

Bioenergy and Ecosystem Services – What's Next?

April 27, 2020

NC Climate Webinar Series

David Ripplinger

Bioproducts/Bioenergy Economics Specialist

NDSU Extension

Bioenergy and Greenhouse Gases

Renewable Fuel Standard (RFS) is a federal policy mandates the use of biofuels by type and year

New biofuels must be approved by EPA and are then assigned to the appropriate biofuel type based on the feedstock, conversion technology, biofuel produced AND most importantly the carbon intensity of the biofuel.

Carbon intensity, or greenhouse gas footprint, is the amount of greenhouse gases released during the production and use of a product.

Advanced Biofuels and LCAs

Lifecycle assessments are used to measure GHG emissions and other environmental impacts

Conventional biofuel (corn-ethanol)

GHG Reduction \geq 20%

Advanced biofuel

GHG Reduction \geq 50%

- Cellulosic biofuel (cellulosic feedstock)

- Biodiesel



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Category	Example/Suggested Data for LCA		Source
	Value	Units	
Composition			
Moisture (%)		delivered	
Hemicellulose (example)		% on dry basis	
Cellulose (example)		% on dry basis	
Lignin (example)		% on dry basis	
Cultivation			
Yield Growth		% yield change / yr	
Crop Yield (Current)		dry tons/acre	
Crop Yield (projected, 2022)		dry tons/acre	
Irrigation			
Soil management (till/no till)			
Harvested acres (current/most recent)		acres	
Harvested acres (projected, 2022)		acres	
Crop Inputs			
Nitrogen Fertilizer		lbs/acre	
Phosphorus Fertilizer		lbs/acre	
Potassium Fertilizer		lbs/acre	
Herbicide		lbs/acre	
Insecticide		lbs/acre	
Fungicide		lbs/acre	
Lime		lbs/acre	
Diesel		gal/acre	
Gasoline		gal/acre	
Electricity		kWh/acre	
Other			
Renewable Fuel Production Yields			
Conversion Rate (current)		gal/unit biomass	
Yield Growth		% yield change / yr	
Type/Amount of Coproducts Produced			
Lignin (example)		amount produced per gallon of fuel	
Use of Co-products			
Lignin (example)			

Source: US Environmental Protection Agency

California's Low Carbon Fuel Standard

Mandates ever declining carbon intensity of transportation fuel used in the state.

Allows firms to trade excess credits to those who are short.

- Incentivized incremental changes in carbon intensity.
- Incentives are large enough to invoke changing behavior
- Program is proven and accepted.



Externalities and the Environmental Lens

Externalities – exist when market prices don't fully capture costs/benefits

Looking at systems through an environmental lens sometimes leads to businesses to identify ways to be more profitable and benefit the environment.

doing good while doing well

Monthly LCFS Credit Transfer Activity Report for March 2020

Posted on 4/12/2020

Current Time Period

Time Period	Transfers¹ (numbers)	Total Volume^{1 2} (credits-MTs)	Avg. Price^{1 3} (\$ per Credit)
Mar-20	233	2,312,000	\$199

Previous Three Months

Time Period	Transfers¹ (numbers)	Total Volume^{1 2} (credits-MTs)	Avg. Price^{1 3} (\$ per Credit)
Feb-20	84	581,000	\$206
Jan-20	240	1,895,000	\$200
Dec-19	217	2,216,000	\$197

Previous Three Quarters

Time Period	Transfers¹ (numbers)	Total Volume^{1 2} (credits-MTs)	Avg. Price^{1 3} (\$ per Credit)
Q1 2019	557	4,788,000	\$201
Q4 2019	548	4,912,000	\$196
Q3 2019	414	3,680,000	\$194

Previous Years

Time Period	Transfers¹ (numbers)	Total Volume^{1 2} (credits-MTs)	Avg. Price^{1 3} (\$ per Credit)
CY 2019	1,656	14,146,000	\$192
CY 2018	1,725	13,334,000	\$160
CY 2017	1,226	8,875,000	\$89

Midwest Corn

One of the challenges of the current LCFS is that it identifies the majority of corn used in biofuel production as a homogenous material in terms of carbon footprint.

Very much untrue. Variations in production practices, input levels, yield, and carbon sequestration.

No till

The most promising opportunity for reducing the carbon intensity of corn used for ethanol is conservation tillage.

If no-till corn was recognized as distinct from conventional 'Midwest' corn the value created is significant

--400 lbs/CO₂ sequestered x \$200/MT ~\$35 per acre

Think of a farmer faced with the value proposition of being paid \$35/acre/year for practicing no-till.

What's missing?

California Air Resources Board wants accurate and precise tracking of sequestration at the field level.

Not an easy task.

ARPAe and CARB are working to develop systems that track field level GHG capture and emissions

The Private Sector

The private sector and various non-profits (Environmental Defense Fund, National Resources Defense Council, World Wildlife Fund) have been actively engaged in supporting and documenting environmentally sustainable practices.

Usually independent of land-grant university of system.

Interest was extremely high prior to Covid-19 pandemic.

Coordinating Organizations

Field to Market

Ecosystem Market Services

US agriculture secretary breaks ranks to endorse carbon pricing

Sonny Perdue is first Trump cabinet member to back policy



Sonny Perdue: 'If it is a social goal and social priority there, then let's put a price over carbon emissions' © Reuters

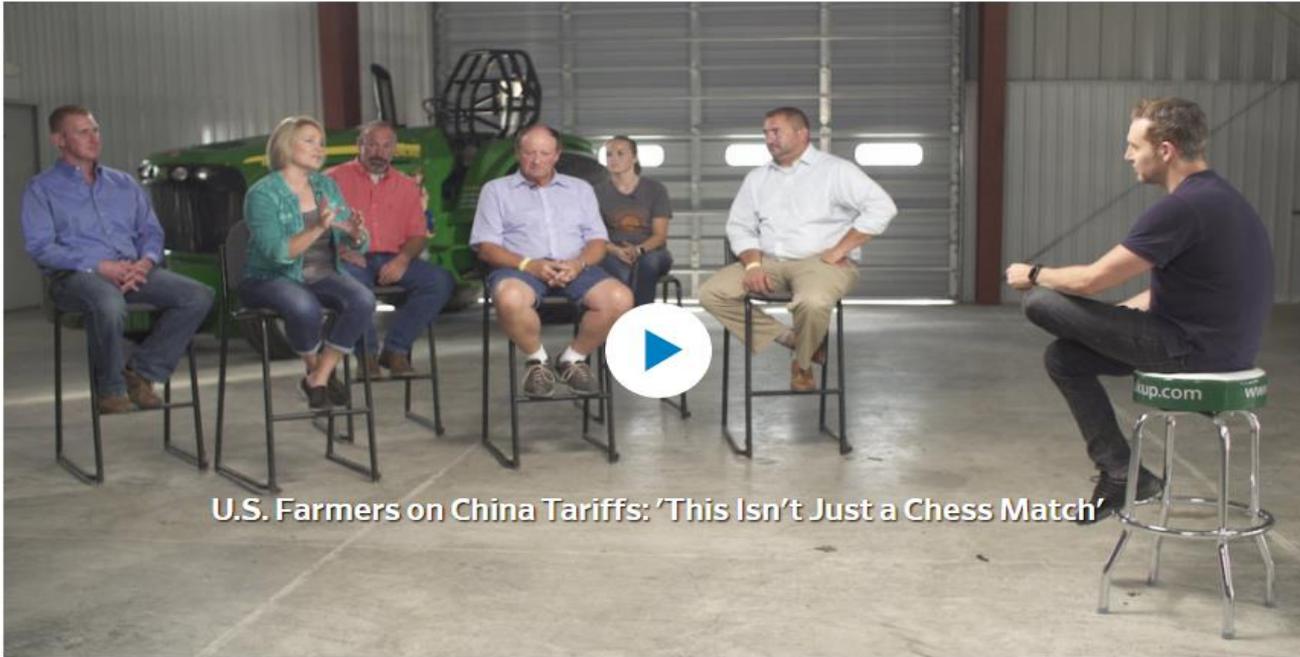
Financial Times, February 20, 2020

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How to Get Rid of Carbon Emissions: Pay Farmers to Bury Them

'Regenerative growing practices' sequester in the soil carbon released from burning fossil fuels



U.S. Farmers on China Tariffs: 'This Isn't Just a Chess Match'

The trade war with China is putting a strain on the U.S. agriculture industry. WSJ's Jason Bellini sat down with a group of farmers from the corn, beef, soybean, and dairy industries to hear how tariffs are affecting their businesses.



By [Greg Ip](#)
Sept. 11, 2019 10:24 am ET

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Stop se
Why

Wall Street Journal, September 11, 2019

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Beyond Carbon

Carbon (Greenhouse gas) emissions receive the lion's share of attention, but are clearly just one ecosystem service.

Others are recognized, but do not yet have the policy or market support to drive innovation like carbon today.

What's Next?

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COVID-19's Impact

Covid-19 is leading to a number of structural upheavals.

- Households have declining incomes, wealth, and increasing uncertainty
- Private business has seen rapid demand destruction and supply chain breakdowns
- Politically, focus is on managing the spread of the virus and preserving the economy, including the agricultural economy.

Where do we go from here?

The economy will rebound.

The value of most assets will recover.

Many individuals will suffer severe and permanent economic and social displacement.

Many small businesses/industries will never return.

What does this mean for
consumer behavior & voter preferences?

David Ripplinger

Bioproducts/Bioenergy Economics Specialist

NDSU Extension

david.ripplinger@ndsu.edu

701.231.5265