

## U.S. Dairy Life Cycle Assessment From Grass to Glass

### Key Elements to a Successful LCA

**Clear definition of goals.** The goal of the U.S dairy industry LCA work is to assist the industry in understanding key opportunities for reducing its impact on the environment in an economically viable way.

- A good answer to the wrong question is of little use. LCA is a very flexible tool that can be applied in a wide range of situations and for a diversity of purposes. It is crucial to make a clear definition of the goals of any project, so that each methodological decision can be evaluated relative to whether it supports the goal.

**Careful selection of the functional unit.** The U.S. dairy industry, in focusing its initial work on LCA of fluid milk, has adopted a functional unit of kg fat-protein corrected milk. A new unit will be adopted for studies beyond milk or for comparative studies across the beverage industry.

- In LCA, one defines “functional unit” as a basis for reporting and comparing results to ensure conclusions are consistent and fair. Many products, such as foods, are multifunctional, for example, providing at the same time refreshment, hydration, nutrition and even caffeine. This can make comparisons across products dependent on the definition of which function they provide and therefore the functional unit must be clear and relevant.

**Close attention to data sources.** The U.S. dairy industry has drawn on and developed the most thorough sources of data to support its work, including detailed surveys of 500 individual farms, 50+ processing plants and 200,000+ transportation trips, as well as national data from the USDA.

- Although it is likely that data for a study will need to come from multiple sources, careful work is required when different upstream process models are taken from different sources. The data must be carefully examined to ensure that the underlying assumptions are consistent in order for the resulting findings to be correct.

**Working with the subject matter experts.** The U.S. dairy industry's researchers have gone directly to the farms, facilities, carriers and other business partners to gain a full picture of the complexity of each stage.

- It is clear that some contact with experts in a domain of interest will be required to collect the data needed for an LCA. Less obvious, perhaps, is the extreme value provided by working closely with these experts throughout the study to utilize their deep understanding of the system or product studied in the design, execution and communication of the LCA.

**Assessing impacts appropriately.** The U.S. dairy industry is not only applying a broad range of indicators, but also obtaining a more complete understanding of local conditions within the impact assessment stage.

- The impact assessment stage of an LCA takes the wealth of data generated in such a project and makes it interpretable, understandable and relevant to the project goals. However, impact assessment models often have important limitations and must be interpreted with some understanding of potential limitations. Among the frequent limitations is a difficulty within an LCA to characterize the influence of geographic location on the impact of pollutant emissions, land use or water use.

**Peer review.** The U.S. dairy industry has recruited panels of leading LCA and subject-matter experts to independently validate the findings of its research teams.

- LCA's biggest strength, its broad flexibility to adapt to a wide range of needs, is also a weakness in that there are many risks of mismatch between scope and quality of an assessment and the conclusions drawn. The ISO standard for LCA prescribed peer review as a solution to ensure credibility and accuracy for these complex projects.

**Documentation and transparency.** The U.S. dairy industry is relying on the most transparent and documented LCA database available and will be the pilot industry participating in the U.S. LCA Data Commons.

- For results to be credible, audience members must be able to make their own independent evaluation of the underlying data and assumptions. Even if accurate, information that is not well documented and disclosed may suffer from suspicion of its quality and validity.

## Key LCA Challenges

- No existing data
- Dairy producers reluctant to share data
- Benefits of the study difficult to explain
- No data collection protocol

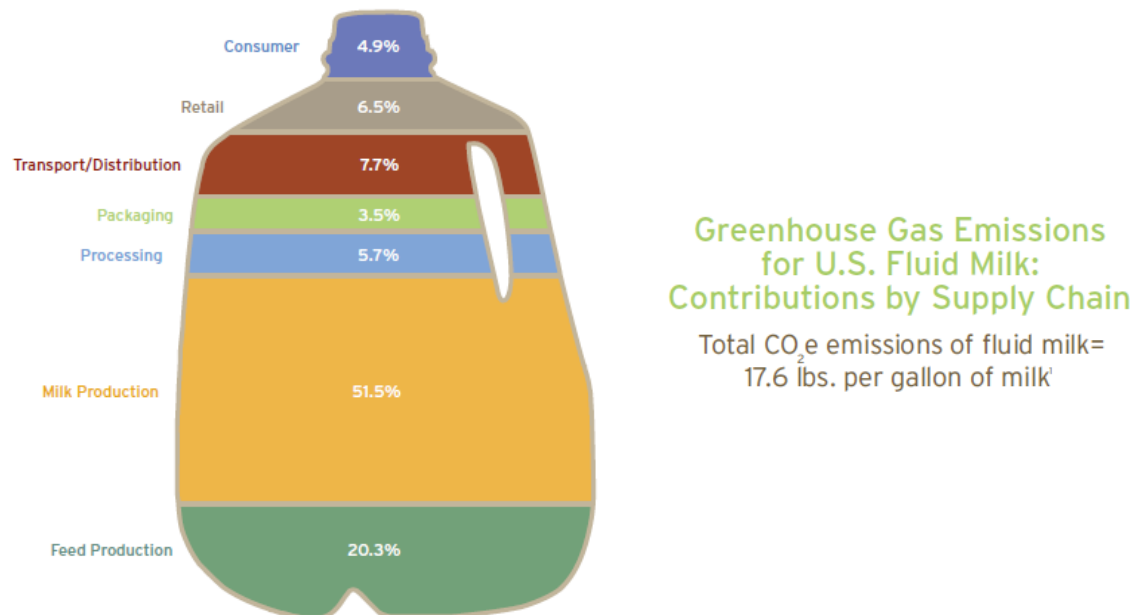
## Lessons Learned

- LCA is inherently interdisciplinary and data hungry
- LCA results are numbers only
  - Shows where to focus
  - Facilitates goal-setting and decision-making
- Process based models are also needed to account for the interdependencies of biological system
- Need to bring science to the decision maker to create change

## Data Set

- 540 dairy farms
- 210,000+ round trip farm-to-processor deliveries of raw milk
- 50 fluid milk processing plants (representing 25% of fluid milk processed in the U.S. during 2007)

## Findings



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<sup>1</sup>Thoma et. al., Greenhouse Gas Emissions of Fluid Milk in the U.S., University of Arkansas, 2010.