

Carbon Markets and Agriculture in North Carolina

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Dept. of Ag and Resource Economics

**Workshop on Carbon Markets, Conservation
Practices, and Ag Labor**

Extension Annual Conference

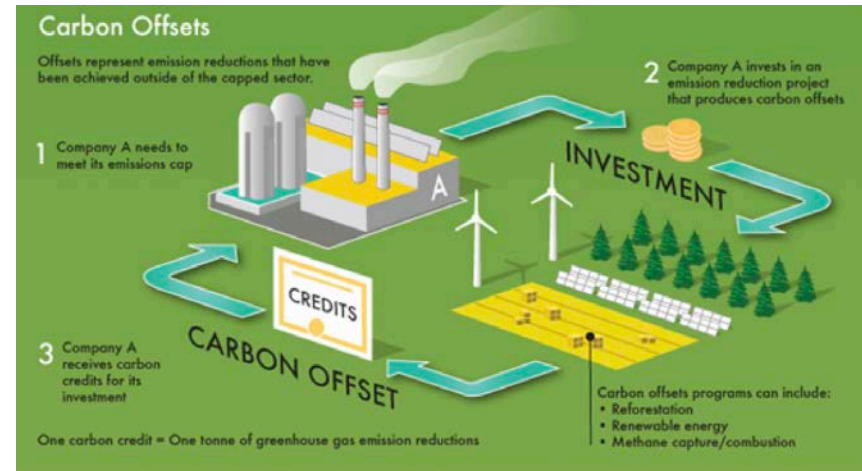
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Overview

- Greenhouse gasses like CO₂ contribute to climate change
- Regulatory and voluntary CO₂ reduction efforts → payments for CO₂
- Agriculture:
 - Reduce carbon emissions through less intensive practices
 - Capture and store carbon via partial or full land conversion
- Individual value proposition greatly depends on price of carbon

What is a Carbon Offset?

- Firms want/need to reduce emissions
 - Regulatory requirement
 - Voluntary
- Reductions from other sectors (like ag) might be cheaper
- Payment for offset is a “win-win”: same reduction, lower price



Carbon Accounting

ADDITIONALITY

GHG reductions that would not have occurred in the absence of a market for offset credits

- Difficult to determine
- Prone to manipulation
- Current practices
 1. Lack of prior use of practice by farmer
 2. County/regional average of prior adoption

CERTIFICATION

1. *Verify that a practice complies with program*
 2. *Document actual GHG reductions or carbon storage*
- Soil testing
 - Soil modeling
 - Questions regarding reversals
 - Limited centralized oversight

Carbon Credits in Ag

Potential Practices

- Decrease fertilization
- Alter manure management
- Reduce fuel consumption or use alternative fuels
- Conversion to grassland
- Afforestation
- Many more...

Current Payments

- No Till
- Cover Crops

Introduction to Carbon Markets

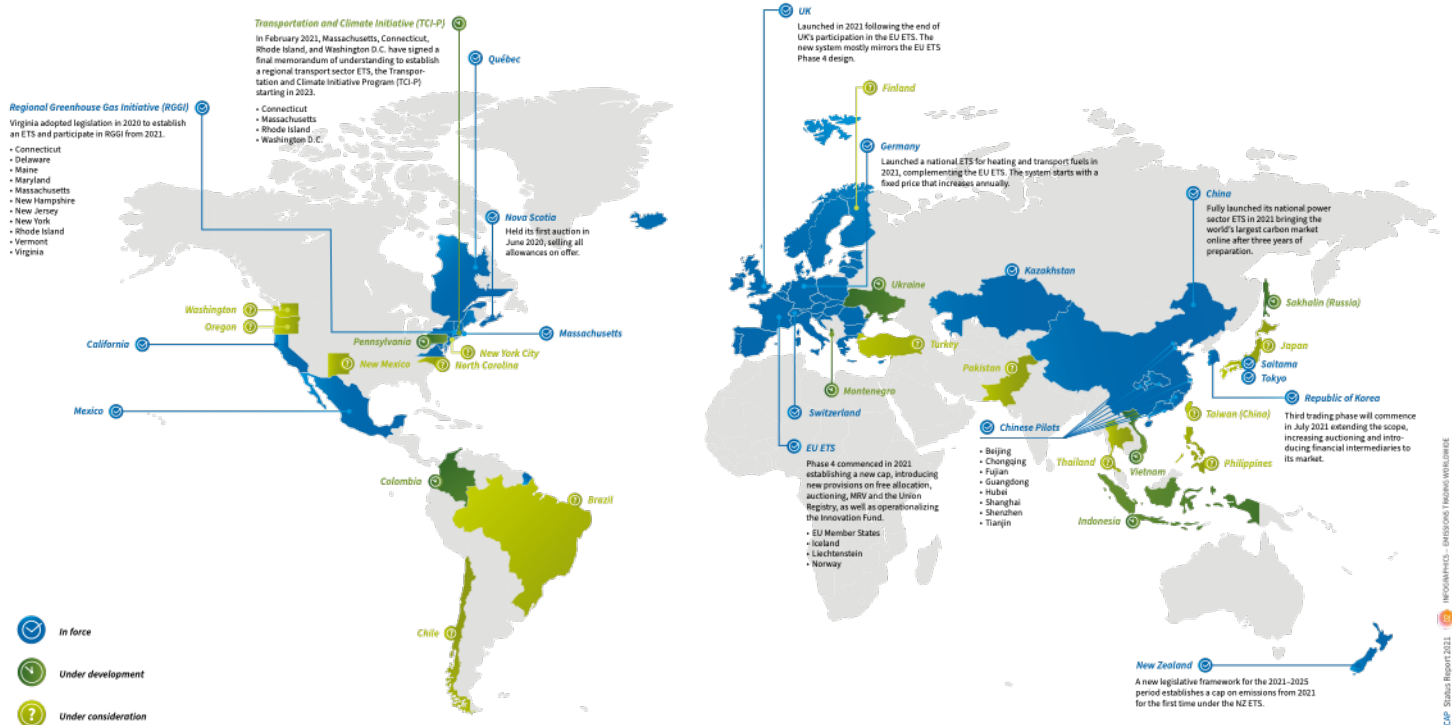
- Carbon markets are not universal and vary in design
 - Cap-and-trade
 - Offset markets
- We observe a price when there is a buyer and seller transacting in a market
- Price predictions are purely speculative

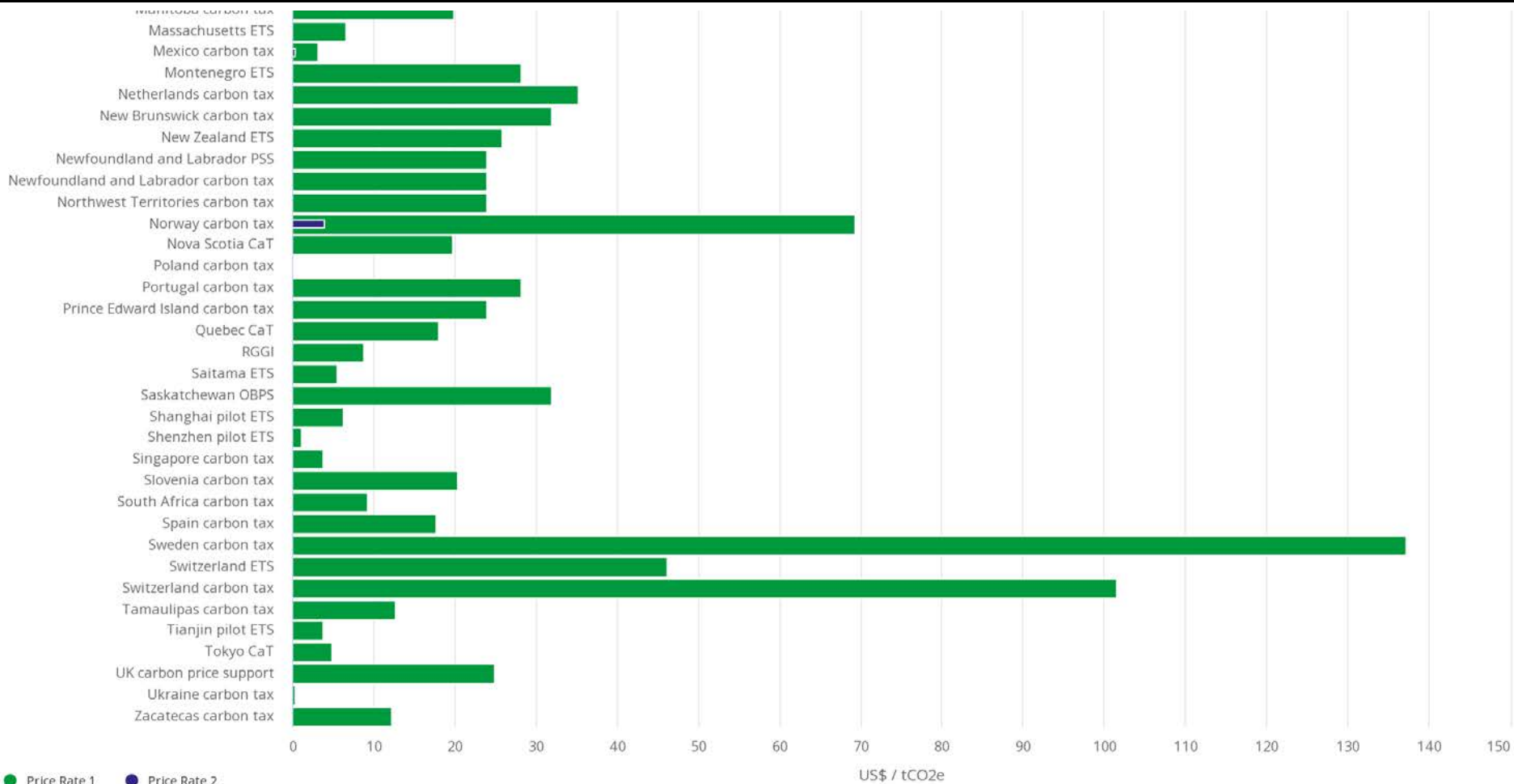
NO MARKET \leftarrow \rightarrow NO PRICE

Cap-and-Trade

- Also called an emissions trading scheme (ETS)
- Regulator establishes total allowable quantity of pollution
- Allocates allowances to regulated firms (1 allowance = 1 unit of pollution)
- Firms w/high abatement costs will buy allowances from firms with low abatement costs
- Allocation of reduction is determined by the market

Carbon Emissions Trading





Offset Markets

- Compliance:
 - Firms purchase offsets to comply with regulatory caps
 - Rules specify projects that can sell offsets
- Voluntary:
 - Individual firms contract with large firms or individual farmers
 - A firm connects buyers with projects (e.g. tree planting)

The Only Game in Town

- Voluntary markets are currently the only way N.C. farmers can sell carbon
- USDA is exploring ideas like a carbon bank, but this would require a national carbon market system
- Offset credits currently sell for ~\$15/mt of CO₂-eq
- Selling and monitoring are potentially costly
- Contracts are typically 10 years with exit penalties

Carbon Reduction Practices in N.C.

Practice	Crop Type	Breakeven Price (2010 \$/mt CO ₂ -eq)	Emissions Reduced (mt CO ₂ -eq/ac/yr)
Restoring Forested Wetlands	-	\$16-\$42	5.17
Restoring Grassy Wetlands	-	\$42-\$108	1.99
Retiring Marginal Soils		\$25-\$72	1.09
Conventional Tillage to No-Till	Corn	\$42	0.53
	Wheat	\$57	0.27
10% Reduced Fertilizer App.	Corn	\$26-\$194	.01-.08
	Wheat	<\$0	

Source: IFC International. 2013. "Greenhouse Gas Mitigation Options and Costs for Agricultural Land and Animal Production within the United States." Prepared by ICF International for U.S. Department of Agriculture Climate Change Program Office.

Getting Paid for Reducing Carbon in N.C.

- Several types of companies
 - Carbon credit entities (Indigo, Nori)
 - Carbon & ecosystem service credit entities (ESMC, SWOF)
 - Input suppliers (Agoro Carbon Alliance, Bayer Carbon, Corteva, Nutrien)
 - Data platforms (CIBO Impact, Gradable Carbon, TruCarbon)
- North Carolina eligibility varies
- No standardization across companies
 - Setup, rules, payments, penalties, and certification all differ
 - Price of carbon is generally around \$15/mt
 - Several companies are still in pilot phase

Examples

[Indigo](#) | carbon credit →

[Bayer Carbon](#)

[Soil and Water Outcomes Fund](#)

[Corteva](#)

[Gradable Carbon](#)

How your farm can earn more through Carbon by Indigo*

On average, farmers are estimated to generate 0.2-1 credits per acre in their first year and increase credit production over time.

<p style="font-size: x-small; color: #c00000;">MINIMUM PRICE PER CARBON CREDIT</p> <p style="font-size: 24px; color: #0070c0;">+</p> <p style="font-size: 18px;">\$15</p>	<p style="font-size: x-small; color: #c00000;">POTENTIAL GROSS INCOME FROM ENRICHING YOUR SOIL</p> <p style="font-size: 24px; color: #0070c0;">+</p> <p style="font-size: 18px;">Up to \$30+ / ac / yr</p> <p style="font-size: x-small;">paid in 5 installments vesting over 5 calendar years; results may vary</p>	<p style="font-size: x-small; color: #c00000;">POTENTIAL CARBON CREDITS / AC. / YR.</p> <p style="font-size: 24px; color: #0070c0;">+</p> <p style="font-size: 18px;">Up to 2 credits+</p> <p style="font-size: x-small;">achieved through sequestration or abatement</p>
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How Carbon by Indigo works

1: SIGN UP

2: MAKE CHANGES

3: RECORD DATA

4: CALCULATE IMPACT

5: ISSUE CREDITS

6: GET PAID

You map (or import) field boundaries and enroll in Carbon by Indigo.

You add new practices that increase soil carbon and reduce emissions on your farm, with agronomic support from Indigo.

You record your historical and current season management data in our web platform, and Indigo takes soil samples on a subset of fields.**

Indigo calculates the carbon credits produced by your farm, validates the findings with a verifier, and submits the results to a carbon registry.

Carbon registry issues carbon credits.

After Indigo sells credits to corporate buyers, you get paid for the carbon credits you produced.

Examples

[Indigo](#)

[Bayer Carbon](#) | input supplier →

[Soil and Water Outcomes Fund](#)

[Corteva](#)

[Gradable Carbon](#)

Up to \$9

per acre, per year

No-till/strip-till and cover cropping are powerful ways to support your yield potential and nutrient management over time, leaving healthier soil for future generations. With the Bayer Carbon Program, you may be able to get paid for climate-smart practices you've already implemented or plan to implement.

 <p>no-till /strip-till </p> <p>\$3 per acre, per year</p>	 <p>cover crops </p> <p>\$6 per acre, per year</p>	 <p>both</p> <p>\$9 per acre, per year</p>
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Examples

[Indigo](#)

[Bayer Carbon](#)

[SWOF](#) | carbon + es credits →

[Corteva](#)

[Gradable Carbon](#)

How the Farmer Enrollment and Payment Process Works



STEP 1. Use our farmer web portal at theoutcomesfund.com to create an account, map your field boundaries, and enter baseline and future cropping system information.



STEP 2. Review the proposed payment offering emailed to you within 1-2 weeks after data submission and determine if you wish to continue participate.



STEP 3. E-sign the contract emailed to you to confirm your participation in the Soil and Water Outcomes Fund, and receive 50% of your payment at signature.



STEP 4. Receive technical assistance from Soil and Water Outcomes Fund conservation agronomists as needed to implement conservation practices.



STEP 5. Receive remaining 50% payment after the crop year is complete and your farm's environmental outcomes are measured and verified.

Examples

[Indigo](#)

[Bayer Carbon](#)

[Soil and Water Outcomes Fund](#)

[Corteva](#) | input supplier →

[Gradable Carbon](#)

The screenshot shows a multi-step calculator interface for estimating carbon credit payments. It includes dropdown menus for state and county selection, radio buttons for different agricultural practices, and a final summary box with two program options: Corteva's Carbon Initiative and USDA Cost-Share EQIP.

1 Enter your location
 Select Your State: North Carolina
 Select Your County: Wake

2 Select your practice(s)
 I plan to:
 Only introduce cover crops
 Only switch to strip or no-till
 Both introduce cover crops & switch to strip or no-till

Before switching to strip or no-till, I implement:
 Intensive tillage
 Reduced tillage

Do you irrigate your fields?
 Yes
 No

Calculate My Payment

You could earn an estimated \$76 - \$93/acre/year

<p>CORTEVA</p> <p>Corteva's Carbon Initiative</p> <p>\$8 - \$11 Est. acre/year</p> <p><small>Estimate based on \$15/credit¹ We project you'll receive \$20/credit based on demand</small></p>	+	<p>FarmRate</p> <p>USDA Cost-Share EQIP²</p> <p>\$68 - \$82 Est. acre/year³</p> <p><small>Paid through the Environmental Quality Incentives Program (EQIP) and estimated by FarmRate</small></p>
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Examples

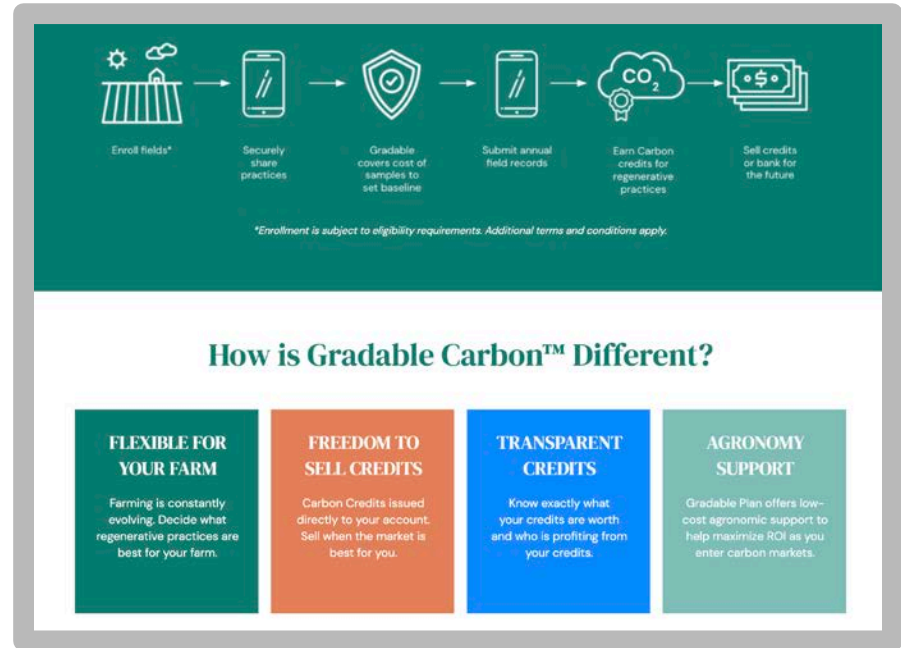
[Indigo](#)

[Bayer Carbon](#)

[Soil and Water Outcomes Fund](#)

[Corteva](#)

[Gradable Carbon](#) | platform →



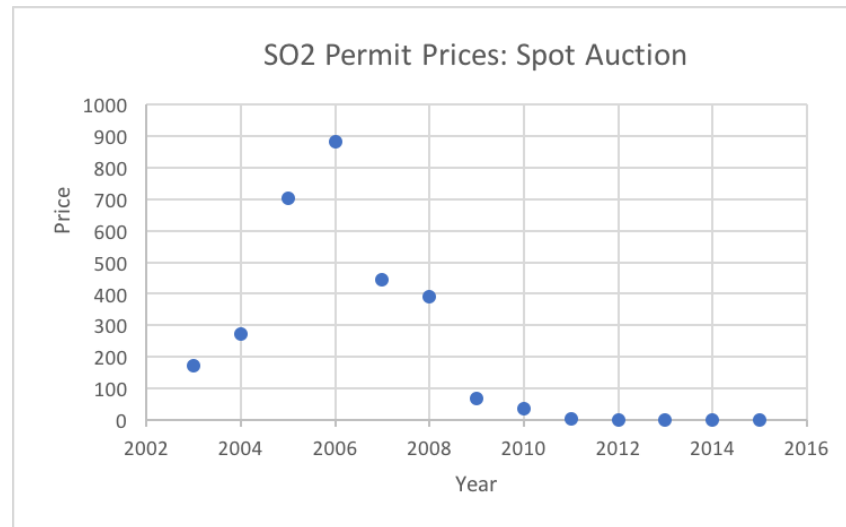
Case Study: California's Forest Offsets

- California ETS implemented a forest carbon offset program
- ~72 projects
 - More than 130M credits
 - \$1.8B (~\$14 per ton of CO₂)
 - 20-39M credits didn't preserve additional carbon in forests but did allow polluters to emit more CO₂

Source: *ProPublica* and *MIT Technology Review*

Case Study: Uncertainty in SO₂ Market

- 2008-2010: New federal pollution guidelines regulating location of SO₂ emissions
 - Mid 2007 permit price: \$600 per ton
 - 2010 permit price: \$5 or less



Resources

Companies

- [Bayer Carbon](#)
- [Soil and Water Outcomes Fund](#)
- [Corteva](#)
- [Gradable](#)
- [Indigo](#)
- [ESMC](#)
- [Nori](#)

Information

- [Comparison of offset companies \(Iowa State\)](#)
- [Discussion of soil carbon offsets \(Green Biz\)](#)
- [Report on ag carbon mitigation options \(USDA\)](#)
- [Questions farmers should ask about carbon credit \(U. of Illinois\)](#)

Questions?

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