



Carbon Credits Economics: Manure Methane Destruction

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Methane is a natural byproduct of bacterial activity in anaerobic (low-oxygen) liquid manure storage structures. This source of methane is significant on farms that store all manure and milk house waste under anaerobic conditions.

Manure is exposed to oxygen when spread on fields, effectively halting the production of methane

In uncovered liquid manure storage structures, methane (CH₄) rises to the surface and passes into the atmosphere where it is more than 20 times as effective as carbon dioxide in trapping heat within the Earth's atmosphere. Methane is highly combustible and is readily oxidized to carbon dioxide (CO₂) and water (H₂O) by simply burning it. By this process, a significantly less potent greenhouse gas molecule is created and released into the atmosphere. For this reason, by covering a liquid manure storage structure and simply flaring the collected methane gas a dairy farm can qualify for 'carbon credits', even without generating electricity or using it for heat and displacing the greenhouse gases that would have been emitted from fossil-based energy.

Methane and other manure gases can be dangerous and should be taken seriously.

Find safety information at:

<http://www.biogas.psu.edu/pdfs/ManureGasCanBeDeadly.pdf>

There can be additional benefits to covering a manure storage structure. Odor control is a popular consideration. Also, the exclusion of precipitation by covering a lagoon increases the storage capacity of the structure and reduces manure hauling costs.

Disincentives also exist. The initial cost of the project and annual operating expenses can be considerable. Labor and management are required for successful operation. The project and operations must meet very specific criteria and be verified by an independent agency, for a fee.

On the reverse is a hypothetical example illustrating one method of analyzing the economics of covering a manure storage structure, taking carbon credits and reduced water hauling savings into consideration. This example is for demonstration only. Work closely with an aggregator and/or verifier to include actual values and firm estimates of revenues and expenses in any analysis.

Critical Thinking Questions

What season is the most crucial for the flare to work on a covered manure storage to produce the most credits?

Choices

This analysis was done based on current (April 2008) CCX rules and rates. One might also explore the economics of a private sale of offsets or wait for January 2009 to trade on the NE exchange, RGGI.

Biogas Collection & Flaring Assumptions:

400 mature dairy cows producing 25000 lbs milk/cow/year
 2.5 cubic feet of waste generated per cow per day
 1000 cubic feet manure and pailor waste enter the lagoon daily

Existing uncovered lagoon provides 26 weeks manure storage, typical
 Surface area of the lagoon is 18000 square feet
 Average annual net precipitation is 6 inches
 27 weeks manure storage by excluding precipitation
 \$0.07 per gallon to empty and haul manure from lagoon

annual savings to reduced hauling by excluding precipitation \$ 4,712

Lagoon cover	\$4.00	per sq ft, installed
total cost of cover, installed	\$ 72,000	
less any cost-sharing, rebates, etc.	\$ -	
net cost of cover:	\$ 72,000	7 year note 6.5% APR

annual debt service, cover \$ 13,128

eventual disposal cost, cover \$0.75 per sq ft. at end of 10 years service life
 2.00% APR
 annual amortized disposal cost, cover \$1,233

Biogas metering and flaring equip.		
Metering equipment, installed	\$ 7,500	total cost, installed
Flaring equipment, installed	\$ 22,500	total cost, installed
less any cost sharing, rebates, etc.	\$ -	
net cost of flare equip.	\$ 30,000	7 year note 6.5% APR

annual debt service, flare & meter \$ 5,470

Initial project cost \$ 102,000
 less cost offset for cover and flare above \$ -

annual repair & maintenance, all \$ 2,500

Net project cost: \$ 102,000

annual operating costs; utilities \$ 500

adds \$ 255.00 new debt per cow

annual labor costs; mgt, records, etc. \$ 1,500

gross annual cost during amortization \$ 19,818

Carbon Sales		
baseline CO ₂ e per cow per year	4.17	metric tons (CCX value)
baseline CO ₂ e per year	1668	metric tons
flaring efficiency	90%	(CCX std value)
CO ₂ e to market per year	1501	metric tons
value per metric ton CO ₂ e	\$6.00	(CCX market)
Gross value carbon credits per year \$ 9,007.20		
aggregator & verification fees	10.0%	
aggregator & verifier, annual total fees \$ 900.72		
additional marketing expenses/yr, total \$ -		

annual net carbon revenue \$ 8,106

Net cost per year, including eventual disposal \$11,512

Net cost per cow per year \$28.78

per cwt milk produced \$ 0.12

Break-Even Analysis

Acceptable 'cost of doing business in the community': odor abatement, GHG mitigation = \$0.60 per cow/year

Resulting break-even net carbon price \$14.52 per metric ton CO₂e

Work closely with an aggregator/verifier to determine project eligibility and to define actual values and firm estimates for any analysis.