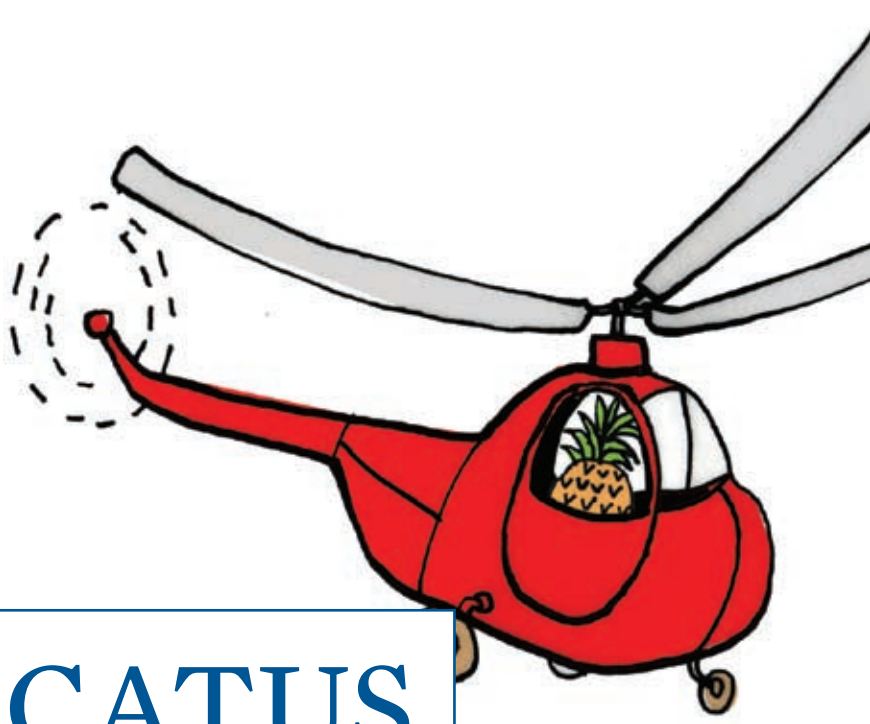
GLOBAL PROSPERITY INITIATIVE



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YES, WE HAVE NO BANANAS: A Critique of the "Food Miles" Perspective

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YES, WE HAVE NO BANANAS:
A Critique of the "Food-Miles" Perspective

Pierre Desrochers and Hiroko Shimizu*

EXECUTIVE SUMMARY

As modern food production and distribution becomes ever more complex and globalized, a "buy local" food movement has arisen. This movement argues that locally produced food is not only fresher and better tasting, but it is also better for the environment: Because locally produced food does not travel far to reach your table, the production and transport of the food expend less energy overall. The local food movement has even coined a term, "food miles," to denote the distance food has traveled from production to consumption and uses the food miles concept as a major way to determine the environmental impact of a food.

This Policy Primer examines the origins and validity of the food miles concept. The evidence presented suggests that food miles are, at best, a marketing fad that frequently and severely distorts the environmental impacts of agricultural production. At worst, food miles constitute a dangerous distraction from the very real and serious issues that affect energy consumption and the environmental impact of modern food production and the affordability of food.

The course of the debate over food miles is nonetheless instructive for policy makers. It highlights the need to remain focused on the issues that are important—in this case, the greenhouse gas emissions of highly subsidized first-world agriculture, the trade imbalances that prevent both developed and developing countries from realizing the mutual benefits of freer trade, biofuel subsidies, and third-world poverty. With the population of the planet growing rapidly, numerous food-policy issues other than food miles should preoccupy policy makers.

*The help and comments provided by Andrew Reed in the course of preparing the primer are gratefully acknowledged.

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YES, WE HAVE NO BANANAS:
A Critique of the "Food-Miles" Perspective

> By means of glasses, hotbeds and hotwalls, very good grapes can be raised in Scotland, and very good wine too can be made of them at about 30 times the expense for which at least equally good can be brought from foreign countries. Would it be a reasonable law to prohibit the importation of all foreign wines, merely to encourage the making of Claret and Burgundy in Scotland?
>
> *Adam Smith, 1776*[1]

> We have had unmistakable warnings too, in the last few years, that we cannot afford to be dependent for the staples of our food and industry on any single place or production. The [Irish] potato disease was one of those warnings.
>
> *Thomas E. C. Leslie, 1862*[2]

INTRODUCTION

In his bestselling popular science book, *Twinkie, Deconstructed*,[3] writer Steve Ettlinger demystifies the origins, complex manufacturing processes, and numerous uses of some of America's most common ingredients and food additives. He takes his readers on a journey to locations as diverse as sugar plantations in Florida, oil fields and vitamin manufacturing plants in China, phosphate mines in Idaho, chemical plants in Louisiana and Switzerland, and many others. In doing so, he gives them a glimpse of how thoroughly globalized our modern food production and distribution system has become. The mind-boggling reality described by Ettlinger probably explains many public anxieties that now frequently surround the modern agro-industrial supply chain.

As a result of concerns ranging from rising energy costs and perceived environmental degradation to health and economic issues, there has been renewed interest in the promotion of locally produced food items. "Food miles" is the term now used by activists seeking to discourage the consumption of foods produced in locations remote from final consumers.

This Policy Primer examines the origins and validity of this concept and the movement it has engendered. Because of its British origins and comparatively greater impact in Western Europe than in North America, much of this discussion will revolve around European Union (EU) cases, but our argument and recommendations are equally valid in the U.S. context.[4]

The evidence presented suggests that food miles are, at best, a marketing fad, but one which so frequently and so severely distorts the environmental impacts of agricultural production that it could be liable to prosecution under false advertising statutes. More importantly, it constitutes a dangerous distraction from the very real and serious issues that affect the affordability, energy consumption, and environmental impact of modern food production.

The first section of this Policy Primer discusses the origins of recent food activism and summarizes the food-

1. Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, ed. Edwin Cannan (London: Methuen, 1904), vol. 1, chap. II, para. 1221, http://oll.libertyfund.org/index.php?option=com_staticxt&staticfile=show.php.%3Ftitle=171&Itemid=99999999.
2. Thomas Edward Cliffe Leslie, *Essays on Political and Moral Philosophy* (Dublin: Hodges, Foster, & Figgis, 1879), 25.
3. Steve Ettlinger, *Twinkie Deconstructed* (New York: Hudson Street Press, 2007).
4. See, for example, Christopher L. Weber and H. Scott Matthews, "Food Miles and the Relative Impact of Food Choices in the United States," *Environmental Science and Technology* 42: 3508–13.

miles perspective. The second section provides a concise history of the development of food production with emphasis on the main drivers behind the globalization of this industry. The third section summarizes the available evidence on the environmental impact of food transport and documents how selecting items based on their country or region of origin provides no solid base to help consumers behave in a more environmentally sustainable manner. On the contrary, this Policy Primer suggests that food purchases from more productive (and therefore typically cheaper) sources that also happen to be more distant have typically numerous advantages, including more efficient use of capital, energy, and labor; lessened environmental impact; and significant economic benefits for producers and workers in less-developed regions. The Policy Primer's final section offers some policy recommendations regarding both the food miles perspective and agricultural policy in general.

I The Recent Food Activism Movement

1.A: From "Organic" and "Fair Trade" to "Slow" and "Local" Food

"Organic," "fair trade," "slow," and "local" describe food activist movements whose stated goals are to allow consumers to express their preferences or opinions against the offerings of large multinational corporations and conventional retailers. Interestingly, the co-optation of the organic and fair trade movements by corporations ranging from Nestle to Wal-Mart has increasingly focused activist efforts on the food miles issue.

The term "food miles" was coined for a 1991 TV documentary by London's City University Professor of Food Policy Tim Lang and two of his colleagues to refer to the distance food items travel from producers to consumers. From their perspective, the further food and other agricultural products are transported, the more fossil fuels are burned and the greater the adverse impact on the environment. Lang later explained his thinking in the following terms: "We wanted people to think about where their food came from, to re-inject a cultural dimension into arcane environmental debates about biodiversity in farms."[5]

The food-miles movement has gained much momentum in the last decade and a half, especially in the United Kingdom where it has reached and influenced a broad audience of environmental activists, producer associations, retailers, media personalities, and governmental organizations.[6] Among other landmark events, in 2005, the United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) produced one of the first substantial reports on the concept,[7] while the following year it became part of the green strategy of large food retailers when Tesco's CEO, Sir Terry Leahy, announced his company's pledge to reduce CO_2 emissions by targeting air-freighted products.[8] Working with the Carbon Trust,[9] Tesco launched a £500 million eco-plan to reduce the company's carbon footprint, an initiative that was followed by Marks & Spencer's similar £200 million, five-year plan. In March 2007, both retail giants introduced their new "air freighted" label as an interim measure to induce consumers to buy more local, low-carbon products and fewer air-freighted products. In the meantime, the Soil Association, the self-described "leading [UK] campaigning and certification organization for organic food and farming,"[10] announced proposed changes along similar lines to its standards for air-freighted products.

5. Tim Lang, "Origin Unknown," *The Guardian*, August 3, 2005, http://www.guardian.co.uk/politics/2005/aug/03/greenpolitics.foodanddrink.

6. Significantly, however, a 2006 study of consumer awareness of the food miles issue in the UK found that only about a third of shoppers were familiar with the concept. See James MacGregor and Bill Vorley, eds., "Fair Miles? Weighing environmental and social impacts of fresh produced exports from Sub-Saharan Africa to the UK (Summary)," *Fresh Insights* 9 (London: IIED & DFID, October 2006).

7. Alison Smith, Paul Watkiss, Geoff Tweedle, and others, *The Validity of Food Miles as an Indicator of Sustainable Development* (DEFRA: ED50254 Issue 7, July 2005), http://statistics.defra.gov.uk/esg/reports/foodmiles/default.asp. This study is discussed in more detail later in this Policy Primer.

8. TESCO is the UK's largest grocer and is also the world's third largest grocery retailer with group sales of £51.8 billion in 2007/08, operating in twelve international markets and employing over 440,000. See http://www.tescoreports.com/downloads/tesco_review.pdf.

9. The Carbon Trust was set up by the UK government in 2001 as an independent company. Its mission is to accelerate the move to a low-carbon economy by working with organizations to reduce carbon emissions and develop commercial low-carbon technologies. See http://www.carbontrust.co.uk/default.ct.

10. According to its press releases, the Soil Association verifies the organic credentials of 70 percent of the UK's $4 billion organic produce market and certifies products on the basis of three principles: minimizing pollution and waste; incorporating social justice and rights; and ecologically responsible production. See http://www.soilassociation.org/web/sa/saweb.nsf/home/index.html.

"AIR FREIGHTED" LABEL

Source: Natural Choices, http://www.naturalchoices.co.uk/Carbon-footprint-labeling-finally?id_mot=7.

In the United States, the popularity of the food miles movement led to the selection of the term "locavore" (originally coined in 2005 by Seattle-based writer Sage van Wing) as the Oxford American Dictionary's word of the year for 2007. Locavores shop at farmers' markets or even grow or pick their own food because they value the alleged greater freshness, taste, nutritional value, and safety of locally grown foods. Implicit in this movement is the notion that this lifestyle combines healthy eating with a high standard of environmental stewardship. Not surprisingly, this perspective has created a trend among gourmet restaurants, where prominent chefs like Alice Waters of Chez Panisse (California) rely on local suppliers for "pure and fresh ingredients."[11] The locavore mentality is further reflected in the development of magazines such as *Backyard Poultry*, websites such as thecitychicken.com and backyardchickens.com, and public television special programs such as "Growing Local, Eating Local."[12]

1.B: The Case for Food Miles

The case put forward by food-mile activists can be summed under four types of alleged benefits:[13]

- **Environmental:** Because locally grown food items travel shorter distances than those produced in more remote locations, they are said to generate less CO_2 and other greenhouse gas emissions. More diversified local food production systems are also viewed as more environmentally sustainable than large, export-oriented systems where only one variety of crop is planted.
- **Social:** The globalization of the food-supply chain is said to have eroded the community ties that once existed between geographically proximate food producers and consumers. Rebuilding these ties would generate significant social benefits.
- **Health:** There is much concern over the safety and quality of conventionally produced food grown or raised in countries with lower health, safety, and environmental standards. Food produced in closer proximity to consumers in more developed economies is also often viewed as fresher and therefore more nutritious and better tasting.
- **Economic:** Locally produced food items improve the economic circumstances of (mostly small-scale) farmers who otherwise struggle in the face of international competition, along with the fortunes of smaller stores who cannot access the international food market as easily as large food retail chains, thereby improving the economic viability of rural communities and independent retailers in advanced economies.

While intriguing, the food-miles perspective fails to question the rationale behind the development of our modern agricultural production and distribution systems. In other words, why is it that past consumers in advanced economies unambiguously rejected not only the rural lifestyle, by moving *en masse* out of farming-related activities, but also increasingly favored food items produced in ever more remote locations? To provide some context to the current debates, we now turn to a brief history of the main drivers behind the latter shift.

2 On the Development of Modern Agriculture and Food Supply Networks

2.A: From Subsistence to Commercial Agriculture

The distinction between subsistence agriculture and commercial agriculture is fundamental to any discussion of food production. In subsistence agriculture, food is consumed in the community in which it is produced. Crop products are stored at the end of the growing season and drawn down until the next harvest, while domesti-

11. Waters is also a strong advocate of farmers' markets and sustainable productions. See http://www.chezpanisse.com.
12. See http://www.pbs.org/now/shows/344/index.html.
13. For statements to this effect, see Rich Pirog, "Food Miles: A Simple Metaphor to Contrast Local and Global Food Systems," *Hunger and Nutrition* (Summer 2004), http://www.leopold.iastate.edu/pubs/staff/files/local_foods_HEN0604.pdf; and Angela Paxton, The Food Miles Report: *The Dangers of Long Distance Food Transport* (London: Safe Alliance, 1994).

cated livestock provide some variety in the diet and serve as a form of insurance against crop failure. Because of bad weather, plant and agricultural diseases, pest infestations, and their inability to draw on the surplus food generated in other agricultural regions, individuals living in subsistence agricultural production systems were, and still are, subjected to recurring famines and starvation. This situation only began to change on a significant scale in Western Europe in the late eighteenth century with the development of the mass transport of foodstuffs and large-scale storage facilities.

Commercial agriculture, on the other hand, implies some reliance on trade with producers in more remote locations. A typical example occurs between communities specializing in raising livestock and those primarily involved in crop production. Increasingly sophisticated commercial relationships between specialized producers, often indirectly through intermediaries, underlie the concept of development. Once specialization in agriculture raises productivity to levels where adequate production can be generated by an ever smaller proportion of the population, individuals are increasingly free to develop expertise in other fields and collectively contribute to improving living standards in other ways. While small in numbers, agricultural producers in advanced economies now generally specialize in a few crops or in one type of livestock, purchasing either all or the vast majority of their own foodstuffs from retail outlets like any urban family. Because of the high productivity made possible by modern technologies, however, they often generate enough surplus to enter international trade where, along with exports from other lines of business, they create the capacity to import products—including foodstuffs—which are produced more efficiently in other locations, contributing to a higher standard of living for all the involved parties than would otherwise be the case.

The most advantageous locations for the production of particular agricultural products obviously depend on a number of factors ranging from transportation costs, links to markets, and political stability to the availability of land, financial capital, and labor. Most crops and livestock, however, can be produced across a wide variety of conditions using vastly different techniques. Market exchanges and the price system then provide a benchmark to compare these alternatives and select the most efficient one.

Of course, this does not imply that different approaches cannot coexist. For example, wheat is grown labor intensively on postage stamp-sized irrigated land plots in Kyrgyzstan; extensively on "mechanically elaborate and agronomically primitive" large scale, dry-land farms in Canada and Argentina; and in Europe on intensively managed, smaller-scale holdings that use numerous mechanical applications of fertilizers, pesticides, and herbicides to generate yields that are typically significantly higher than those obtained without those inputs. Of course, different wheat varieties used for different purposes—such as the production of bread, pasta, or cake—are more suited to some physical environments than others, but again, market exchanges reward the most efficient productive arrangements in each case. Similar differences and complex arrangements exist across a wide variety of food commodities.

Agricultural producers typically have limited scope to influence the price they receive for their products, so their profitability depends heavily on the success of their efforts to reduce production costs. In a market economy, the suitability of a given location as a source of a particular food is ultimately expressed in terms of the cost effectiveness of production at that location. For example, while it is possible to grow bananas in Iceland, this was never done on a large scale because they have always cost much less when shipped in from tropical countries.[14] Unfortunately, however, because of the strategic importance of the rural vote, the apparently simple concept of raising food where it is least expensive to do so is complicated by a broad spectrum of government interventions that have long distorted prices through subsidies, regulations, and constraints that together make it very difficult to determine underlying production costs. As an illustration, if government subsidies are paid on the basis of land farmed, the value of land rises to reflect not only its productive potential, but also its economic potential as a means of accessing government assistance. From the perspective of the consumer, the price of domestically produced agricultural products is reflected not only at the supermarket, but also in the proportion of the taxes paid allocated to farm-related programs.

14. Banana production did and does take place in Iceland as an experiment to use water from hot geysers productively, but prohibitive costs have always ensured that the total volume remained insignificant.

State spending on agriculture is often both high and ineffective.[15] Among nations, agricultural policy is a major source of friction, and it is no coincidence that trade in agricultural products is the major impediment to initiatives designed to reduce constraints on international trade. Suffice it to say that trade and development policies that affect agricultural commodities further complicate efforts to determine the cost structure of agriculture in both exporting and importing countries.

2.B: Yes, We Have Lychees! The Modern Food Supply Chain

Historically, the food trade has been driven by the urbanization process and its accompanying lifestyle changes. The first food items shipped on a large scale and over long distances to urban populations were, for the most part, valuable and easily preserved commodities such as cereals, sugar, coffee, tea, and cocoa.[16] As transportation (trains and steel ships) and preservation technologies (canning and refrigeration) improved, new items such as meat were increasingly shipped over long distances under the control of increasingly large food conglomerates. As early as the 1870s, bananas—which could tolerate long-distance transportation[17]—were produced and shipped over thousands of kilometers by what would in time become major distributors like Dole, Chiquita, and Del Monte. As urban populations grew and became wealthier, so did the demand for fresh fruits and vegetables. By the 1920s, the U.S. production and distribution system had become sufficiently sophisticated to supply lettuce and tomatoes year-round. In the 1980s, two major developments—the extension of seasonal production using alternative production systems (large-scale greenhouses) and the diversification of production locations—provided increased variety and a year-round steady supply of fresh fruits and vegetables. These advances were further reinforced by product-capacity expansion, a growing awareness of the nutritional benefits associated with fresh products, and the establishment of large-scale, temperature-controlled logistic systems (refrigerated containers and cold-storage facilities). As a result, the range, quality, volume, price, and reliability of traded varieties increased rapidly, especially for exotic fruits and vegetables (such as lychees, passion fruit, and Chinese cabbages), salad greens (such as arugula and chicory), and baby vegetables.

According to a recent World Bank report,[18] the volume of fruits and vegetables (including processed products) traded worldwide increased 30 percent between 1990 and 2001. While the monetary value of world imports grew 7–8 percent annually during the 1980s, it dropped to 2–3 percent a year during the 1990s because of a decline in world prices for many products and the stagnation of EU imports due to market saturation. The growth rate for the demand for some products, especially tropical fruits such as papaya, mango, and pineapple, has nonetheless remained constant at around 8 percent annually during the 1990s. The European Union (15 member states), NAFTA (the United States, Canada, and Mexico), China, India, and Japan now dominate the world trade in fruits and vegetables. In 2001, EU imports ($37 billion) accounted for 51 percent of world imports, although almost two-thirds of these were from other EU countries. Still, the European Union is one of the largest fruit and vegetable markets for non-EU countries, especially those in Sub-Saharan Africa. Intraregional trade is also significant in NAFTA countries, which are the world's second largest fruit and vegetable market. Interestingly, as incomes rose and diets diversified, some major food exporters also became importers of more varied food products in the 1990s.

For developing economies, fruits and vegetables—both fresh and processed—are not only important items in agricultural trade (accounting for about 22 percent of their exports in 2000–2001), but also in many cases the

15. U.S. agricultural policy is so notoriously complicated that U.S. agricultural economist Vernon Ruttan has referred to farm bills as "a full employment act" for his colleagues. For a reasonably up-to-date overview of U.S. farm spending, see E. C. Pasour, Jr.'s *Plowshares and Pork Barrels: The Political Economy of Agriculture* (Oakland, CA: The Independent Institute, 2005). Pasour points out that in 2002, spending by the U.S. Department of Agriculture on initiatives designed to increase the prices received by farmers amounted to $37.8 billion, while initiatives to reduce producer price cost taxpayers $11.4 billion.

16. William H. Friedland, "The Global Fresh Fruit and Vegetable System: An Industrial Organization Analysis," in *The Global Restructuring of Agro-Food Systems*, ed. Philip McMichael (New York: Cornell University Press, 1994), 173–89.

17. The innovation that facilitated the long-distance transportation of bananas by sea was the use of ripening rooms near the point of retail sale where green bananas were ripened in a methane-rich atmosphere.

18. Ndiame Diop and Steven M. Jaffee, "Fruits and Vegetables: Global Trade and Competition in Fresh and Processed Product Markets," in *Global Agricultural Trade and Developing Countries*, eds. M. Ataman Aksoy and John C. Beghin (Washington, DC: World Bank, 2005), 237–57.

agricultural segment with the greatest growth potential. Significant success in this respect, however, has so far been limited to a few countries. Most remarkable have been the performances of Argentina, China, Mexico, and Syria, which supplied 67 percent of developing countries' fresh-vegetable exports between 1997 and 2001, while Chile, Costa Rica, Ecuador, and Mexico accounted for 43 percent of developing countries' fresh-fruit exports during this time. In all cases, exporters supply mainly products that are either not grown in or are out-of-season in importing countries.

The fruit and vegetable market is strongly demand-driven and is ultimately a function of consumers' income levels and population composition and dynamics. Some important trends include the following:

- Higher incomes induce increased expenditures on an wide array of fruit and vegetable products, while simultaneously creating a demand for convenient shopping offering increasingly processed products and reliable year-round availability.
- More leisure hours and the increased availability of leisure-time activities raise the opportunity cost of preparing meals at home.
- Population size, age, and ethnic composition affect the overall demand for specific items.

In short, the global trade in fresh fruits and vegetables is demand-driven, highly competitive, dynamic, and requires significant capital and labor investments. Private, large-scale global supply chain structures, encompassing as they do vast amounts of experience, knowledge and capital, are, along with favorable government policies and functioning institutions, necessary for success in this market.

Food-miles activists, however, fail to understand or address the numerous factors that have shaped our modern food-supply chain. As such, their main claims and prescriptions for sustainability have little validity.

3 The Case Against Food Miles

The most problematic aspect of the food-miles perspective is that it ignores productivity differentials between geographical locations. In other words, activists assume that producing a given food item requires the same amount of inputs independently of where and how it is produced. In this context, the distance traveled between producers and consumers, along with the mode of transportation used, become the only determinants of a food's environmental impact. But any realistic assessment must reflect both transport to final consumers *and* the total energy consumption and greenhouse gas emissions associated with production. While the complexity of "seed-to-plate" processes is quite mind-boggling, researchers using the so-called Life Cycle Assessment (LCA) methodology have shed much light on the issue.[19] We now summarize some of their main findings, beginning with the transportation component that is at the heart of the local-food debate.

3.A: Environmental Effect: Energy and CO_2 Emissions

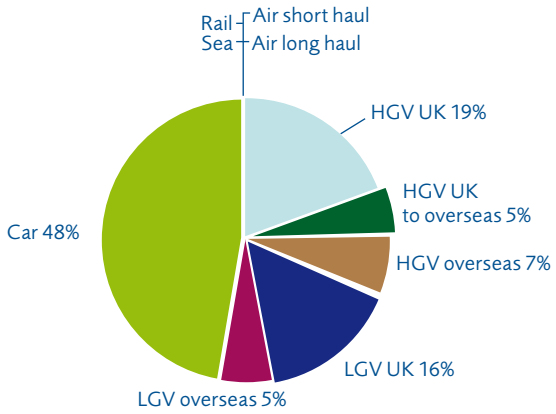
TRANSPORTATION MODE/LOAD

In 2005, DEFRA published what is probably the most comprehensive analysis of the food-miles controversy to date.[20] Using 2002 data, researchers used two measurements for food transport: vehicle kilometers (the distance traveled by vehicles carrying food and drink regardless of the amount being transported) and ton kilometers (distance multiplied by load).[21] They obtained the following results:

> **1. Vehicle kilometers:** 82 percent of the estimated 30 billion food miles associated with UK-consumed food are generated within the United Kingdom, with car transport from shop to home accounting for 48 percent and heavy goods vehicles (HGV) like tractor-trailers for 31 percent of food miles. Remarkably, air transport amounted to less than 1 percent of food miles.

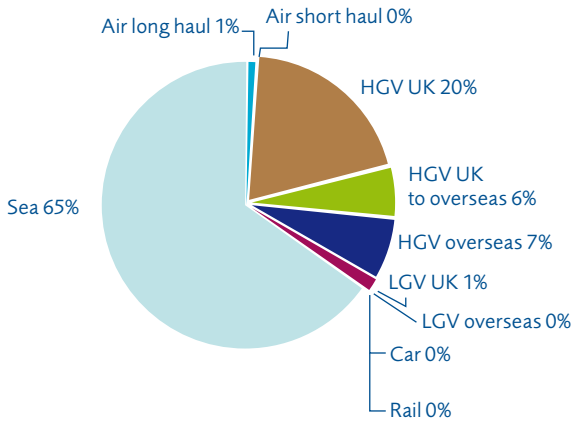
19. For a broad and accessible introduction to the purpose, scope, and limits of LCA, see, among others, the webpage of the Environmental Protection Agency on this approach, http://www.epa.gov/nrmrl/lcaccess/.
20. Smith, Watkiss, Tweedle, and others, *Validity of Food Miles as an Indicator of Sustainable Development*, ED50254 Issue 7, July 2005, http://www.defra.gov.uk.
21. A ton is a metric measurement of 1,000 kilograms (kg), where 1 kg = 2.2 lbs.

FIGURE 1: VEHICLE KILOMETERS



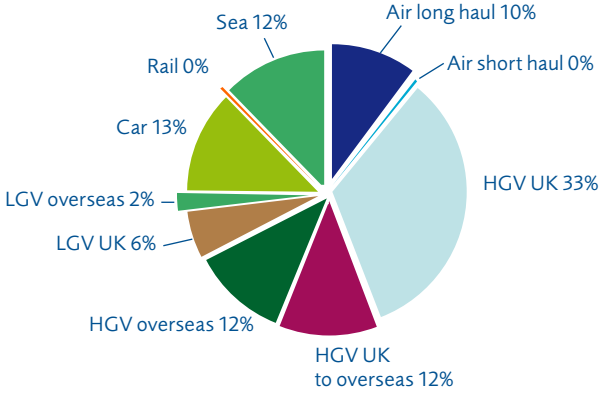
Source: DEFRA

FIGURE 2: TON KILOMETERS



Source: DEFRA

FIGURE 3: CO_2 EMISSIONS



Source: DEFRA

The large share accounted for by cars is the result of individual families making many small-volume trips to transport food from store to home. Comparatively, these cars are much more inefficient than bigger transportation modes that move food from the point of production to the retail location. See figure 1.

2. Ton kilometers: Sea transport accounts for 65 percent of food miles, but this doesn't mean that this mode of transport is the most polluting in terms of greenhouse gas emissions. Transportation by sea is a highly energy-efficient way to move goods, and its "vehicle" kilometers account for less than 1 percent of total vehicle kilometers. In other words, moving New Zealand apples to the United Kingdom using highly efficient, diesel-powered container ships consumes very little energy per apple when compared to moving them by car from a supermarket to a relatively nearby residence. See figure 2.

3. CO_2 emissions: Food transportation in the United Kingdom accounted for 1.8 percent of total CO_2 emissions in 2002, with tractor trailers and air transportation (including both import and export products) respectively accounting for 57 percent and 10 percent of this total, and sea transport accounting for 12 percent. See figure 3.

In short, according to the DEFRA report, food miles (or "vehicle kilometers") and environmental burden (in terms of CO_2 emissions) are not directly correlated. While air freight is typically singled out by activists as both the most environmentally damaging and most energy-intensive mode of transport, it is actually a minor contributor (10 percent) to total CO_2 emissions.

In the United States, a recent LCA study confirmed the plausibility of these findings by showing that 11 percent of greenhouse gas emissions related to food are from the transportation segment as a whole. Moreover, the "food-miles" segment (from producers to retailers) contributed only about 4 percent of total emissions, while 83 percent came from producing the food.[22]

The concept of food miles is therefore a profoundly flawed sustainability indicator as its proponents typi-

22. Christopher L. Weber and H. Scott Matthews, "Food-Miles and the Relative Climate Impacts of Food Choices in the United States," *Environmental Science & Technology* 42, no.10 (2008): 3508–13.

cally fail to factor in the efficiency of both transportation modes and loads transported.

PRODUCTION STAGE

Growing concerns over food miles have resulted in a significant increase in the number of LCA studies on the topic. The best literature review on the subject at the time of publication is authored by New Zealand researchers Caroline Saunders and Peter Hayes (2007).[23] While the scope and focus of the twenty-seven studies reviewed (seventeen of which were funded by UK sponsors) varied, they shed valuable light on the picture of energy consumption and CO_2 emissions for the whole agricultural production chain (Figure 4). In short, according to the available data, the most energy-intensive segments (and therefore those providing the best target for reducing energy use) of the agricultural production chain were not related to transportation.

FIGURE 4. LCA SCOPE AND INPUT

SCOPE	PLAYER	INPUT
1. Raw material for production	Farm	Seed, land, fertilizer, water herbicide, pesticide, etc.
2. Production		Capital (machinery, facility buildings, etc.) Energy (fuel, electricity, oil) Labor
3. Packaging		
4. Distribution	Supply chain	Storage Waste Transportation Labor
5. Consumption	Consumer	Transportation Preparation Waste
6. Disposal		Recycle Waste Transportation

PRODUCTION METHOD

The DEFRA (2005) study compared emissions from energy used for UK and Spanish tomatoes and factored in the production stage and post-production transfer from Spain to the United Kingdom by land transportation. In this context, UK tomato production emits 2,394 kg of CO_2/ton compared to 630 kg/ton for Spanish tomatoes, with the significant difference being accounted for by the energy requirements of UK greenhouse production (about 90 percent of the energy used in this production), while Spanish production takes place in unheated, plastic-sheeted greenhouses.

In general, physical environments that require significant heating and/or cold protection technologies entail much greater energy consumption than more favorable climates, often on a scale that dwarfs the energy requirements associated with the transportation of agricultural products from more remote locations. Furthermore, a misplaced emphasis on transported distance from producers to retailers as a sustainability indicator will hurt the development of more distant, poorer economies and therefore hurt their capacity to devote more resources to environmental protection. This point will be addressed in further detail in later sections.

PRODUCT TYPE, PREPARATION, AND STORAGE

The type of product is an important factor in determining total energy consumption/CO_2 emissions.[24] In other words, a product is energy intensive or less environmentally friendly if it is preprocessed or requires much cooking preparation. Such products include frozen and ready-prepared fruits and vegetables. Low greenhouse gas-emission products are typically seasonal, require no heating and protection, are not highly perishable, and travel short distances. Common examples are staple root vegetables and tubers (carrots and potatoes), cabbages, and staple indigenous fruits (apples and pears). Interestingly, however, a study on the CO_2 emissions associated with Swedish organically grown potatoes found that the most significant factors in this respect are household shopping, storage, and preparation—especially preparation since potatoes are not eaten raw

23. Caroline Saunders and Peter Hayes, *Air Freight Transport of Fresh Fruit and Vegetables* (New Zealand: AERU, Lincoln University, 2007), http://researcharchive.lincoln.ac.nz/dspace/bitstream/10182/248/1/aeru_rr_299.pdf.
24. Tara Garnett, "Fruit and Vegetables & UK Greenhouse Gas Emissions: Exploring the Relationship" (working paper, Food Climate Research Network, UK, 2006).

and require much energy to cook.[25] In 2000, a study by Heller and Keoleian similarly pointed out that home cooking and storage require much energy.[26]

The importance of seasonality in terms of energy input and CO_2 emissions is also often easily forgotten by activists and consumers. In a study of the issue published in 2006,[27] Saunders, Barber, and Taylor provide out-of-season cold storage energy input and CO_2 emissions for UK apples and assume that they would be kept in this state for an average of six months.[28] According to their scenario, UK apple storage energy consumption was 2,069 megajoules(MJ)/ton and CO_2 emissions for production 85.5 kg of CO_2/ton. These amounts are comparable to the transportation energy consumption required to ship New Zealand apples to the United Kingdom (2,030 MJ/ton), but far exceed those required to produce New Zealand apples (60.1 kg of CO_2/ton). In other words, because New Zealand is located in the southern hemisphere where the growing season coincides with the northern hemisphere's winter, shipping freshly picked New Zealand apples and selling them quickly to UK consumers during their winter season entails less greenhouse gas emissions than the purchase by UK consumers of UK apples that have been in storage for several months. Another study by Milà i Canals, Cowell, Sim, and Basson in 2007 further factored in seasonal storage and storage losses.[29] In this scenario, local apples stored between five and nine months with normal storage-loss rates increased total primary energy use by 8–16 percent. This high level of cold storage energy consumption indicates that out-of-season storage should be avoided (at least if uneconomical) and that seasonal differences can provide important environmental benefits.

CONSUMER SHOPPING AND FOOD HANDLING BEHAVIOR

Consumers' transportation choices, such as walking or biking as opposed to driving, obviously affect the total CO_2 emissions associated with their food purchases. The magnitude of this impact, however, is also typically underestimated by activists and consumers. In the worst scenario, a UK consumer driving six miles to buy Kenyan green beans emits more carbon per bean than flying them from Kenya to the United Kingdom. The authors of the DEFRA study showed that car driving by UK consumers to and from the retailers where they purchase their food contributes 48 percent of vehicle miles and 13 percent of CO_2 emissions associated with their food purchases.

Another largely overlooked issue is the way consumers handle their food. Garnett (2006) points out that 25 percent of all produce grown ends up as waste.[30] Another British study conducted by the Waste & Resources Action Programme (2008)[31] analyzed the trash of 2,138 households and estimated that more than 6.7 million tons of food—roughly a third of the food bought by consumers—was thrown out in the United Kingdom every year. According to the report's authors, 61 percent of this food waste (consisting mostly of fresh fruits, vegetables, and salads and amounting to approximately 70kg/year/person) could be avoided with better shopping and meal planning. Food waste costs were estimated to be on the order of £10.2 billion (about $19.5 billion USD) and the cause of 18 million tons of CO_2 emissions per year in the United Kingdom—an amount equivalent to the annual emissions of one-fifth of the British car fleet during this time period.

In sum, while activists and consumers tend to focus exclusively on the transportation distance between pro-

25. B. Mattson and E. Wallén, "Environmental Life Cycle Assessment (LCA) of Organic Potatoes," *Acta Horticulturae* 619 (2003): 427–35.
26. Martin A. Heller and Gregory A. Keoleian, *Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System* (Center for Sustainability Systems report no CSS00-04, Ann Arbor: University of Michigan, December 2000).
27. Caroline Saunders, Andrew Barber, and Greg Taylor, *Food miles – Comparative Energy/Emissions Performance of New Zealand's Agriculture Industry* (Research Report No. 285, New Zealand: AERU, Lincoln University, 2006).
28. Ibid. Apples and similar fruits are frequently kept in storage with higher than normal CO^2 concentrations. Temperature control involves either maintaining lower than ambient temperatures to inhibit spoilage or maintaining higher than ambient temperatures to prevent freezing, depending on the location.
29. Llorenç Milà i Canals, Sarah J. Cowell, Sarah Sim, and Lauren Basson, "Comparing Domestic Versus Imported Apples: A Focus on Energy Use," *Environmental Science and Pollution Research* 14, no. 5 (2007): 338344.
30. Garnett, *Fruit and Vegetables & UK Greenhouse Gas Emissions.* See also Bronwen Jones, "The Sustainable Food Challenge" (presentation, Resource Recovery Forum conference, November 6, 2007), http://www.resourcesnotwaste.org/members/conf-application-form/Conf-presentations/RRF-foodwastes(presentations).pdf.
31. WRAP, "The food we waste," http://www.wrap.org.uk/retail/food_waste/research/the_food_we_waste.html. WRAP is a nonprofit company established in 2000, backed by government funding from England, Scotland, Wales, and Northern Ireland, that "helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change."

ducers and retailers, they are unaware of the typically greater impact of their own shopping and food handling behavior on CO_2 emissions.

3.B: Social Effect

In recent years, about 40 percent of the United Kingdom's air-freighted fresh fruit and vegetable imports have originated from sub-Saharan countries such as South Africa, Ghana, Tanzania, Uganda, Zambia, and Kenya.[32] Kenyan producers' successes (especially in terms of green beans, green peas, and fresh flowers), however, eventually drew the ire of European food and environmental activists concerned that these goods were air-freighted and therefore allegedly "the epitome of unsustainable consumption." As a result, a series of initiatives, campaigns, and measures were launched that triggered considerable fears and complaints from African governments and producers.[33] The facts of the Kenyan case are instructive.

In 2004, Kenya's export of vegetables, roots, tubers, and other edible vegetables totaled $161 million and made it the 27th largest exporting country in this category.[34] In another export category, live trees, plants, bulbs, roots, and cut flowers, Kenya exported $470 million worth of merchandise and was the 7th largest exporter in the world in 2006. Indeed, Kenyan cut-flower exports amounted to $250 million and accounted for about 10 percent of the agricultural sector's contribution to gross domestic product in 2004.[35] Kenya was the leading supplier of cut flowers to the European Union, with a 25 percent market share that has exceeded that of either Columbia or Israel since 2000.

Because of their characteristics (light weight, high value, perishable), 91 percent of fresh fruits and vegetables exported from Kenya to the United Kingdom are air freighted,[36] adding, for example, an additional 2 to 18 pence to the cost of each pack of organic Kenyan green beans.[37] Intercontinental air freight adds 8 kg of CO_2 to the atmosphere per kg transported, about 200 times more emissions and 12 times more energy than sea transport.[38] However, a much larger volume of CO_2 emissions is released by UK passenger flights each year. Indeed, passenger flights amount to 90 percent of all emissions from airlines, with cargo flights amounting to about 5 percent. Furthermore, less than 0.1 percent of total UK emissions of CO_2 are contributed by fresh fruit and vegetable air-freighted imports. Interestingly, 60 to 80 percent of Kenyan fresh agricultural products are transported in the cargo hold of passenger flights.[39] When passenger-related emissions are factored in, CO_2 emission levels for air-freighted exports are much lower.

In a recent study, Adrian Williams contrasted production of cut flowers in Kenya and the Netherlands destined for the UK market.[40] For every 12,000 cut roses produced, Kenyan producers released 6,000 kg of CO_2, as opposed to 35,000 kg of CO_2 for their Dutch competitors. Overall, Kenyan rose production is said to be much more efficient and environmentally friendly than Dutch production, reflecting, among other things, that 99 percent of Dutch emissions were caused by heating- and lighting-intensive production systems, whereas Kenyan flower production relies mostly on natural sunshine. In contrast, 91 percent of Kenyan emissions were attributed to the 4000 mile air-freight transport from Kenya to the United Kingdom. This study provides a striking illustration of the impact of environmental differences between production locations.

32. James MacGregor and Bill Vorley, "Fair miles?: the concept of 'food miles' through a sustainable development lens," *Fresh Perspectives* 1 (London: IIED, 2006), http://www.agrifoodstandards.net.
33. Ben Garside, James MacGregor, and Bill Vorley, "Miles better? How 'fair miles' stack up in the sustainable supermarket," *Fresh Perspectives* 9 (London: IIED, December 2007), http://www.agrifoodstandards.net; and Roger Turney,"Organic Growth," *Air Cargo World Online*, http://www.aircargoworld.com/regions/euro_0108.htm.
34. International Trade Statistics, http://www.intracen.org/tradsat; and Trade Competitive Map, http://www.intracen.org/appli1/TradeCom.
35. Catherine Riungu, "Why Kenya Dominates Export of Flowers to the EU Market," *The East African*, February 21, 2005, http://www.theeastafrican.co.ke/business/-/2560/245890/-/7oem2tz/-/index.html.
36. MacGregor and Vorley, "Fair Miles?"
37. Freshinfo, "Airfreight proposals vilified by industry," April 8, 2008, http://www.agrifoodstandards.net/en/news/global/airfreight_proposals_vilified_by_industry.html.
38. MacGregor and Vorley, "Fair Miles?" 2.
39. James MacGregor and Muyeye Chambwara, "Room to move: 'Ecological space' and emissions equity," *Fresh Perspectives* 14 (London: IIED, December 2007).
40. Adrian Williams, *Comparative Study of Cut Roses for the British Market Produced in Kenya and the Netherlands*, Précis Report for World Flowers (Cranfield University, 2007), http://www.fairflowers.de/fileadmin/flp.de/Redaktion/Dokumente/Studien/Comparative_Study_of_Cut_Roses_Feb_2007.pdf.

When the food-miles controversy broke out, supporters of Kenyan exporters were quick to point out that greenhouse gas emissions associated with air-freighted produce exports were miniscule in comparison with the impact of tourist air travel by citizens of importing nations. They further argued that Kenyan agriculture—often relying on manual labor instead of farm machinery and chemical weed control, integrated pest management instead of applications of chemical pesticides, and organic rather than chemical fertilizers—was inherently more competitive in terms of its carbon footprint than its first-world counterpart. Of course, CO_2 emissions per capita vary widely from country to country, but the global average is currently estimated to be about 3.6 tons per person per year. Interestingly, the UK average of 9.2 tons is considerably higher than the African average of 1.04 tons and the Kenyan average of 0.2 tons.

These figures highlight the hypocrisy underlying the campaign by the Soil Association and other rich-country activists who claimed that the distance traveled by imported organic produce implied significant environmental damages in the form of greenhouse gas emissions. This claim has been demonstrated conclusively to be inaccurate and misleading along the lines already discussed in this Policy Primer:

1. The distance traveled by a product between producer and consumer is not indicative of the relative "cost" to the environment as expressed in terms of greenhouse gas (GHG) emissions.

2. The mode of transportation and volume of goods transported by each mode plays a crucial role in the amount of GHG emissions attributable to each product. Not surprisingly, the greatest volume of emissions is often incurred by tractor-trailers in the United Kingdom.

3. Very insignificant volumes of food travel by air compared to other modes of transportation, and there is no reason to suppose that the share of air-freighted foodstuffs will increase significantly.

4. Importing foods over long distances from producers that use low-carbon technologies is likely to be less environmentally damaging than employing locally grown alternatives, especially out of season.[41]

3.C: Economic Impact

Responding to the arguments put forward by the local food movement, a growing number of community groups and social activists, such as the organizers of the 2008 (American) Democratic National Convention,[42] have taken up the challenge of subsisting (at least temporarily) on a (mostly) local diet. The most radical individuals in this respect are the promoters of the so-called 100-mile diet, who voluntarily limit their food consumption to items grown or caught within a 100-mile radius of their residences.[43] One of the best-documented cases is a Canadian couple based in southwest British Columbia (perhaps Canada's most ecologically diverse and productive agricultural region) who, in 2005, took up this eco-challenge for a year and documented their experiences online and in a book.[44] Their experiment quickly highlighted some fundamental problems with the 100-mile approach:

- **Cost:** Locally grown organic products or substitutes for conventional products, in general, cost more (often significantly more) than conventional products.[45]
- **Lack of variety:** Sugar, rice, lemon, ketchup,

41. Ibid. Nonetheless, the UK Soil Association continues to insist that it did not intend to target all air-freighted produce, but merely that it sought to withhold its "organic" certification from produce that failed to meet its own ethical trade standards or the Fair Trade Foundation's standards. This, however, raises the important issue of who is best placed to determine whether a product is traded fairly or not. For a more detailed discussion of the issue, see Colleen Berndt, *Does Fair Trade Coffee Help the Poor?* (Arlington, VA: The Mercatus Center, 2007).

42. Since this event was held in Denver (Colorado), a region with a dry climate and a short growing season, this resolution proved quite difficult to implement. See Diane Francis, "Marx Goes Local," *National Post*, May 21, 2008, http://www.nationalpost.com/opinion/story.html?id=528407&p=1.

43. The Small family, of Bruntisland, Fife, Scotland, provides a UK example. For six months they have adhered to and publicized the "Fife Diet" which is restricted to food—mostly vegetables, meat, and fish—raised in the region and caught in adjacent waters. Robin McKie, "How the Myth of Food Miles Hurts the Planet,"*The Observer*, March 23, 2008. It should be noted that Fife is a particularly remote and windswept northerly county of Scotland.

44. See Alisa Smith and J. B. MacKinnon, "Living on the 100-Mile Diet," *The Tyee*, June 28, 2005, http://thetyee.ca/Life/2005/06/28/HundredMileDiet. Also, see Smith and MacKinnon, *The 100-Mile Diet: A Year of Local Eating* (Toronto: Random House Canada, 2007).

45. The 100-mile couple mentioned that the cost was a big problem, for example, locally grown organic salad mix cost $17.99 a pound, and honey cost $11 a kilo instead of $2.59 a kilo for sugar. See http://thetyee.ca/Life/2005/06/28/HundredMileDiet/.

olive oil, peanut butter, orange juice, and flour could not be produced locally. In winter, only a very narrow selection of vegetables was available.

- **Time:** The time spent acquiring and preparing food (for both immediate and later consumption) was comparable to holding a part-time job.

Of course, these problems were actually mitigated by the fact that the couple did not forego access to a wide range of services, such as sophisticated health care, which were available to them only because food imports made it possible for other individuals to specialize in nonagricultural activities. Still, this experiment does help illustrate the large and very tangible benefits of trade and the sophisticated division of labor it allows.

3.D: Health and Security

Industry-initiated and government-sponsored promotional campaigns to "buy local" are nothing new, as food producers and some consumers have long considered food items produced within their political borders (and, ideally, grown organically) to be inherently more desirable for alleged health and security reasons. There is, however, no guarantee that locally produced food is inherently safer than food produced elsewhere under the watchful eyes of advanced countries' buyers whose very survival is dependent on their capacity to deliver affordable and safe food to consumers. Ironically, a recent LCA study sponsored by DEFRA has raised questions about the claims repeatedly made in favor of organic foodstuffs in general, the first of which is that organic farming is good for the environment.[46] It is similarly difficult to argue that a country is safer if it relies entirely on local crops that are always subject to bad yields or outright failures rather than on numerous foreign suppliers.

Of course, most health, safety, and environmental concerns raised over foreign food supplies are often thinly veiled protectionist measures. For example, the early involvement of the British Soil Association in the food-miles controversy was quickly denounced as an ill-disguised protectionist move by a lobby group with a vested interest in protecting its (high-cost) members from offshore competition. In the United States, a 2002 farm bill discussed a country-of-origin labeling (COOL) proposal that would have required retailers to provide customers with country-of-origin labeling for beef and other perishable products previously exempted from this requirement. While COOL proponents (primarily uncompetitive crop growers and cattle producers)[47] tried to link this provision to safety and health concerns, such as recent BSE (mad cow disease) and foot and mouth disease episodes, as trade analyst Daniel J. Ikenson put it, this proposal ultimately aims to "saddl[e] others with what should be the marketing costs of domestic producers and [to reduce] import competition."[48] Not surprisingly, COOL faced strong opposition from retailers (who would bear the cost of this requirement) and serious implementation difficulties, leading to its postponement until September 30, 2008, when COOL labeling went into force for beef, lamb, peanuts, pork, vegetables, gin-

46. Rob Johnston "The great organic myths: Why organic foods are an indulgence the world can't afford," *The Independent*, May 1, 2008. Interestingly, the "attack is the best form of defense" strategy employed by the Soil Association seems to be coming unstuck. The organic food movement in the UK, which is mostly confined to the wealthy southeast of the country, is also under attack from the Food Standards Agency, which maintains that "the weight of current scientific evidence does not support claims that organic food is more nutritious or safer than conventionally produced food." Jo Revill, "Organic Food 'No Benefit to Health,'" *The Observer*, March 30, 2008.

47. See the membership list of the website "Americans for Labeling" for further detail, http://americansforlabeling.org.

48. Daniel Ikenson, *Uncool Rules: Second Thoughts on Mandatory Country of Origin Labeling*, Free Trade Bulletin no. 7 (Washington, DC: The Cato Institute, Center for Trade Policy Analysis, 2004). See also Gary Brester, John M. Marsh, and Joseph Atwood, "Who Will Bear the Cost of Country-of-Origin Labeling?" *Choices*, 4th Quarter 2004.

seng, chicken, goat meat, pecans, macadamia nuts, and fruits.[49] Indeed, in the beef case, COOL labeling would actually discriminate against Uruguay, the only country in the world producing BSE-free beef. [50]

Furthermore, in practice, investigating and documenting the full array of environmental impacts of specific items and conveying the resultant information to consumers at the point of sale proves to be an extremely difficult task. For example, brands familiar to UK consumers (such as Walkers crisps and Boots the Chemist), along with retail giant TESCO, were committed to implement "carbon-labeling" policies that would quantify and communicate the total CO_2 emissions of specific items from the production stage to the retail shelf. While the cost of obtaining a reasonably accurate estimate of emission per item turned out to be at least $10,000,[51] in practice the inherent complexity and trade-offs involved in the modern food production and distribution chain probably make all such attempts eminently debatable and arbitrary.

In short, while it is often assumed that locally grown foods are both less energy consuming (and therefore less CO_2 emitting) and more beneficial in terms of safety, security, and health, there is no solid evidence to back any of these claims.

3.E: Other Considerations

LABELING INFORMATION AND CONSUMER BEHAVIOR

Studies of consumer behavior undertaken as a consequence of the food-miles controversy tend to confirm a long-established divergence between what consumers say they prefer (in this case, a strong preference for local food) and their actual shopping behavior, which demonstrates the greater importance of factors such as price, time, convenience, variety, and year-round availability. Indeed, Tesco's and Marks & Spencer's early embrace of food miles has confirmed that "air freighted" labels have no discernable impact on sales.[52] Meanwhile, consumers seem to continue to appreciate the convenience and choices offered by large supermarkets as opposed to the more limited options typical of smaller retail outlets.[53]

Similarly, while a study conducted in the context of the U.S. COOL debate suggests that U.S. consumers might be willing to pay a premium for COOL-labeled American meat on the assumptions that it is fresher and safer than its imported counterparts, no credible research guarantees that COOL labels would boost demand for U.S. meat to the point that it would offset additional labeling costs. Moreover, a case has been made that labels describing attributes such as grass-fed, organic, and free-range—or other factors, such as color, quality grade, and price—would similarly influence consumers' purchasing decisions.[54]

49. For more recent details on these and related developments, see http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateM&navID=CountryofOriginLabeling&rightNav1=CountryofOriginLabeling&topNav=&leftNav=CommodityAreas&page=CountryOfOriginLabeling&acct=cntryoforgnlbl.
50. Michael A. Boland, Lautaro Perez, and John A Fox, "Crass-Fed Certification: The Case of the Uruguayan Beef Industry," *Choices*, 1st quarter 2007.
51. Heather Green and Kerry Capell, "Carbon Confusion," *Business Week*, March 6, 2008, http://www.businessweek.com/magazine/content/08_11/b4075052454821.htm?campaign_id=rss_innovate.
52. Freshinfo, "TESCO and M&S Admit Airfreight Apathy," November 2007.
53. Stephanie Chambers, Alexandra Lobb, Laurie Butler, and others, "Local, National, and Imported Foods: A Qualitative Study," *Appetite* 49 (2007): 208–13.
54. Wendy J. Umberger, "Will Consumers Pay a Premium for Country-of-Origin Labeled Meat?" *Choices*, 4th quarter 2004.

TOWARD A VALID INDICATOR FOR SUSTAINABLE PRODUCTION AND DEVELOPMENT

In recent decades, market mechanisms have delivered remarkable results in providing ever more diverse, healthy, and affordable food to consumers. Many activists, however, suggest that these favorable trends have been purchased at the expense of ever-increasing environmental degradation. Assuming that all human beings should be provided adequate nutrition, however, this proposition is highly debatable in that certain amount of environmental degradation should be acceptable in order to provide people with food. In short, there is a long-standing debate between proponents of alternative approaches to agricultural production—mostly those pushing the local food movement—and their opponents, who suggest that concentrating agricultural production in the most favorable regions is the best way to minimize human impacts because doing so "spares" much land that can then be returned to or remain in a "natural" state. This debate now seems to be over and to have been won by the latter group.[55] We would further suggest that market economics and the price mechanism developed precisely for the purpose of avoiding the root cause of the food-miles controversy: the ability to address competing interests with a common yardstick.

4 Policy Discussion

4.A: Trade Barriers

Feeding a rapidly growing world population in a sustainable manner requires long-distance trade to ensure that food is produced most efficiently in the most suitable locations.

The two closely-related mechanisms that impede the ability of developing nations to realize their full economic potential in agriculture involve the subsidy regimes and trade policies of developed countries. Subsidies exert a considerable price on taxpayers, mainly through efficiency losses and the distortion of relative market prices. In other words, most subsidies are, in the end, harmful to both the environment and the economy, although they might end up lowering consumer prices in other jurisdictions. According to one review of the literature,[56] estimated total subsidies worldwide to six economic sectors (agriculture, fishery, energy production, transport, water, and forestry) hover around $1 trillion per year. Agriculture is the most heavily subsidized and receives $376 billion, $207 billion (55 percent) of which can be described as "perverse subsidies" that have negative impacts on both the economy and the environment.

Tariffs are the most common instrument used to protect local fruit and vegetable markets. Compared to other industries, the average agricultural tariff, at 16.7 percent, is rather high.[57] The European Union, Japan, and the United States use a wide range of protectionist tools to varying degrees.[58] The net effect of the trade inhibitions that arise from the subsidy regimes and trade policies of developed nations is to keep developing (and, ironically, developed) countries much poorer than they would otherwise be. As poverty, rather than the potential to produce more food, is, along with inappropriate domestic policy environments, the main reason for food insecurity in many jurisdictions, trade restrictions imposed by developed nations and the subsidy regimes that distort what trade is permitted are largely to blame for food shortages in the developing world. As one observer pointed out, trade restrictions and various European government policies tainted by "befuddled romanticism"—from campaigns against genetically modified foods and low-wage produce to "save the peasant" farm reforms—have resulted in sub-Saharan Africa now having *less* commercial agriculture than it did fifty years ago.[59] It must be pointed out, however, that numerous trade barriers and other institutional deficiencies (such as lack of or inadequately enforced property rights) can also be found in less-developed economies.

According to a World Bank report, developing countries would capture about $85.7 billion in real income

55. Pamela Matson and Peter Vitousek, "Agricultural Intensification: Will Land Spared from Farming Be Land Spared for Nature?" *Conservation Biology* 20, no. 3 (2006): 709–710.
56. Peter M. Kjellingbro and Maria Skotte, *Environmentally Harmful Subsidies* (Copenhagen, Denmark: Envinronmental Assessment Institute, September 2005).
57. Diop and Jaffee, *Fruits and Vegetables*, 2005.
58. Kym Anderson, Will Martin, and Dominique van der Mensbrugghe, "Distortions to World Trade: Impacts on Agricultural Markets and Farm Incomes" (*World Bank Policy Research Working Paper* no. 3736, 2005): 24, http://go.worldbank.org/5YTCBD72W0.
59. Paul Collier, *The Bottom Billion* (Oxford, UK: Oxford University Press, 2007).

gained from the full liberalization of the global merchandise trade.[60] The global liberalization of agricultural and food markets would contribute about 63 percent of the total global gains, but many barriers must be surmounted to achieve these benefits. In short, removing barriers to free trade aligns the commercial interests of all actors involved in the food-supply chain to provide an ever more reliable, higher-quality, and affordable supply of food items to consumers. As a result of these processes, one can observe, among other things, a constant need to tap supplies from places with complementary growing seasons and to use air freight to fill unexpected gaps in the supply of products shipped by sea.[61]

As illustrated, barriers to the trade of food represent a major problem. Although small compared to these bigger issues, the local food movement only exacerbates the problems outlined above. Any attempt to legislate this current fad will have far-reaching negative consequences. However, even if not legislated, there is still a misunderstanding, outlined in this Policy Comment, about the benefits and costs of buying locally produced foods.

4.B: Real Impact of Mandating Local Production Purchases

Food-mile advocates don't appear to understand the full ramifications of their prescription. The most obvious is that the immense majority of individuals living in advanced economies are food consumers rather than producers. Coercive policies based on food-mile thinking, like all trade barriers to agricultural products, can therefore only affect consumers negatively.

THE DIRECT COSTS OF HYPOTHETICAL FOOD-MILE LEGISLATION

Food-mile activists sometimes promote the economic benefits of local purchases, at least inasmuch as they imply higher incomes for local producers. Missing from this perspective, of course, is the fact that, if forced by political intervention, farmers' gains can only come at the expense of consumers who will be forced to pay higher prices for similar food items, or similar prices for lesser-quality food items, than would otherwise be the case (if not, there would be no need to adopt coercive policies to penalize agricultural items produced in more distant political jurisdictions).

LIMITED CHOICES AND SUPPLY

Restrictive "local food" policies would imply, even in the world's currently most productive agricultural areas, a drastic reduction in the quantity and diversity of foods available to consumers. Smaller supplies of meat, soybeans, cereals, fresh fruits and vegetables—even if somewhat compensated by increased local production of a few items (say, potatoes, beets, and onions)—would result in lower amounts of calories available per individual and reduced vitamin, protein and mineral intakes.[62] In this context, reduced population levels and living standards would be mandatory. Of course, in the absence of substitutes (rice, soybeans, etc.), people suffering from food allergies would be more affected than most in this context, especially those who experience violent reactions to items such as gluten, dairy products, and eggs, which are commonly used in food preparation.

An interesting historical parallel is Western Europe during the two world wars, as continental countries were cut off from the foreign food shipments they had come to rely on. For example, the Allied naval blockade of Germany during World War I created such misery that by 1916, the German population was surviving on a diet of dark bread, slices of sausage without fat, turnips, and an individual ration of three pounds of potatoes per week. As observers put it at the time, the German women "who stood in the pallid queues before shops spoke more about their children's hunger than about the death of their husbands."[63] Anticipating similar problems, officials of many European countries adopted measures to increase

60. Anderson, Martin, and van der Mensbrugghe, "Distortions to World Trade," 2005.

61. As the automotive components industry has moved to just-in-time (JIT) component supply, similar costly measures are sometimes required because the reliability of the supplier is at risk if its customer has to stop the assembly line for want of a particular part. In many respects the logistics of the fresh fruit and vegetable market is JIT because of the perishable nature of the product.

62. Of course, the situation would be made even worse if food additives such as vitamins and minerals, which are currently produced in a few highly efficient locations, were similarly affected by "local food" restrictions.

63. Ralph Raico, "The Politics of Hunger: A Review," *Review of Austrian Economics* 3, no. 1 (1990): 253–59. Other factors, such as wartime planning and the dominance of a dietary perspective that required the diversion of tubers and cereals to produce more meat than was necessary for German soldiers also played a role in this respect.

agricultural self-sufficiency before and at the beginning of World War II. As a result, large areas of pastureland and "idle" land were plowed under, increased subsidies were devoted to farming, and people were drafted to work in agriculture. The number of chickens and pigs was curtailed drastically in order to make the grain, potatoes, and skim milk they were fed available to the human population.[64]

In short, the available evidence suggests that hypothetical food-mile legislation could only be used with parsimony. Indeed, it could perhaps oblige retailers to show the area of origin of each product they sell and perhaps constrain them in offering a certain percentage of products from local producers. Beyond this and because it would dramatically reduce the diversity of products available to consumers, such a legislation would impose severe costs to consumers and society. For these reasons alone, the temptation to legislate a limit on the mileage food can travel before being sold to the final consumer should be resisted. It would make consumers worse off, would not be environmentally friendly, and would be damaging to the economy.

5 Conclusion

The appeal of the food-mile perspective, with its promise to reconnect people with food, neighboring producers, and seasonality while delivering environmental, economic, heath, and social benefits, is superficially obvious. Unfortunately, these issues are generally discussed in an emotional context, based on activists' distrust of large corporations and romanticization of subsistence agriculture rather than on scientific or reliable information based in fact. As this Policy Primer argues, the benefits claimed by food-miles proponents have little basis in fact while providing a new set of rhetorical tools to bolster protectionist interests that are fundamentally detrimental to most of humankind. Subsistence agriculture, which is ultimately what the food-miles concept boils down to, is of course feasible, but it implies significant trade-offs that may not be readily apparent to most people who fail to understand that our modern food supply chain is a demonstrably superior alternative that has evolved through constant competition and ever more rigorous management efficiency.

Indeed, in a world characterized by free trade and the absence of agricultural (and other) subsidies, prices would go much further toward coordinating supply and demand for a wide variety of foods in a manner that is both economically and environmentally efficient. The underlying principle would be very simple. As Adam Smith wrote more than two centuries ago, it is the "maxim of every prudent master of a family, never to attempt to make at home what it will cost him more to make than to buy." By continually eliminating waste and inefficiencies, market processes would ensure an ever increasing, healthier, and more affordable food supply while simultaneously constantly reducing inputs per unit and, over time, their environmental impacts.

The course of the debate over food miles is nonetheless instructive for policy makers. It illustrates the importance of both questioning claims made by organizations with a vested interest in a particular form of public policy and digging deeper for information that either supports or refutes the claims made. Above all, it highlights the need to remain focused on the issues that are important—in this case, the greenhouse gas emissions of highly subsidized first-world agriculture, the trade imbalances that prevent both developed and developing countries from realizing the mutual benefits of freer trade, biofuel subsidies, and third-world poverty—and avoid being distracted by tempests in teacups. With the population of the planet rapidly heading for an estimated 9 billion people over the next few decades, numerous food-policy issues other than food miles should preoccupy policy makers.

64. William Vogt, *Road to Survival* (New York: William Sloane Associates, Inc., 1948).

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