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Critical Issue Report: Shades of Green

SHADES OF GREEN: Quantifying the Benefits of Organic Dairy Production

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Executive Summary

Consumer awareness – and concern – is growing over the impacts of food production on environmental quality and personal health. The average Joe, public health specialists, and a diversity of organizations are asking more probing, sophisticated questions about these impacts and placing pressure on retailers and the food industry to purchase and sell food from farmers who are committed to long-term sustainability, humane animal care, and planetary health.

In this era of heightened scrutiny on how food is produced, American agriculture is evolving toward extremes. The number and importance of very small farms, and very large ones is growing. The number of mid-size farms is declining, as is their share of total production.

In the dairy industry, cow numbers have been increasing for close to 20 years in arid parts of the west, especially in states like Idaho and New Mexico, where large industrial dairy farms manage one to several thousand cows in feedlot-based farms. Most of these cows do not have access to sufficient pasture to contribute significantly to their daily feed intakes. Grain-based rations and high-quality alfalfa hay form the backbone of the cows' diet. The number of mid-sized dairies in New England and through much of the Midwest has been declining, replaced by larger farms in these regions or newly established farms in the west.

Bucking these trends, the number and importance of small to moderate-scale organic dairy farms is increasing nationwide, as well as in both New England and the Midwest. The most successful operations grow all or most of their feed on or near the home farm. In addition, pasture and grazing contributes significantly to daily feed intakes in those parts of the year when the weather supports active forage plant growth. On conventional, feedlot-based industrial dairies, corn and other corn-based feeds typically account for around two-thirds of a cow's diet, whereas on grazing-based organic farms,

pasture and forage-based feeds typically account for at least two-thirds of daily feed intake, and corn in all its forms less than one-quarter.

On large conventional dairies, artificial insemination is used on mostly purebred Holstein cows. Each milking dairy animal with a future in the herd produces a minimum of 22,000 pounds of milk during a 305-day lactation. A range of drugs are routinely administered to these animals to help them fight infections, efficiently digest their energy-dense, low-fiber feed, and to help synchronize artificial insemination breeding attempts.

On most small and moderate scale organic dairies, production levels are lower, averaging closer to 17,000 pounds per year. Breeds of cattle other than Holsteins, as well as crossbreed cattle are common and artificial insemination is a tool used on many farms, but has not displaced bulls and traditional breeding programs.

No artificial hormones or antibiotics are administered to animals on organic dairy farms, unless returning a cow to good health requires treatment with an animal drug not approved for use on organic farms. In such circumstances, the organic rules codified by the USDA's National Organic Program require a farmer to proceed with treatment and remove the cow forever from the herd producing certified organic milk.

The environmental impacts of large, confinement based conventional dairies are much different than those associated with small and mid-sized organic dairies. One set of the impacts is linked to how cows are managed and how their manure is handled and utilized. These impacts mostly occur in the vicinity of where the cows are housed and milked on a daily basis. Moreover, large confinement-based dairies often are clustered in the same regions where combinations of available feed, climate, accessible land for manure applications, and lenient environmental regulations have collectively created a favorable business climate.

For these reasons, impacts stemming from how cows are managed and housed are far more concentrated geographically than the impacts stemming from how and where the feed is grown for a given dairy herd. Dairy farm feed production can occur on or near the farm, but for most large dairies in the west, occurs hundreds of or even thousands of miles away.

Some of the major differences between conventional and organic dairy farms, in terms of animal husbandry and health care, food safety, and environmental quality, stem from animal drugs and crop production inputs that are routinely used on conventional dairy farms but are prohibited on organic farms. The major classes of inputs are:

- Fertilizer nutrients applied to increase crop yields, and in particular, nitrogen;
- Pesticides applied to manage weeds and control insects; and
- Animal drugs administered to fight infections (antibiotics), boost milk production (rbGH), or hormones given to increase success when artificial insemination is the preferred method of impregnating cows.

Drawing on data from the U.S. Department of Agriculture and the dairy science literature, a calculator has been developed which estimates the above three categories of "avoided impacts," along with the acres required to produce organic dairy feeds, when a cow on a typical conventional dairy farm is switched to organic management. The calculator can be used to quantity the pounds of fertilizers and pesticides not applied when a milking dairy animal, or a herd of cows of known size, is shifted to organic production, as well as the number of doses of certain animal drugs that will not be administered.

The calculator is accessible free of charge through The Organic Center's website (go to http://www.organic-center.org/science.environment.php?action=view&report_id=139). The values of a number of key input variables have been set at typical, or default levels to produce average estimates of expected, avoided impacts. Users of the calculator can replace these input variable values with data specific to a given farm or a group of farms.

There are nine steps, each accomplished in a different table, required to estimate the avoided impacts stemming from the conversion of a single conventional milking cow to organic management. The tenth step and table provides a way to estimate the avoided impacts from the conversion of a known number of milking dairy cows to organic management.

For example, there are about 120,000 lactating animals on organic dairy farms in the United States today, presenting about 1.5% of the nation's total herd of about 8.5 million milking dairy animals. These 120,000 cows on organic farms account for the following avoided impacts in 2008:

- Over 761,000 acres of land were managed organically in producing the forages, feed grains, and protein supplements fed to the 120,000 organic dairy cows (6.3 acres per cow);
- Some 40 million pounds of synthetic nitrogen was not applied;
- Over 785,000 pounds of pesticides were not sprayed on crop fields, mostly herbicides; and
- Cows were administered 1,776,000 fewer treatments (usually injections) of hormones used as reproductive aids, a genetically-engineered hormone to boost production, and antibiotics.

More work is needed to refine the equations built into the calculator; the data on crop yields and input use; and, to expand the calculator to encompass additional avoided impacts, such as those involving green house gas emissions. Some of this work is underway (see the Center's website for details). In the interim, this calculator can be used and/or adapted to produce estimates of the above avoided impacts on one or several dairy farms anywhere in the United States.

I. Why This Study?

Buyers of organic dairy products are asking suppliers to help them project the environmental benefits of organic dairy production. In response, dairy processors are working toward methods to estimate various environmental impacts associated with organic milk production, in contrast to conventional dairy operations. Some processors are also carrying out or sponsoring research on specific environmental impacts, such as greenhouse gas emissions, in order to generate the data and methods needed to more accurately assess the relative impacts of different types of dairy farm management systems.

In March 2008 Stonyfield Farm requested that the Center develop and propose a methodology to project the avoided impacts of organic dairy farming and provided funding to support the project. The project has been carried out in cooperation with several major organic dairy processors.

The methodology that follows is limited in scope to pesticides and nitrogen fertilizer, and the use of certain animal drugs. It does not cover several other important components of the impact of organic and conventional dairy production on the environment and human health (e.g., climate change, food miles, food safety, energy use, water pollution, and manure management).

The goal is to produce an easy-to-use methodology that can be applied consistently across the industry. Reaching common ground on the data, equations, and assumptions embedded in such a methodology will foster public understanding of, and confidence in the results emerging from applications of the methodology.

To facilitate widespread use of the methodology, the Center will provide free of charge an Excel-based calculator which can be used to apply the methodology on a given farm, or across multiple farms. The calculator allows users to enter information specific to their farm, dairy herd, or region, as well as farm-specific information on production levels, feed rations, and crop yields. Access the calculator and instructions on how to use it on the Center's website under the "State of Science" section, in the "Environment" category, or at http://www.organic-center.org/science.environment.php?action=view&report_id=139.