Carbon Credits Economics: Manure Methane Destruction

Steve Bulkley & Jeni Wightman, Consultants

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 (CH_4) 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 (CO_2) and water (H_2O) 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 parlor 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 equipt:	$	30,000	7 *year note*	6.5% *APR*	

Initial project cost	$	102,000	**annual debt service, flare & meter**	$ 5,470
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	$ 19,618

Carbon Sales

baseline CO2e per cow per year	4.17	*metric tons (CCX value)*
baseline CO2e per year	1668	*metric tons*
flaring efficiency	90%	*(CCX std value)*
CO2e to market per year	1501	*metric tons*
value per metric ton CO2e	$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 = $0.00 *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.