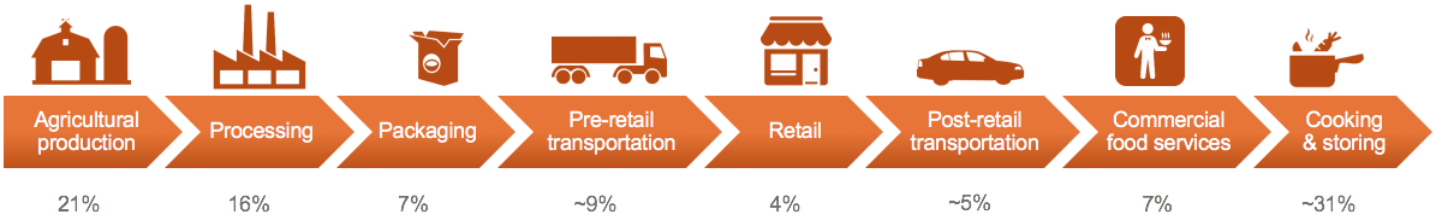
Executive Summary: Environmental Footprint Literature Review

Food Transportation

Distribution – the transport of food from producer to consumer – is commonly perceived as a dominant contributor to the overall environmental footprint of foods. Because personal and freight transportation account for 28% of the total energy use in the U.S., it is intuitive to reason that the further a product travels to market from the production site, the greater its environmental damage and contribution to global warming. Yet a closer look at our food system suggests a different story, one where transportation accounts for about 14% of the total energy used by the U.S. food system, about 5% from personal grocery shopping trips and only about 9% from distributing raw and processed food. The graphic below illustrates the distribution of energy used by the food system in the U.S.



While supporting a local food system and minimizing transport are generally useful principles, differences in agricultural production and the realities of transportation impacts may favor sourcing from other regions from an environmental impact perspective. A systems approach to considering the environmental footprint of foods and the food system, through tools such as life cycle assessment (LCA) can offer perspective on the relative importance of food transport. Indeed, repeated studies demonstrate that “food miles”, the distance food travels from producer to consumer, is of very little value in predicting the carbon footprint or environmental impact of a food item. Often, the carbon footprint is dominated by variability in production and processing stages of the food life cycle, and can easily overwhelm any differences brought about by transportation distances. This summary highlights results from LCA studies to clarify the role that transportation plays in the food system, and addresses the deceptively simple question: is “local” more sustainable than “global”?

Key Findings

Relevance of Transportation in Food LCAs: In general, the contribution of food transportation relative to the total greenhouse gas emissions of a given food product represents a small percentage of the carbon footprint for many foods. Fresh foods transported by air freight can have significant distribution-related carbon impacts, but on average, distribution of finished foods (from farm or factory to retail stores) contributes less than 4%, on average, of the greenhouse gas emissions of foods consumed in the U.S.

Implications of Transport Mode: Another challenge with relying on “food miles” as an indicator of greenhouse gas emissions or other environmental impacts is that often, the mode of transport (air, road, rail, and water) is a much more important determinant than the distance traveled. The graphic below shows the relative impacts of food transportation options:

Of course, such values are dependent on how efficiently the vehicle is loaded and will be different for products where packing into a vehicle or freight container is volume- rather than weight-limited. Other environmental impacts that are relevant to transport such as acidification potential (causing acid rain) or particulate emissions (affecting the respiratory system) associated with the burning of fuel are typically proportional to energy use and greenhouse gases.

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Consumer Shopping: Transport can play an important role in other ways in the food life cycle: numerous studies that include the impacts of consumer shopping trips – driving a car to the grocery store or other points of purchase – have shown the rather surprising contribution that this seemingly innocuous act can have on the overall footprint of food. For consumers driving long distances to purchase few items, the contribution from a shopping trip by car can be larger than all other transport, storage and processing energy used in marketing stages combined. For example, one study detailed in the wine product environmental footprint summary found that a San Francisco customer driving to a vineyard in Sonoma is even more impactful than distributing wine from Sonoma to a customer in Manhattan using air freight and delivery trucks.

Comparing Local and Regional/Global Food Systems: When considering the question of whether a "local" food system has lower environmental impact than a global food system, we must consider factors *beyond* transportation distance and mode that can come into play. These considerations include emissions due to the use of fertilizers and other chemicals during agricultural production that vary greatly by soil type, climate and management practices, and which can greatly affect the total greenhouse gas emissions of a food. Crop yields, which ultimately have a strong influence on environmental impacts per unit of output, also vary with soil type, climate, and historical and current management practices. In addition, crops in most locations have a seasonality and there is a need to store food in some way between the time of harvest and the time of consumption. Consuming local food year-round requires additional or improved storage, leading to impacts typically in the form of energy consumption for refrigeration or freezing. Identifying a minimally impactful consumption strategy would require balancing this with emissions from transport of non-local foods, and this balance likely will vary by season.

In one study of staple crops, a distance-minimized scenario had greenhouse gas emissions that were 86 percent higher than a scenario where crops were grown in locations chosen to minimize overall greenhouse gas emissions. The advantage of non-local production is explained by the minor importance of transport emissions compared to those caused by on-farm production. On-field emissions are influenced by yield differences, which are in turn a consequence of soil and climate conditions. This study demonstrates that staple crops should be produced where the crops grow best and then traded internationally in order to cause fewer greenhouse gas emissions.

Conclusions

Transportation is an integral part of our modern food system, yet it represents a relatively small contribution to the life cycle impacts of food production. The conclusions listed below however do not suggest that food transport impacts should simply be ignored or tolerated, but instead highlight the need to consider individual food commodity life cycle impacts and, when warranted, focus initial abatement strategies on stages and processes with the greatest impact.

- Transportation represents a relatively small contribution to the energy use and associated greenhouse gas emissions of the U.S. food system.
- Meta-analysis of existing food LCAs suggests that for most foods, distribution is not a dominant contributor of greenhouse gas emissions, yet exceptions exist.
- Not all miles traveled are equal in terms of greenhouse gas emissions. Modes of transportation can have a much stronger influence on emissions than transportation distance *per se*.
- Consumer shopping trips can be a surprisingly large source of greenhouse gas emissions in the cradle-to-grave life cycle of foods. Clearly, this is influenced by consumer behavior, including mode of transport (walking, biking, public transit, personal vehicle), vehicle fuel efficiencies, the quantity of food purchased per trip, and whether shopping trips are combined with other tasks.

The full report created by Center for Sustainable Systems - University of Michigan can be downloaded from http://www.oregon.gov/deq/mm/food/Pages/Product-Category-Level-Footprints.aspx.