same fields?
- What is the contract length? exit clauses?

## Questions to Ask before Signing a Carbon Contract

- What management data and verification are you required to provide? How often?
- How long will it take you to upload your data into their system?
- Is there free customer support to help you enter data into the online database?
- Is there free agronomic guidance to implement practices?
- What will your carbon sequestration be used for? inset, offset, low carbon-intensity market, etc.?

## Questions to Ask before Signing a Carbon Contract

- How frequently is the carbon removal or emission reduction measured through the life of the contract?
- What circumstances trigger temporary or permanent breach of contract? What are the associated penalties?
- Any requirements based on land ownership and tenure or leasing agreements?
- Will current “additional” practices be considered eligible for future carbon programs?

## Important

- Keep in mind that carbon contracts “are **written by the attorneys for the aggregators, the brokers, or the sponsoring organizations**” and they “**will be written in the best interest of those parties.**”

Kristine Tidgren, ISU Center for Ag Law and Taxation\*

\*Tidgren, Kristine. 2022. “Legal Considerations for Carbon Contracts.” Farm Foundation Forum: Solving the Barriers to Agricultural Carbon Markets. April 12.  
<https://www.youtube.com/watch?v=ey-ua-vT5y4>

## Concluding Remarks

- Conservation Practices provide multiple environmental benefits, but they are costly to implement
- Carbon farming can generate different types of carbon credits that can attract different prices
- Not all carbon farming initiatives allow for “stacking” payments
- When “stacking”, pay attention to timing of contracts
- Evaluate your costs and benefits and ask plenty of questions before signing contracts

## Extension Reports

### 1) **How to Grow and Sell Carbon Credits in US Agriculture**

<https://www.extension.iastate.edu/agdm/crops/pdf/a1-76.pdf>

### 2) **How Do Data and Payments Flow Through Ag Carbon Programs?**

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

### 3) **What's in Store for Voluntary Agricultural Carbon Markets?**

[https://www.card.iastate.edu/ag\\_policy\\_review/article/?a=136](https://www.card.iastate.edu/ag_policy_review/article/?a=136)

### 4) **Net Returns to Carbon Farming**

<https://go.iastate.edu/B46UXX>

### 5) **Carbon Farming: Stacking Payments from Private Initiatives and Federal Programs**

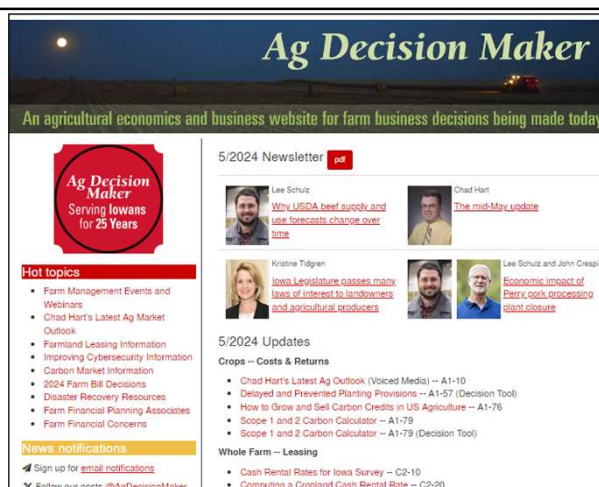
<https://www.extension.iastate.edu/agdm/crops/pdf/a1-40.pdf>

# Questions?

## Thank you for your time!



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<https://www.extension.iastate.edu/agdm/>

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## Concluding observation

- While carbon farming is driven by voluntary initiatives, USDA can indirectly affect the market scope for agricultural carbon credits (insets and offsets) via eligibility criteria and cost-share funding for conservation practices that sequester carbon.

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