

Agricultural Anaerobic Digestion Potential Offset Development in a Regional Cap and Trade System

**Agricultural Sector Carbon Market Workgroup Committee Meeting
August 15th 2008**

Anaerobic Digestion

An estimated 8% of US anthropogenic methane emissions result from manure management with dairy manure representing 43.3% of total.

Changes in animal management have resulted in an estimated CH₄ increase of 50% during the period 1990 – 2005 (US EPA Estimate)

Washington dairy operations generate approximately 450,000 dry tons of manure annually

Manure management activities (in Washington State) resulting from an estimated 250,000 annual average head (milking cows) is calculated at .024 MMT CH₄ or .495 MMTCO₂e (2007 ICF GHG Inventory

Methodology)

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Anaerobic digestion of manure with or without co-digestion of municipal solid waste (MSW) has the potential for reducing greenhouse gas emissions via three avenues:

- ✓ *Manure methane capture and conversion*
- ✓ *Organic municipal solid waste methane capture and conversion*
- ✓ *Fossil fuel emission reduction from use of biogas in combined heat and power generation & fuel substitution*

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Offset potential associated with anaerobic digestion of manure

Manure management practices associated with 1190 AU is used to calculate an estimated CH₄ emission of 405,615 Kg/yr

Assume that capture of all CH₄ emissions occur, the initial potential offset from CH₄ emission avoidance would be equal to 405,615 Kg/yr

The potential revenue from CH₄ capture and avoidance (2008 CCX values) would equal \$ 24,063.00 /yr

Example(s) based on analysis of operation of Lynden, WA digester

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Offset potential associated with anaerobic digestion of organic municipal solid waste

Incorporation of 18 – 20 % MSW in digestion process results in an estimated 324,000 Kg CH₄/yr emission avoidance that would otherwise occur as a result of long term anaerobic digestion in a landfill

The potential revenue from CH₄ capture and avoidance (2008 CCX values) of organic municipal solid waste would equal \$ 19,220.00 /yr

Additional income maybe derived from receipt of tipping fees to the digester operator

Example(s) based on analysis of operation of Lynden, WA digester

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Offset potential associated with fossil fuel use and alternative biogas for combined heat and power generation

At a 90% operation run time approximately 2790 MWh can be produced

Power production using biogas as opposed to fossil fuels results in an emission avoidance of .304 kilotons of Ce/yr

Potential revenue as a result of using biogas generated through anaerobic digestion for CHP is estimated at \$ 3149.00/yr

Example(s) based on analysis of operation of Lynden, WA digester

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Capture of CH₄ and its use in generating CHP is considered a direct emission reduction and emission avoidance thus qualifying for offsets because they are:

- ***Well suited for use in a regulatory offset program***
- ***Additionality easy to establish***
- ***Baselines relatively easy to establish***
- ***Monitoring and verification easy to conduct***

However, policy issues do exist

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Overall Policy Issues

- ***Digesters must demonstrate additionality (where would the manure or other digested materials go other than to digestion)***
 - ***Performance or production of methane or nitrogen recovered beyond dairy production levels***
- ***Records of the type, source, quantities of digested materials must be maintained to allow for measurement, monitoring, and verification***
- ***Gas production data, electricity production, power sales or fuels must be kept to address measurement, monitoring, verification of emission avoidance***
- ***Adherence to Dairy Nutrient Management Plan (Co-Benefit)***

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Specific Policy Issues

- ***Should nutrient recovery (ammonia N) be considered as a BMP, or direct offset***
- ***Should committee include a nitrogen fertilizer background capture discussion or defer until technology becomes available***
- ***Should offsets for methane use as a fertilizer input be allowed (substitute source of natural gas for industrial production of ammonia through the Haber process)***
- ***Should committee also consider the use of on-farm methane as a substitute for diesel in transportation fuels either on the farm or in off-farm processes***

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Technical Issues

- ***Digestion vs. Co-Digestion (maintaining uniformity)***
- ***Development of standard of comparison***
- ***Measurement (production data) issues associated with gas and power production***

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Data Development Needs

- *Daily materials input of manure and other organics*
- *Facility operations data such as temperature profile, daily inputs and outputs, sources of materials and other organics*
- *Gas production data*
- *Generated power in MwHr*
- *Alternative fuel production to offset diesel production*
- *Others – such as pipeline, off-farm CHP & fuels use.*

