

15. Measurement of Carbon Emissions by Kansas Agribusiness Retailers

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Abstract/Summary

Retail agribusinesses are exempt from the proposed cap and trade legislation passed by the U.S. House of Representatives. However, it is not clear what future proposed regulations might look like. The objective was to estimate the impact of the regulation to determine a baseline cost for Kansas cooperative agribusiness retailers. The cost of compliance (if they were not exempted) for the larger cooperatives was less than \$10,000 per location and the average locations had emissions much less than 25,000 tons per year. The main impact of the proposed regulation is likely to be higher fertilizer and energy prices which would be passed on to the retailers (and presumably producers) by wholesalers.

Carbon emissions by Kansas Retailers

2010 Risk and Profit Program

K-State Alumni Center

Presented by
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Background

- American Clean Energy and Security Act (Waxman-Markey Bill) of 2009.
- Cap and trade.
- Covered entities: 25,000 Mt CO₂
- Agriculture is not covered.



Objective

- No information is available on the extent of CO₂ emissions emitted by agribusiness retailers and the possible effects of climate legislation.
- **Objective:**
To evaluate carbon dioxide emissions by agribusiness retailers in Kansas and the compliance cost based on their current level of emissions.



Data

- Not a randomized designed experimental data
 - Test retailer
 - Retailers were invited to participate
- Nine agribusiness retailers in Kansas (2007-08)
 - More than 100 locations with a grain elevator, fertilizer plant, feed plant or bulk plant
- Acreage: market share
- Energy use
 - Office building, vehicles, grain elevators.



Data

- Mean electricity and fuel consumption across retail operations, 2007-2008

Year 2007	Mean	Maximum	Minimum	Standard Deviation
Electricity ^a	3,307,877	19,774,646	11,234	7,278,393
Diesel ^b	91,936	294,796	4,321	95,707
Gasoline	13,891	25,865	4,431	7,078
Natural Gas ^c	76	478	0	178
Propane	607	4,250	0	1,606
Ethanol	136	949	0	359
Year 2008	Mean	Maximum	Minimum	Standard Deviation
Electricity	613,935	1,434,260	12,987	535,542
Diesel	75,930	135,611	4,456	49,252
Gasoline	13,385	22,276	3,987	7,337
Natural Gas	130	712	0	287
Propane	1,191	5,670	0	2,272
Ethanol	0	0	0	0

^a Electricity is expressed in kWh units.

^b Diesel, gasoline, propane and ethanol are expressed in gallons.

^c Natural gas is expressed in MCF.



Data

- CO₂ emission factors

Electricity and Fuels	Direct kg CO ₂ e / unit	Upstream kg CO ₂ e / unit
Electricity (kWh) ^a	---	0.788
Natural Gas (MCF) ^b	55.79	12.61
Propane (gallon)	6.12	1.16
Gasoline (gallon) ^c	8.80	1.98
Diesel (gallon)	10.10	1.58

^aEmissions from electricity include emissions from the generation of electricity (U.S. Department of Energy 2002) and from the production and transport of fuels employed for electricity generation (West and Marland 2002).

^b Natural gas and propane factors from Deru and Torcellini (2007).

^c Direct emission factors for gasoline and diesel are from EPA (2005) and the upstream factors are from Ecoinvent (2009).



Calculation of CO₂ emissions

- Direct and upstream emissions:

$$CDE^D = \sum_i (IR_i \times EF_i^D)$$

$$CDE^U = \sum_i (IR_i \times EF_i^U)$$

- Total emissions:

$$Total\ emissions = CDE^D + CDE^U$$

where:

CDE^D = Direct CO₂ emissions

CDE^U = Upstream CO₂ emissions

IR = Energy input rate

EF = Emission factor

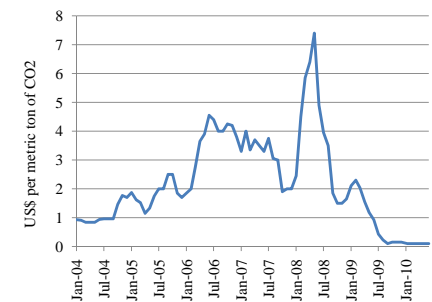


Cost of CO₂ emissions

Scenarios

- Prices
 - \$0.10 (Current CCX price)
 - \$7.40 (Highest CCX price)
 - \$13 (Projected price by U.S. EPA)
- Compliance level
 - 10%
 - 25%
 - 100%

Historical CO₂ prices in the Chicago Climate Exchange



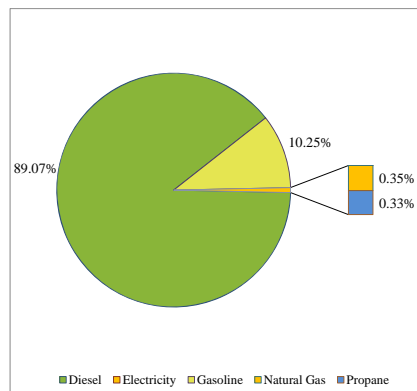
Data obtained from: Chicago Climate Exchange market information <http://www.chicagoclimatex.com/>

CO2 emissions by agribusiness retail operations

Direct, upstream and total CO2e emissions (MT)

Retailer	Direct	Upstream	Total
A	833	1,326	2,160
B	517	535	1,052
C	1,181	382	1,562
D	105	31	135
E	3,103	16,072	19,176
F	1,014	864	1,877
G	1,204	462	1,665
H	2,572	1,802	4,374
I	911	4,896	5,807
Average	1,271	2,930	4,200

Sources of direct carbon emissions



Cost of CO2 emissions

Value of CO₂ Emissions under Three Different Compliance Levels (10%, 25%, and 100%) and Three Different Prices (\$0.10, \$7.40, and \$13.00)

	\$ 0.10 MT CO ₂			\$ 7.40 MT CO ₂			\$ 13.00 MT CO ₂		
	10%	25%	100%	10%	25%	100%	10%	25%	100%
Average (1,271 MT CO ₂)	\$13	\$32	\$127	\$941	\$2,351	\$9,405	\$1,652	\$4,131	\$16,523
Maximum (3,103 MT CO ₂)	\$31	\$78	\$310	\$2,296	\$5,741	\$22,962	\$4,034	\$10,085	\$40,339
Minimum (104 MT CO ₂)	\$1	\$3	\$10	\$77	\$192	\$770	\$135	\$338	\$1,352

- If these retailers had to comply the cost would be low even for the highest emitter.



Conclusions

- None of the nine retailers had locations that could be subject to the current cap and trade bill passed by the House of Representatives.
 - unlikely that local agricultural retailers will be subject to the proposed cap and trade legislation proposed by Congress.
- Grain marketing agribusiness had lower direct emissions than agribusinesses with a strong agronomic component.
- In the case that agribusiness retail operations were regulated and had to comply with carbon offsets, the cost would be low.



Implications

- A cap and trade program will be established and carbon dioxide emissions will be restricted in the near future if this bill is enacted.
- Primary energy suppliers constrained → affect end-energy users.
- Carbon sequestration from crop land → offsets
 - Supplied by cooperative members?

