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The Ecological Sustainability of Local Food Systems

There are many political, social, and economic arguments that support (re)localizing food systems, as the other contributions to this issue of *RCC Perspectives* illustrate. However, the argument that has perhaps received the most attention from the general public and mass media concerns the reduced ecological footprint of consuming locally produced products. According to the Intergovernmental Panel on Climate Change (IPCC), the greenhouse gas (GHG) emissions and land-use practices associated with the agricultural sector are a driving force behind climate change.¹ To be more specific, the global food system accounts for approximately one third of anthropogenic GHG emissions.² In an attempt to address this, considerable attention has been focused on promoting the consumption of locally grown food. The most prominently voiced reasoning behind this is the reduction of GHG emissions that would result from the decrease in transportation requirements. A straightforward and plausible concept, deliberately purchasing and consuming local products has quickly become a core strategy for reducing individual and institutional GHG emissions and is perceived as the motivation behind the “locavore” movement. But is locally produced food genuinely more sustainable?

This essay argues that while the belief that locally grown food is more sustainable due to the shorter distance it travels from farm to plate is misplaced, local food systems as a whole are more sustainable, both ecologically and socially.

The Where vs. The How

The idea of reducing one’s own ecological footprint by eating locally grown food took off with the release of a 2001 study on food miles by Rich Pirog and colleagues. The authors use the term “food miles” to refer to the distance a food product travels from

1 Intergovernmental Panel on Climate Change (IPCC), *Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the IPCC* (Cambridge: Cambridge University Press, 2007).

2 Sonja J. Vermeulen, Bruce M. Campbell, and John S. I. Ingram, “Climate Change and Food Systems” *Annual Review of Environment and Resources* 37 (2012): 195–222.

producer to point-of-sale. Concentrating on the conventional US food system, Pirog and his colleagues determined that, on average, produce in the United States traveled 1,518 miles (approximately 2,400 kilometers) by truck before it reached the supermarket. In a local system—defined by Pirog and his colleagues as a system in which farmers used consumer-supported agriculture enterprises to market directly to local buyers—produce traveled on average 44.6 miles (72 kilometers).³ Transportation in the conventional system used 4–15 times more fuel and emitted 4–17 times more carbon dioxide than transportation in the local system.⁴ Against this backdrop, the argument that buying local food products—keeping in mind that the term “local” has not been clearly defined, and is therefore open to interpretation—is more sustainable is persuasive. And, all other factors remaining equal, it is scientifically speaking a legitimate argument.

However, as tempting as this coherent rule-of-thumb appears, recent studies show that things are a bit more complicated. Weber and Matthews’ life-cycle analysis of GHG emissions associated with food production in the US is particularly enlightening for a couple of reasons. First, it shows that the GHGs emitted during the transportation of a food product from producer to point-of-sale represent approximately four percent of all life-cycle GHG emissions. Food miles also only represent a quarter of the total miles and 40 percent of the transport-related GHG emissions in the conventional US food supply chain (11 percent of total life-cycle emissions).⁵ Second, Weber and Matthews revealed that the majority (80 percent) of GHG emissions occur during the production phase. Take, for example, GHG emissions resulting from the transport of fertilizers, pesticides, and feed (it takes around 10 kilograms of feed to produce one kilogram of meat in conventional livestock husbandry), or those from the use of synthetic fertilizers and pesticides, and of course the enteric methane emissions that are common among ruminant animals.⁶

In short, GHG emissions from food miles account for a trifling percentage of the total emissions produced in the agricultural sector. The majority of GHG emissions in the agricultural sector stem from certain practices in the production phase.

3 Rich Pirog, Timothy Van Pelt, Kamyar Enshayan, and Ellen Cook, *Food, Fuel, and Freeways: An Iowa Perspective on How Far Food Travels, Fuel Usage, and Green House Gas Emissions* (Ames, IA: Leopold Center for Sustainable Agriculture, 2001), 13.

4 Pirog et al., *Food*, 18.

5 Christopher Weber and H. Scott Matthews, “Food Miles and the Relative Climate Impacts of Food Choices in the United States,” *Environmental Science and Technology* 42 (2008): 3509.

6 Weber and Matthews, “Food Miles,” 3510.

However, while this information suggests that there are perhaps better ways to reduce GHG emissions than cutting down on food miles, it does not prove that buying locally produced food is less sustainable than purchasing non-local food products. As a US Department of Agriculture report aptly puts it, “Given two otherwise identical supply chains, the supply chain with greater food travel distance will use more energy and emit more pollution.” Ergo, is less ecologically sustainable. “But supply chains . . . are seldom identical; the mode of transport, load sizes, fuel type, and trip frequency all affect energy use and emissions.”⁷

How food travels is often more important than how far, as the life-cycle analyses conducted by Weber and Matthews and by Saunders and Hayes illustrate. To summarize their findings, the transportation of food products via large boats or trains is more energy efficient and produces fewer GHG emissions than transportation via airplanes or trucks (the smaller the vehicle, the less energy efficient it is).⁸ As a result, the reduction in food miles won by purchasing locally sourced foods is often offset by the inefficiency of the mode of transportation (i.e., smaller trucks).⁹ Similarly, how the food is produced is very important. These findings are not limited to the US conventional food system. In a study of food life-cycle energy inputs in Sweden, Ann Carlsson-Kanyama and colleagues argue that buying imported produce can often be more sustainable than local produce—particularly when it comes to produce that requires considerable irrigation or must be grown in fossil-fuel-powered greenhouses because it is cultivated in a region that is unable to sustain it naturally.¹⁰

In this light, consuming local food does not always mean consuming more sustainably. Purchasing fresh produce, grown in a greenhouse running on fossil fuels on a local farm and transported to your market or home on a small truck, is rarely a more sustainable practice than purchasing fresh produce from the conventional supply chain.

7 USDA, *Local Food Systems*.

8 Weber and Matthews, “Food Miles.”

9 Caroline Saunders and Peter Hayes, *Air Freight Transport of Fresh Fruit and Vegetables*, Research Report No. 299, Agribusiness and Economist Research Unit (Christchurch, New Zealand: Lincoln University, 2007).

10 Ann Carlsson-Kanyama, Marianne Pipping Ekstrom, and Helena Shanahan, “Food and Life Cycle Energy Inputs: Consequences of Diet and Ways to Increase Efficiency,” *Ecological Economics* 44, no. 2 (2003): 293–307.

Sustainable Local Markets

In practice, however, ecological sustainability is not equivalent to fewer or no GHG emissions. And local food systems are not simply a mirror image of the conventional food system with less food miles; rather, they differ fundamentally from the global conventional food system in both structure and culture. Building on this, this essay argues that local food systems currently offer the best source of sustainable food products in most Western, industrialized economies today. The common practices of the average producer and retailer in a local food system, together with short supply chains, increase the sustainability of local food markets. Of course, not all local systems are alike—quite the contrary. The practices adopted by members of local food systems can vary greatly from system to system, yet these variations are frequently a reflection of both the region and community in which the local food system is rooted. It is precisely this physical and social embeddedness that enables local food systems to be opportune sources of sustainable food products.¹¹ While the other contributions in this volume delve more deeply into social and economic sustainability, this essay will conclude with a few examples of the ecologically sustainable practices commonly adopted in local food systems.

In general, such systems foster a culture of consumers and producers who value sustainability.¹² For example, as Brian Halweil so aptly puts it in his paper, “the foundation of a local food system is crop diversity.”¹³ Living off of one or two crops is neither economically sensible nor appetizing. As a result, producers in local food systems not only frequently adhere to the ideas of crop rotation and polyculturalism, but also integrate crop and livestock production.¹⁴ Another common occurrence in local food systems is the compliance of producers with organic farming standards. According to a report published by the US Department of Agriculture, 49 percent of small farms that sold directly to consumers used organic production methods.¹⁵ Finally, considerable research has

11 David W. Hughes, “What is the Deal with Local Food Systems: Or, Local Food Systems from a Regional Perspective,” (working paper, Clemson University, 2007).

12 Amory Starr et al., “Sustaining Local Agriculture: Barriers and Opportunities to Direct Marketing Between Farms and Restaurants in Colorado,” *Agriculture and Human Values* 20 (2003): 301–21.

13 Brian Halweil, *Home Grown: The Case for Local Food in a Global Market* (Danvers, MA: Worldwatch Institute, 2002), 29.

14 Halweil, *Home Grown*, 29–30. The environmental benefits of polycultures and diversified farms over monocultures are widely accepted. For more information see any of the core texts on agroecology, such as Francis et al., “Agroecology: the Ecology of Food Systems,” *Journal of Sustainable Agriculture* 22, no. 3 (2003): 99–118.

15 Stephen Martinez et al., *Local Food Systems: Concepts, Impacts, and Issues*, US Department of Agriculture Economic Research Service, Economic Research Report no. 97 (2010): 18.

also shown that the majority of producers who actively choose to participate in local food systems are small farmers who are prone to adopting one or more of the following sustainable production and distribution practices: moderating or abstaining from the use of synthetic chemicals and fertilizers, allowing livestock to range freely or graze, using cover crops, designing field borders to provide a refuge for native biodiversity, and minimizing packaging.¹⁶

Going beyond the practices of producers, local food systems are also good venues for purchasing ecologically sustainable food products as they frequently have shorter supply chains. In many cases, market intermediaries are disposed of entirely and farmers handle storage, packaging, transportation, and distribution themselves.¹⁷ This in turn frequently reduces or eliminates entirely the processing and packing of food products, which greatly reduces their ecological footprint.¹⁸ In addition, short supply chains enable consumers to access information about the origin of and methods used to produce a food product and to make more informed decisions. Consumers in local food systems can more easily identify and choose products based on their social, ecological, and economic impact on the local community and environment.

With agriculture and food production accounting for such a significant amount of anthropogenic greenhouse gases, assessing the ecological footprint of our diets is pertinent to combating climate change. While the “100-Mile Diet” is unfortunately not quite the easy fix to our unsustainable food consumption patterns that many of us had hoped for, the discussion surrounding it has played a critical role in drawing attention to the environmental impact of the global conventional food system. Simply reducing food miles does not guarantee a more sustainable diet, but consciously choosing to participate in alternative local food systems instead of the conventional food system is a sure way to increase your access to environmentally friendly food and to support more ecologically sustainable agricultural practices.

16 This list is not exhaustive, but merely represents the most common sustainable practices adopted by local food producers. Donald W. Lotter, “Organic Agriculture,” *Journal of Sustainable Agriculture* 21, no. 4 (2003).

17 Terry Marsden, Jo Banks, and Gillian Bristow, “Food Supply Chain Approaches: Exploring Their Role in Rural Development,” *Sociologia Ruralis* 40 (2000): 424–38.

18 Patrick Canning, Ainsley Charles, Sonya Huang, Karen R. Polenske, and Arnold Waters, *Energy Use in the US Food System*, US Department of Agriculture Economic Research Service, Economic Research Report 94 (2010).