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Editor’s note: This article is based on a forthcoming USDA report on cooperative approaches for implementation of dairy manure digesters.

Ethane from anaerobic digestion of dairy cow manure may qualify for carbon credits if collected and prevented from emitting into the atmosphere. According to the Second Assessment Report (1996) of the Intergovernmental Panel on Climate Change (IPCC), the global warming potential of methane is equivalent to 21 times that of carbon dioxide. This means the reduction of the emission of one metric ton of methane gas has the effect of reducing the amount of greenhouse gas emission equivalent to 21 metric tons of carbon dioxide.

(Although IPCC has updated the global warming potential of methane to 23 carbon dioxide equivalent in its Third Assessment Report (2001) and to 25 in the Fourth Assessment Report (2007), 21 carbon dioxide equivalent continues to be used for consistency in greenhouse gas inventory reporting.)

A business or organization may strive to reduce its contribution to global warming potential by taking steps to mitigate its direct or indirect greenhouse gas emissions. In case its effort is short of its own set mitigation goal (or cap), the firm may want to offset its shortfall by purchasing greenhouse gas reduction credits (“carbon credits”) from others who could provide credible net-reduction claims.

In this way, the firm disciplines itself by paying a financial penalty for not meeting its own emissions reduction goal, while offering incentives to providers of offset credits, such as dairy farmers who capture methane from anaerobic digestion of cow manure for use as fuel. This so-called “cap-and-trade” system works to cut overall greenhouse gas emissions, which are usually measured in carbon dioxide equivalent.

**Carbon credit trading systems**

Various systems for buying and selling carbon credits are in varying stages of evolvement in the United States. These transactions could be made by private negotiations, or the trading could be through formal exchange mechanisms. For example:
• **Cash market:** The Chicago Climate Exchange claims to be “North America’s only — and the world’s first — global marketplace for integrating voluntary, legally binding emissions reductions with emissions trading and offsets for all six greenhouse gases.” It was launched in 2003. (Source: *Chicago Climate Exchange.*) Trading on this exchange is similar to a commodity cash market.

• **Futures market:** The Chicago Climate Futures Exchange, a wholly owned subsidiary of the Chicago Climate Exchange, “is a CFTC-designated contract market, which offers standardized and cleared futures contracts on emission allowances and other environmental products.” (Source: *Chicago Climate Futures Exchange.*)

The Green Exchange contracts began trading in March 2008. However, the Commodity Futures Trading Commission (CFTC)-regulated Green Exchange is expected to launch during the first quarter of 2009. The Green Exchange — a partnership between New York Mercantile Exchange and Evolution Markets — claims that it “will be the most globally integrated marketplace for the trading of environmental products. It will enable market participants to gain exposure to environmental trading markets and manage their risk via a diversified product slate, from Europe’s carbon allowances and Kyoto-based carbon credits to U.S. voluntary carbon credits, renewable energy credits and emissions allowances.” (Source: *Green Exchange.*)

• **Auction:** The World Green Exchange, launched by the World Energy Exchange in February 2008, brings together buyers and sellers of carbon credits (among other green commodities) by holding auctions. The Exchange claims the auction process provides “a superior price discovery mechanism by enabling buyers and sellers to see what the market will command in real time, thus allowing the true forces of market competition to deliver the efficient pricing result.” (Source: *World Green Exchange.*) Occasionally, the Chicago Climate Exchange also conducts auctions for members to fulfill specific needs.

### Carbon credit trading standards

Just like all traded commodities, certain standards and specifications are required of carbon credits to facilitate the transaction. Some basic requirements of the underlying offset projects for carbon credits could be:

- The methane gas that is captured from anaerobic digesters actually results in net reduction of carbon emissions, as compared to a certain base period.
- The claim of carbon credits (i.e., net reduction of carbon emissions) is measurable and verifiable.
- The ownership of the claim of carbon credits is clearly established.

On the Chicago Climate Exchange, the closing price of Carbon Financial Instrument Vintage 2008 started the year at $1.90 per metric ton of carbon dioxide equivalent. It rose to peak at $7.40 at the end of May and the beginning of June, and then declined to $4 on July 15. The simple average for the first 137 trading days this year is $4.98, which amounts to an extra income of about $25 per lactating cow per year for dairy farmers who have carbon credits to sell.

This potential revenue will not fully cover the cost of installing anaerobic digesters. But the sale of carbon credits could at least partially offset the cost of animal waste treatment. Under certain conditions, further credit also may be available if the captured methane gas is used as fuel for electricity generation.

### Costs of carbon credit trading

There are costs involved in selling carbon credits to cover administrative and trading expenses. If the credits are sold through an aggregator, the costs may include one or all the following:

- An aggregation fee charged by the aggregator, the going rate of which is around 10 percent of the value of the carbon credits, or about $2.50 per cow at the carbon credit value cited above. (More about aggregation is explained below.)
- A trading fee, such as fees for registration and sales through the Chicago Climate Exchange. For example, one aggregator quoted a trading fee of 20 cents per metric ton of carbon dioxide equivalent, or $1 per cow per year.
• A project verification fee(s), if the anaerobic digester system and the claim to the carbon credits need to be verified. Initial and annual verifications may be required. (For other examples, see: Michigan Conservation and Climate Initiative; National Farmers Union; Iowa Farm Bureau.)

Potential roles for cooperatives

As of November 2007, the U.S. Environmental Protection Agency (EPA) was aware of 95 anaerobic digester projects in 19 states. These digesters collectively reduce 20,892 metric tons of methane emissions per year (438,742 metric tons of carbon dioxide-equivalent).

The number of digesters in any region may not constitute the kind of critical mass cooperatives would need in order to play a significant role (at this time) in marketing carbon credits. However, as a service to members, a dairy cooperative may want to inform them of the opportunity to generate returns by marketing carbon credits as an additional benefit of treating waste with an anaerobic digester. Indeed, some cooperatives have already done so.

If installations of anaerobic digesters on dairy farms become more common, a critical mass of members may ask their cooperative to pool and help market their carbon credits. Pooling is most likely necessary to aggregate a large enough volume for efficient marketing.

The reason for this is that a lactating cow weighing 1,376 pounds generates about 5 metric tons of carbon dioxide equivalent of methane gas in a year through anaerobic digestion of her manure. That amount is only about 20 percent of the size of a Chicago Climate Exchange’s Carbon Financial Instrument contract (i.e., a contract represents 100 metric tons of carbon dioxide equivalent). In other words, it would take 20 to 25 cows a year to satisfy one single contract.

The Chicago Climate Exchange defines aggregators as “entities that serve as the administrative representative, on behalf of (greenhouse gas) offset project owners, of multiple offset-generating projects.” The Exchange further stipulates that “Offset projects involving less than 10,000 metric tons of CO2-equivalent per year should be registered and sold through an Offset Aggregator.”

Offsetting 10,000 metric tons of carbon dioxide-equivalent by flaring methane produced from anaerobic digestion of dairy manure would require the waste of more than 2,000 lactating cows. However, only 595 dairy operations had that many cows in 2007, representing just 3.5 percent of all U.S. farms with more than 100 cows (USDA National Agricultural Statistics Service). Therefore, most dairy farms would need to register and trade through an aggregator.

Co-op bargaining role

Through joint actions by members, a cooperative may be able to bargain for lower marketing fees and/or higher returns. Depending on the needs of the members, cooperatives may play these roles in the marketplace of carbon credits:

• A co-op may engage a broker(s) to negotiate with carbon credit purchasers on prices and terms of trade.
• A co-op may act as a broker to negotiate with carbon credit purchasers on prices and terms of trade.
• A co-op may engage an aggregator(s) to trade carbon credits for members.
• A co-op may act as an aggregator if there is enough volume of carbon credits generated by members. In essence, the function of an offset aggregator is similar to that of a milk-pool administrator, and dairy cooperatives are well experienced in the pooling operations.
• A co-op may form a joint venture with other co-ops to provide aggregator services to members. The joint venture would have a broader membership base to operate.

• Because verification of the anaerobic digester system’s impact on greenhouse gas reduction is usually required, a cooperative may engage verifiers, or have verifiers on its field service staff to carry out the function.

Thus, a cooperative could help its members maximize the benefit available from the sale of carbon credits by negotiating the highest prices possible for the credits and minimizing the costs associated with selling carbon credits. Combined with other revenue streams associated with byproducts of anaerobic digestion (avoided purchases and/or sales of energy and of other byproducts), carbon credits could contribute additional cash flow to enhance the economic feasibility of digester projects.

Editor’s note: References used for this article will be listed in the forthcoming USDA research report upon which it is based. They are also available upon request from the authors: Charles.Ling@wdc.usda.gov, or Carolyn.Liebrand@wdc.usda.gov.