Cows and carbon: where we stand

As a result of an unprecedented study, we know the carbon footprint required to produce one gallon of milk. Action plans are being developed to improve it.

by Hoard's Dairyman staff

PRIOR to this decade, the words cows and carbon were not commonly found in the same sentence. Now, our beloved bovines have a giant target on their heads for what they do best — turning feed into milk. This process has had us in awe for years. Some environmentalists say the by-products of rumination (CO_2 and methane) are foes of the environment and a source for global warming.

A wide range of studies label cows as gas factories — but none of these estimates were made with the unparalleled depth of a recent study completed by the University of Arkansas. The study, commissioned by the Innovation Center for U.S. Dairy, is a life cycle assessment (LCA) to determine the carbon footprint of one gallon of milk. Researchers collected data from 500 farms, 50 processing plants, and more than 210,000 round trips of milk from farm to processor. The team randomly selected the 500 farms while keeping the demographics similar to our industry's actual makeup.

The story behind the LCA research started when an industry-wide goal to reduce greenhouse gas emissions by 25 percent by 2020 was created. That goal was penned in 2008, and in late 2009, a memorandum of understanding (MOU) was signed by the Innovation Center for U.S. Dairy and the USDA to support the voluntary goal.

Erin Fitzgerald, vice-president for Sustainability at the Innovation Center for U.S. Dairy says, "The MOU is a mechanism to bring together the resources of the USDA and existing research of the USDA around our various innovation projects in support of our overall goal."

DANA ALLEN
Eyota, Minn.
Gar-Lin Dairy
Nutritionist by education — she works to balance rations on their farm to gain feed efficiency.

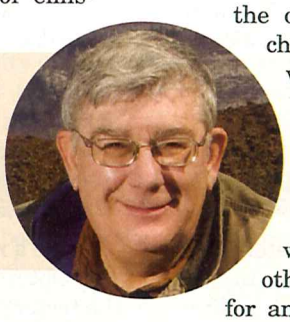
Support for the LCA research in the study came from check-off dollars to the tune of $650,000, as approved by the DMI Board of Directors and by USDA. Consistent with USDA guidelines, check-off funds support research and promotion that helps protect and grow consumer confidence. The industry secured more than $2 million in 2009 in noncheck-off funds and other in-kind resources, from companies like GE and Ecolab, to support project work that cannot be funded by the check-off.

The LCA measures greenhouse gas (GHG) emissions of fluid milk from farm to table by considering both the inputs and outputs of carbon.

When all was said and done, the carbon footprint for a gallon of milk was determined to be 17.6 pounds of CO_2 equivalent per gallon. CO_2 equivalent is a measure that accounts for all greenhouse gasses including CO_2 and methane — the two gasses most prevalent when discussing dairy. To account for uncertainties in the system, we can say with 95 percent confidence that the exact figure lies between 15 and 20 pounds of CO_2 equivalent.

Lead investigator Greg Thoma from the Department of Chemical Engineering and the Center for Applied Sustainability at the University of Arkansas reports that 72 to 73 percent of all greenhouse gasses involved in the production of milk are emitted before leaving the farm gate. However, the opportunistic news from this research is that there is a great deal of variability between farms. This variability gives the dairy industry "a tremendous opportunity to learn, really from itself," says Thoma. He adds that we now have a baseline, a number we can work to improve. A great deal of that variability among farm emissions is not associated with the size or location of the farm but is driven by on-farm practices.

"Deep bedding used for longer than a month can be a significant source of emissions," he says. Anaerobic lagoons are also a significant source. "Dry-stacked, daily spread are two of the least impactful manure management techniques in regards to greenhouse gas emissions.



BOB FOSTER
Middlebury, Vt.
Foster Farms
Manages a large composting business using byproducts of their anerobic digestor.

"Equally important to manure management issues is that farms that have generally speaking lower footprints also have much better feed conversion efficiency," Thoma says.

So how do we measure up? Thoma says we shouldn't compare our results to previous research or other commodities, rather use this as a benchmark to improve ourselves. Somewhat similar studies do put us in the range of other global dairy players, though. "We're right in the ballpark of studies from UK, France, New Zealand, and Sweden," he says.

Bob Foster of Foster Farms in Middlebury, Vt., was one of the farms asked to participate in the in-depth survey process. The team at Foster Farms began reducing their carbon footprint several years ago — without really knowing it. The farm is home to 385 milking cows. In 1982, they built an anaerobic digester primarily to be better neighbors. The digester gave way to a large composting business that supplies soil and soil amendments throughout the Northeast. In addition, Foster says they wanted to be more feed efficient. "We adopted a TMR a number of years ago so we could be more feed efficient. And we sample (our feed) more frequently — about every two weeks now."

Three farm energy audits over the years have evaluated Foster Farms to determine which equipment is most efficient and what is not. That's an opportunity Foster says more farms should take advantage of today. As a result, they utilize variable-speed vacuum pumps, reclaim heat from the milk to use for both water and space heat, use compact fluorescent lighting, and have high-efficiency fans, just to name a few.

Dana Allen is a partner in Gar-Lin Dairy Farm in Eyota, Minn., and also took part in the study. The farm is a partnership between two families; and that's the first reason why their farm is sustainable, Allen says. Because of the partnership, Gar-Lin is able to milk 1,650 cows and raise all their own crops on just over 3,000 acres.

Allen says she gladly participated in the survey because of the end result. "The whole initiative really gives the whole dairy industry the opportunity to communicate with the changing public that's farther away from what we do than it ever has been."

They reduce their impact by producing more, by feeding less. "I'm a nutritionist by education, so feed efficiency is somewhat near and dear to my heart. We're constantly doing studies with the University of Minnesota or other universities or companies looking for an opportunity or the next cutting-edge project that might make cows produce another pound of milk or be healthy."

Dana also states that the ration is balanced for specific amino acids (methionine and lysine) which means that they are now able to decrease dietary protein while increasing milk solids.

"We're shipping less water down the road; instead we have increased milk protein."

Focused on sustainability

Fitzgerald of the Innovation Center for U.S. Dairy worked closely with Thoma throughout the research project. She also directs many of the Innovation Center's other projects that will be completed in the coming years such as water, water use, water quality, land use, waste, biodiversity, and toxicity. "Greenhouse gas is just one dimension," she says. Yet, each of these projects remains focused on sustainability.

Other programs focused on reducing greenhouse gasses encompass two major areas: best practices and next practices. "The best practices are really projects for today. Energy efficiency on farms, driving smarter, feed efficiency, manure management, and so forth," Fitzgerald says.

"Next practices is where we want to be in the next 10 years," Fitzgerald says hopefully. She concludes, "Can we power farms from green energy from our farms? Can we have cutting-edge research that will help reduce emissions from rumination?"

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