

Agriculture and Carbon Trading

Greenhouse Gases and Offsets

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Conservation and Development (CNY RC&D)**

**New York State alone, contributes
nearly 1% of global greenhouse
gas emissions.***

Reducing Greenhouse Gases Within Agriculture

What are the gases of concern?

How much does agriculture contribute?

How can agriculture be accountable for its own emissions?

*US EPA, Energy CO2 inventories

Gases of Concern:

Carbon Dioxide (CO ₂):	fossil fuel combustion
Methane (CH ₄):	cow rumen, manure
Nitrous Oxide (N ₂ O):	nitrogen fertilizer

Different greenhouse gases have different
Global Warming Potential (GWP):

1 unit of CO₂ = **1** CO₂equivalents

1 unit of CH₄ = **23** CO₂equivalents

1 unit of N₂O = **298** CO₂equivalents

ENERGY Use Analysis Of NY Dairy Herd.

We start with energy because use of fossil energy is the dominant source of Greenhouse Gas Production.

NY DAIRY INDUSTRY		ENERGY	
700,000 milking cows	10 ⁹ BTU	%BTU	
FEED			
Nitrogen	5,174	31%	←
Phosphorus	298	2%	
Potassium	288	2%	
Lime	905	5%	
Herbicides	663	4%	
Insecticides	47	0%	
Tractors	3,933	24%	←
Seed	1,369	8%	
FEED Total	12,678	76%	
Feed transport ¹	1,010	6%	
Milk transport ²	1,617	7%	
Dairy farm electricity	2,202	10%	←
TOTAL for dairy system	17,507	100%	

Greenhouse Gas (GHG) Analysis of NY Dairy Herd

NY DAIRY INDUSTRY	GREENHOUSE GASES	
700,000 milking cows	MTCO ₂ e	%CO ₂ e
Nitrogen	1,281,679	20%
Phosphorus	58,571	1%
Potassium	31,456	0%
Lime	252,127	4%
Herbicides	43,477	1%
Insecticides	2,277	0%
Tractors	429,226	7%
Seed	85,644	1%
FEED Total	2,184,457	(34%)
Feed transport ¹	73,874	1%
Milk transport ²	117,121	1%
Dairy farm electricity	230,172	3%
Enteric CH₄	2,446,107	38%
Manure management		(23%)
CH ₄	938,277	15%
N ₂ O direct	297,846	5%
N ₂ O indirect	223,384	3%
TOTAL for dairy system	6,511,238	100%



Methane and Nitrous Oxide contribute 75% of total farm Global Warming Potential (GWP)

Farm GWP By By Source		Farm GWP By Greenhouse Gas	
	%		%
Cow + Manure	61	CH ₄	53
Feed production	35	N ₂ O	22
Mechanical	9	CO ₂	25

75

NY Dairy contributes
6.5 million metric tons of CO₂equivalents!

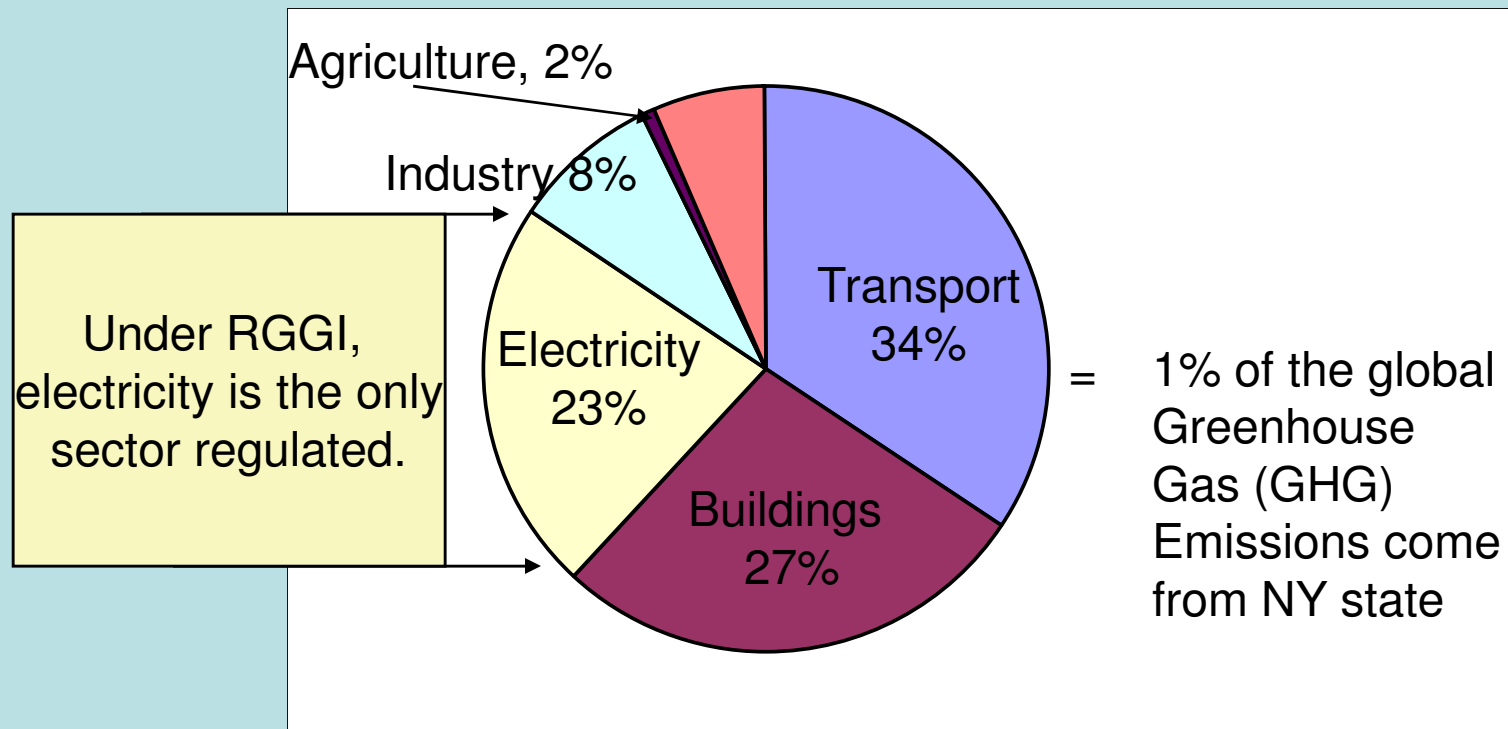
Daily Spread vs Liquid Storage

- Lagoons address important water issues
- Lagoons produce large amounts of Methane, CH₄

Methane emissions from three major manure management strategies (1992, NY, EPA)

	% practice	% methane emissions
Liquid/slurry	20%	47%
Solid storage	10%	12%
Daily Spread	70%	41%

Some Perspective: NY Ag Contributes ~2% of NY GHG



Pataki greenhouse gas report, slightly modified

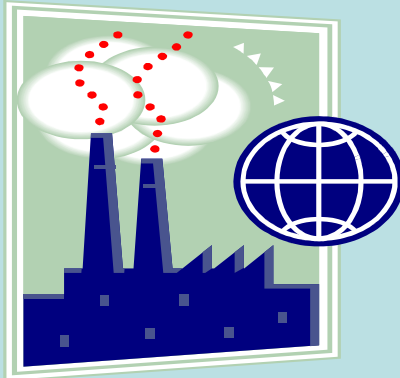
Electricity is Regulated First under RGGI

- Electricity contributes ~23% of State emissions
- For the quantity to be regulated, there are relatively few power plants
- Easy records to follow, relatively easy to regulate.

Anything farms or other sectors do at this time to reduce greenhouse gases is voluntary

Cap & Trade for Electricity CO₂

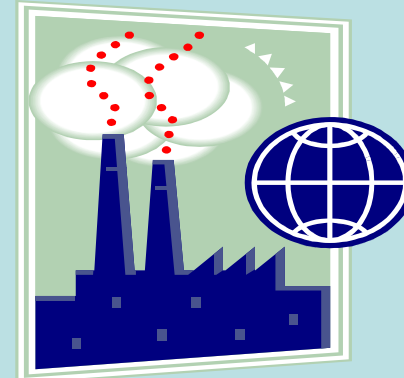
Plant A



Government sets Cap

CAP: 800 Tons

Plant B



BEFORE: 500 Tons
Allowance: 400 Tons
Activity: NONE, too cost prohibitive
Reductions: 0 Tons
Purchase: 100 Tons

BEFORE: 500 Tons
Allowance: 400 Tons
Activity: \$spent on site exceeds requirements
Reductions: 200 Tons
Sell: 100 Tons

To meet its compliance requirements Plant A can purchase

Allowances from another plant or

Offsets (greenhouse gas reductions achieved by other non-regulated parties) from agriculture or forestry.

Offsets: How Ag gets into the carbon-trading market

- Electric plants are the *first* to be regulated.
- The power plants can 1) reduce their own emissions or 2) buy another plants allowances 3) buy offsets from greenhouse gas emission reductions *outside* of the electric sector

Offsets are greenhouse gas reductions achieved by non-regulated market participants. Greenhouse gas mitigation achieved by non-regulated parties can be purchased as offsets by a regulated power plant to meet the required cap.

Some perspective: 1 farm

Looking only at Bob Aman's AD

Possible saleable offsets by type (in CO₂e) at AA Dairy (for 2004):

Back of the envelope calculations

Potential AA Dairy credits	Metric Tons CO ₂ e
Liquid manure CH ₄	1,244
AD Intentional CH ₄	2,431
On Farm Electricity	115
Electricity (grid sale)	19
Total	3,809

The maximum credits Bob could sell from his Anaerobic digester
In 2004, would be 3,800 metric tons of CO₂e.

Your Credits and the Futures Market:

Possible saleable offsets by type (in CO₂e) at AA Dairy (annual basis):

Back of the envelope calculations

Potential AA Dairy credits	Metric Tons CO ₂ e	CCX February, 2006	ED sales of credits*	European Market February, 2006
Price/MT CO ₂ e		\$2.15	\$8.00	\$29.95
Liquid manure CH ₄	1,244	\$2,674	\$9,952	\$37,262
AD Intentional CH ₄	2,431	\$5,227	\$19,448	\$72,831
On Farm Electricity	115	\$247	\$920	\$3,445
Electricity (grid sale)	19	\$40	\$152	\$557
Total	3,809	\$8,189	\$30,472	\$114,095

*On ED (Environmental Defense, max price is currently \$8/ton, only 6,000 tons have sold total on that site)

CO₂e are Carbon Dioxide Equivalents are the units of carbon trading. This unit accounts for the difference in the global warming potential of Methane (CH₄) and Nitrous Oxide(N₂O), two common agricultural gases.

AA Dairy C-trading Assets 1998-2005

Potential AA Dairy credits	Metric Tons CO ₂ e	ED Minimum price August, 2006
Price/MT CO ₂ e		\$4.00
Liquid manure CH ₄	1,244	\$4,976/yr
Total from 1998-2005	9,952	\$39,808

*Remember, a power plant wants to buy ~30,000 metric tons

*Over 8 years of operation, Bob has only accrued ~10,000 metric tons

Bob's digester on ED website ~ \$5,000/yr (1,250 metric tons).
Over 8 years of operation ~ \$40,000 (10,000 metric tons).

How a farm's credits get sold

- First, farm/land activities are evaluated. If the activities are eligible then the practice is documented (share information with an aggregator). This is called a baseline.
- Aggregator draws up a contract. If participant agrees, contract is sent to verifier.
- Certified 3rd party verifier reviews contract and visits site to inspect.
- If the activities pass inspection, verifier sends letter to aggregator and registry verifying the credits.
- The registry lists the tons on their exchange.
- A buyer purchase the credits and credits are retired.

3rd Party Verifiers - sharing the litigation

- 1) are certified to evaluate any aggregators calculations in one or more areas
- 2) may be certified with one or more registries
- 3) evaluate numbers and visit site
- 4) write a letter 'verifying' the activities

Typical language:

Based on its review, _X_ has verified the information submitted by _Y_ as being consistent with the attached monitoring, reporting and verification protocol. _Z_ has registered a total of 8,008 metric tons of CO₂ equivalent emissions reductions in 2003 and 5,893 tons of CO₂e reductions in 2004 conditioned on the following findings and adjustments.

Registry – monitoring credits

- Registries are full life cycle accounting of purchases and sales of credits w serial numbers.
- Registries are responsible for maintaining records of verification, transactions, etc.
- Registries retire credits once they have been used to offset emissions.
- Registries while not yet unified, will be cross-referenced if there is a national system to ensure no double accounting of credits

Variety of Markets: Different prices, different requirements

- There are several potential markets (CCX, ED, RGGI)
- Each market has different rules
 - Types of credits (anaerobic digestion, forestry)
 - Start date (of farm activity)
 - Quantity of credits earned from an activity
 - Price per carbon credit
- Until there is a single market, differently acting farms can seek out the best options

Example, Start Date:

Bob Aman, installed digester before CCX rules, sell on the ED publicly traded site for individuals. Patterson Farms is eligible for CCX or ED but not RGGI.

Earning Range for Verifying/Registering 8 years of Bob's Credits at \$4/ton

value, costs, income	Metric tons	Current Value(\$)	Grant(\$)	Aggreg. Earn(\$)	Bob Earn(\$)
Credits from AA Dairy	10,000	40,000			
Aggregator Rate <small>(50% of credits sold)</small>				20,000	20,000
Verifier range \$1,000 - \$10,000 <small>(if several digesters)</small>	X tons	Xdollars	1,000-10,000		
Registry cost \$2,000 - \$10,000 <small>(if several digesters)</small>			2,000-10,000		
Lawyer to look over contracts			250-5,000		
TOTAL			3,250-25,000	20,000	20,000
Net profit selling credits at \$4.00/ton <small>(not including other AD)</small>				-5,000 16,750	20,000

Keep an Eye out for RGGI

- While CCX and ED credits are selling currently, they are voluntary trades
- RGGI (or a national policy) will make the demand stronger through regulation
- With Regulation:
 - the carbon will likely have more value
 - buyers and sellers will think more seriously

Conclusions:

- A voluntary registry exists (Chicago Climate Exchange)
- A regulatory market is beginning (Regional Greenhouse Gas Initiative signed by 9 NE states)
- An international market exists
- There are more aggregators out there now, ECC, CCC, AgCert, AgRefresh, NativeEnergy and others
- There is a large potential for the market value to increase

- There is increasing demand for carbon credits which may mean increasing pressure to sell
- The markets are rapidly changing so pay attention to the language of all contracts.