NATIONAL DAIRY COUNCIL®

June 20, 2014

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2015 Dietary Guidelines Advisory Committee

The Dietary Guidelines Advisory Committee (DGAC) is assessing the sustainability of the U.S. food system as part of its evidence-based review and report for the 2015 Dietary Guidelines for Americans (DGA). The following comments about dairy-specific efforts to document and reduce U.S. dairy's environmental footprint are submitted in response to the request by Subcommittee 5 for information on approaches and current examples of sustainability in the food system.

Dairy's Impact – Life Cycle Assessments

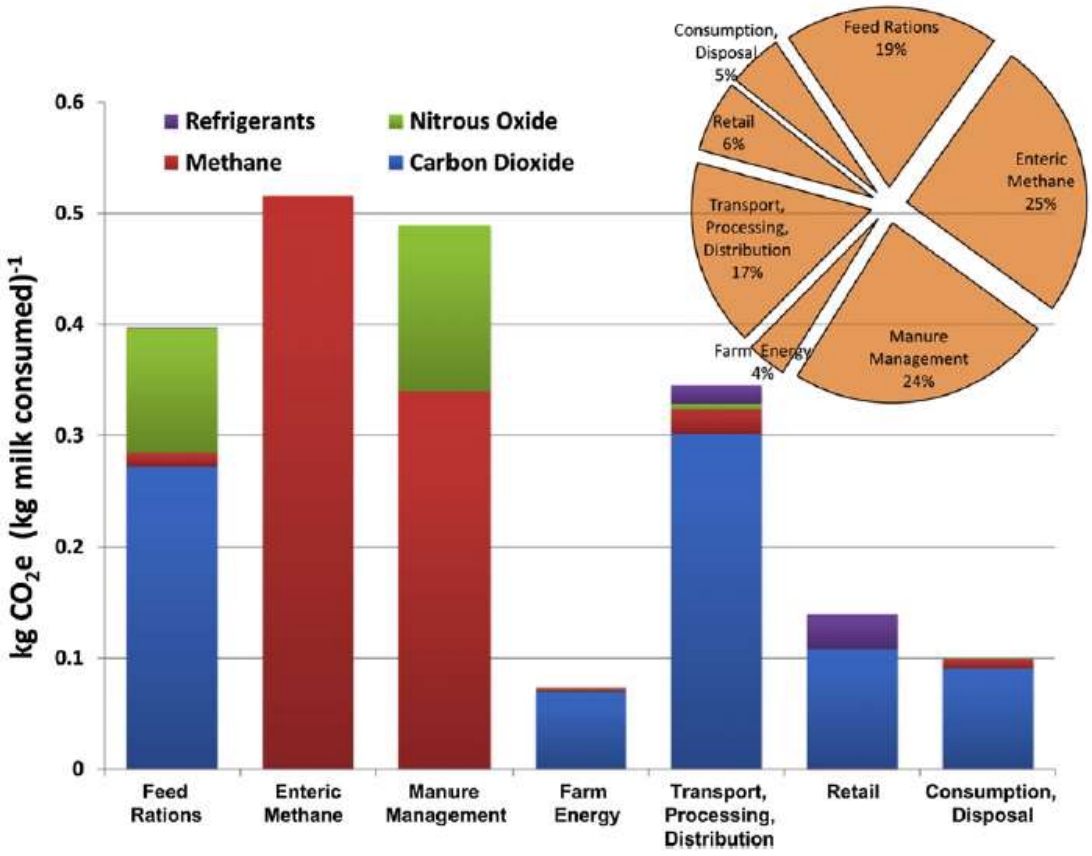
A sustainable food supply requires adoption of cost-effective production practices that make efficient use of finite resources while also producing safe, affordable, nutritious foods that meet market demands. The U.S. Dairy industry has been a leader in this area. From 1944 to 2007, innovations in cow comfort, cow health and other areas have enabled the production of a gallon of milk with 90% less cropland, 65% less water and 63% less carbon emissions (1).

In January 2009, the Innovation Center for U.S. Dairy – which brings together leaders of 32 companies from across the U.S. dairy industry – established a voluntary goal to reduce greenhouse gas (GHG) emissions of fluid milk by 25% by 2020. At that time, the Innovation Center for U.S. Dairy commissioned the first U.S. national greenhouse gas life cycle assessment (LCA) for fluid milk production and consumption, which provided an estimate of the carbon footprint for the U.S. dairy supply chain. The Applied Sustainability Center at the University of Arkansas conducted the study with the assistance of Michigan Technological University. The LCA for milk included detailed surveys of 536 individual farms, 50 processing plants, 300,000-plus transportation trips plus extensive secondary sources of data, and the results were published in the International Dairy Journal in 2013 (2).

The LCA established that the production of all dairy foods in the U.S. accounts for approximately two percent (2%) of total U.S. greenhouse gas (GHG) emissions for 2008 (1). It also provided a benchmark for GHG emissions across the dairy supply chain, from farm to table, of 17.6 pounds

CO_2/gallon fluid milk consumed (2). The benchmark will be the basis to measure the industry's progress toward achieving its voluntary GHG emissions reduction goal.

Figure 1: Carbon Footprint of Milk in the United States



Source: Thoma G, Popp J, Nutter D, Shonnard D, Ulrich R, Matlock M, Kim DS, Neiderman Z, Kemper N, East C & Adom F (2013). Greenhouse gas emissions from milk production and consumption in the United States: A cradle-to-grave life cycle assessment circa 2008. *International Dairy Journal* Volume 31, Supplement 1, S3-S14. http://www.sciencedirect.com/science/journal/09586946/31/supp/S1.

The study followed International Organization for Standardization (ISO) guidelines. All data used in the study is available through the USDA's National Agricultural Library LCA Digital Commons (http://www.lcacommons.gov/?q=node/16) to allow LCA practitioners open access to the data to use and build upon. This supports the need for comparable LCA data for all foods in the U.S. food supply to better model and understand how to develop sustainable food systems and sustainable diets.

Because of the complexity of the dairy industry and the comprehensiveness that LCA demands, the U.S. dairy industry began their work with a greenhouse gas (GHG) for milk. The GHG fluid milk LCA serves as a foundation for analysis of other dairy products, packaging and delivery system. The scope of subsequent LCAs has broadened to evaluate water use and water quality, land use and biodiversity and many other environmental impacts (3, 4).

Based on the LCA findings, the Innovation Center is leading a multi-stakeholder development and review process to create a framework for assessing dairy sustainability, including priority topic areas such as:

Environmental	Economic	Social
GHG emissions	Local economic impacts	Animal care
Water use and quality	Financial value across the supply chain	Community contributions
Energy use		Working conditions
Waste and materials		Food safety
Land and biodiversity		Health and nutrition
Crop production		

Best Practices and Tools

The findings of the dairy industry's LCA studies are also being applied to develop new "smart tools," which will support science-based decision making as well as tracking and communication of progress by dairy farmers and companies across the dairy supply chain. Using these tools supports continuous improvements that are economically viable. Examples include:

- **Farm Smart™**
  Farm Smart™ aims to help dairy farmers optimize their production techniques, identify potential improvements in management practices and communicate positive contributions their farm businesses have made.
    - In addition to encouraging energy efficiency, two programs underway to reduce on-farm environmental impact include "Cow of the Future,™" to reduce enteric methane emissions and "Dairy Power,™" to produce energy and other value-added co-products, such as renewable energy, nitrogen, phosphorous, and fiber through anaerobic digestion of manure and other organic waste. The Innovation Center is conducting research in these areas, and outcomes will be included in the Farm Smart™ tool when complete.

- **Dairy Plant Smart™**
  Dairy Plant Smart™ helps dairy processing and manufacturing companies track and reduce energy use, operating costs and greenhouse gas (GHG) emissions associated with energy, fuel, refrigerant and packaging. Dairy Plant Smart provides an average of GHG emissions data for plants in the same region as well as a national average to serve as a benchmark.

- **Dairy Fleet Smart™**
  Dairy Fleet Smart™ combines science-based decision-making tools with recommended management practices that reduce fuel consumption, costs and greenhouse gas emissions. The tool builds on the U.S. Environmental Protection Agency's SmartWay program.

For more information visit USDairy.com (http://www.usdairy.com/sustainability/reporting).

Dairy and Methane

The LCA for milk found that the majority of GHG emissions associated with milk production occur on-farm, and the key contributors are enteric methane and methane from manure (see Figure 1). Enteric methane is emitted by ruminant animals but is produced by the microbes in the animal's rumen. These microbes digest fiber (cellulose and hemicellulose) in plant cell walls and provide nutrients to the cows in the process. In this way dairy cows convert feedstuffs not edible by humans, such as grass or corn silage, into energy and nutrients to produce milk (5). In human nutrition, cellulose is part of the indigestible plant material called fiber.

Methane is also released when manure is broken down by microbes. As mentioned earlier in the context of Dairy Power™, anaerobic digesters capture the methane released from manure and other organic waste, like food, and use it to produce renewable energy such as electricity and compressed natural gas. Manure also contains valuable nutrients, including nitrogen and phosphorus, which have been used by dairy farmers for generations to fertilize farm fields to grow crops such as corn and alfalfa. It is a top research priority of the dairy industry to find more ways to harness the value of these nutrients while mitigating the potential environmental impact of manure.

Dairy Industry Included in White House Biogas and Energy Roadmap

On March 28, 2014, the White House announced a Biogas and Energy Roadmap to reduce methane emissions from agriculture. In its announcement, the White House formally cited the work of the Innovation Center for U.S. Dairy's Sustainability Council, whose efforts in part include a partnership with the U.S. Department of Agriculture to proactively reduce greenhouse gas emissions, including methane.

A Biogas and Energy Roadmap will be developed by the White House, the Department of Energy, the United States Department of Agriculture and the Environmental Protection Agency in partnership with the dairy industry to accelerate the adoption of biogas (anaerobic digester) systems and other cost-effective technologies. Biogas systems have been singled out because of the significant potential they offer, as noted above, to mitigate methane emissions. New technologies can optimize this potential and deliver environmental and economic benefits to dairy farms and those they work with, including the communities in which they operate.

Dairy and Beef Impacts

During the January DGAC meeting, a question was raised by Dr. Alice Lichtenstein about the environmental impact of dairy cows. This question came up in the context of a description by expert speaker Kate Clancy of the environmental impact of beef cattle. Comparing the environmental impacts of dairy and beef cows is complex; differences in production systems and research methodology will be addressed here.

All farmers, regardless of what they grow, constantly make choices about the best production systems and practices to balance market demand with resource use, environmental impact and economic viability. Dairy and beef farmers have many options to consider for their operations including animal breed, breeding practices, feed production, dietary composition and feeding regimens, animal care, housing, land use, water use, and waste management, etc. Over time,

different systems for producing milk and beef have emerged. Dairy cows are raised primarily to contribute milk and milk products to the food supply. In addition, 24% of the animals in the beef supply originated as dairy cattle (6), thus many dairy cows contribute meat in addition to milk to the food supply, improving efficiency of production. In contrast to dairy cows, beef cattle are grown primarily to contribute meat to the food supply, so the production goal is efficient growth of the animal for harvest at a desired weight and quality. While both dairy and beef come from ruminant animals, production practices are different enough that the dairy and beef industries are generally considered to be completely different industries. For a description of current production practices for milk and beef, see references 1 and 7.

Regarding methodology, while LCAs have been conducted for both milk (1, 2) and beef (7, 8, 9), using them to compare environmental impacts of the different food products should be done with extreme caution. Studies with different methodologies (e.g. goals, boundaries, or functional units) for assessing the environmental impact of a food category or specific product are not comparable. For example, determining the functional unit is an important aspect of any LCA study. Food product LCAs have traditionally calculated impact per weight or volume of food, such as CO_2 emissions per kg of milk or beef. Though this functional unit is a practical approach to account for environmental impact, it may not be meaningful when comparing the impacts of two or more foods. Milk and beef have different water contents, contribute unique sets of nutrients, are used differently in dietary patterns and have different effects on health. Thus looking at environmental impact by weight of food is a limited view of what a food contributes to diets. A more useful unit of measure for comparing foods may be one that goes beyond environmental impact to include nutrient contributions from foods as well as links to human health. Such a functional unit has not yet been developed but is being explored.

Therefore, when taking into account differences in production systems, LCA methodology (goals, boundaries and functional units etc.) and other characteristics of milk and beef food products, comparing the environmental impact of milk and beef is not straightforward.

Food Waste Impacts

An important aspect of sustainable food systems is efficiency, which includes reducing waste. The U.S. Department of Agriculture has developed a program to quantify the amount of food lost in the supply chain. The findings of this work are somewhat startling, because food lost at the retail and consumer levels are 10% and 19% of the total weight of food produced, respectively (10). Consumer level loss, which includes waste both at home and out of the home, such as at restaurants, is estimated to be 250 pounds per person per year. To put this in perspective, this is approximately 0.7 pounds of food per person per day in the U.S. The food lost has an environmental burden of about 2 pounds CO_2 emissions per pound of food lost (11), thus U.S. consumer food waste accounts for about 520 pounds CO_2 emissions per person annually. If half of this waste was eliminated, it would save the equivalent of the footprint of almost 15 gallons of milk. Looking at it another way, 520 pounds CO_2 emissions per person annually translates to 72 teragrams (Tg) CO_2 emissions from food waste. The entire U.S. carbon footprint in 2012 was 6,526 Tg CO_2 emissions, of which 9% came from agriculture (12). Our calculations show that food waste avoidance could save 1% of the U.S. carbon footprint.

The Food Waste Reduction Alliance, an initiative of the Grocery Manufacturers Association, the Food Marketing Institute, and the National Restaurant Association, is addressing the issue of food waste (http://www.foodwastealliance.org/). The Alliance has three goals:

- Reduce the amount of food waste generated
- Increase the amount of safe, nutritious food donated to those in need
- Recycle unavoidable food waste, diverting it from landfills

Conclusion

As outlined in comments NDC previously submitted to the DGAC, dairy foods make key nutrient contributions to the U.S. diet, including more than 50% of the calcium and vitamin D (13). In addition, according to the 2010 DGA, moderate evidence links "milk and milk product intake with improved bone health, especially in children and adolescents, and with reduced risks of cardiovascular disease and type 2 diabetes, and lower blood pressure in adults."

In the 2009 paper by Capper et al, the authors state "All food production has an environmental impact, and as the US and global populations continue to increase, it is critical to produce sufficient high-quality food from a finite resource supply while minimizing effects upon the environment" (1). In collaboration with the Innovation Center for U.S. Dairy and its multiple partners, the U.S. dairy industry is committed to delivering wholesome and nutritious products to the food supply, while reducing the environmental footprint of milk.

Thank you for the opportunity to submit these comments.

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