

The Necessity of a Shorter Food Supply Chain

by David Nicholson

Economist Herbert Stein once stated, “If something cannot go on forever, it will stop.” By this, he meant that if a trend is unsustainable—that is by meeting the needs of the present while preventing future needs from being met—that trend will ultimately come to an end. Stein’s aphorism describes the current direction of the global food system and the global food supply chain. The current supply chain, despite the decreased food prices it provides to consumers and the high cost efficiencies it provides to businesses, is exacting heavy costs on the global environment, is generating massive food wastage, and is incredibly dependent on a steady supply of fossil fuels in order to function. As a result the global supply chain should be considered unsustainable and a new food system is required in order to replace it. One such promising replacement is the shortened/local food supply chain, which outperforms the global supply chain in arenas such as energy, environmental sustainability, and food wastage. Consequently, this paper will critique the current global food system—through the lens of food wastage, energy usage, and environmental impact—and argue for the necessity of a wide-scale adoption of a local food supply chain, which has much less serious impacts than the current global model, while also discussing the challenges facing the adoption of a local food supply chain and food system.

First, however, it is necessary to have an understanding of what a food supply chain is. A food supply chain, or food system, according to a lecture by the Harvard Medical School, refers to the “processes that describe how food from a farm ends up on our tables. These processes include the production, processing, distribution, consumption and disposal [of food]” (Harvard Medical School). Moreover, according to the lecture, any food supply chain shares a few key characteristics: a) “food moves systematically in domino-like motion from producers to consumers” and b) “Every step of the supply chain requires human and/or natural resources” (Harvard Medical School). In addition there is a “push-pull” dynamic within the food supply chain, with food producers and processors ‘pushing’, or supplying food, and consumers ‘pulling’ or demanding food, and this continuous shift between supply and demand allows the food supply chain to function. These features are a key part of what makes any food supply chain.

Given this definition of a food supply chain, what makes the global food supply chain so distinct from other supply chains? In essence, the global food supply chain is characterized by several key trends: globalization, consolidation, and commoditization, as stated in the research paper “Unraveling the Food Supply Chain: Strategic Insights from China and the 2007 Recalls”. For globalization, there has been a shift in the food supply chain, particularly in the United States, from what “was predominantly regionally localized and consisted of mostly small-to-medium size independent and local businesses” to a global model, which relies on importing (to reduce costs) and exporting (to increase revenue) at all levels of the supply chain. This has led to the dominance of “large, vertically integrated multinationals with huge product diversity and a focus on low cost and efficiency” with more than 80% of food sales being delivered by large multinational enterprises (Roth). Consolidation, the next trend in the global supply chain, has been due to “only small margins attainable in most links of the food supply chain” resulting in “pressures to reduce cost and maximize profits” (Roth). As a result, the food supply chain is dominated by a few large businesses—Wal-Mart, Cargill, Unilever, and Nestle among them—

which has resulted in a concentrated control of all food markets and the companies erecting “[high] barriers against the entry of potential competitors” (Roth). The final trend, commoditization, is the result of a shift in food from being seen as a ‘value-laden’ item—where the specific nature of the food is of importance to customers—to a commodity good, which is treated as a generic item. This has led to food being “aggregated from multiple global sources, standardized and traded on spot markets based largely on price alone” given that commodity transactions “often take place over long distances; and standardization reduces the need for communication and knowledge about the specific product characteristics” (Roth).

The consequences of these trends in the global food supply chain is that food supply chain managers pay attention on maintaining high levels of standardization, high volumes, and low prices, and that extensive global sourcing of food ingredients is a reality. The resulting global food supply chain is one that has provided massive profits for the companies organizing it as well as massive cost savings for consumers. In fact, according to an article by Derek Thompson in *The Atlantic*, the amount of household food expenditures shrunk from about 30% in 1950 to about 13% in 2003 (Thompson). However, this global supply chain is also facing unique issues of its own and is accompanied by the “(1) additional costs for oversight, logistics, pipeline inventory and quality management; (2) heightened vulnerability and greater supply risks stemming from potential supply disruptions, lack of accountability, lower visibility and quality failures; (3) issues concerning global financing and funds transfer; and (4) lower responsiveness [to issues in the supply chain] due to longer lead times”, according to the authors of “Unraveling the Supply Chain” (Roth). Beyond that, however, the global supply chain exacts several costs not accounted for by traditional business practices.

One of these hidden costs is intense ecological damage. According to the textbook, *Food Supply Chain Management: Economic, Social and Environmental Perspectives* by Madeline Pullman and Zhaohui Wu, 50 million acres of agricultural land are lost each year due to soil erosion and degradation under the current food system, and 70% of all available fresh water worldwide is used by agriculture (Pullman). Meanwhile, the United Nations 2013 Food and Agriculture Report states notes how livestock production in the food supply chain is responsible for 18% of all global greenhouse gas emissions, higher than the global transportation sector, and is one of the major contributors to climate change (United Nations). Moreover, the report also notes that since forests are often cleared to make space for livestock grazing and crop land; over the last 25 years, the world has lost forests equal in size to India, while by 2050 it can be expected that degraded cropland will result in a reduction of available farm land by 8-20%, a challenge given that many farmers are struggling to provide food for the world on the land they have available now (United Nations). These trends are only likely to worsen if the current food system remains in place, as leaders in the global supply chain are unlikely to avoid the environmentally damaging practices of the current system.

Yet despite the environmental destruction caused by the global food supply chain, it is failing in its basic goal to ‘feed the world’. As stated in the United Nations Food and Agriculture Report, there are 975 million people in the world today who suffer from malnourishment and food insecurity, or not knowing where their next meal is coming from, while a 1 billion individuals are overweight (United Nations). The report further states that these problems are not “an issue of just more food...they are an issue of access”, citing statistics on India, which despite being a

net exporter of food with millions of tons of grain, has 47% of its population suffering from malnourishment (United Nations). A report by the Natural Resource Defense Council by Dana Gunders stresses this issue of access even further stating that within the United States 40% of all food produced within the United States is never eaten—the equivalent of throwing out 165 billion dollars a year, and 17% of all the waste in landfills—while one in six Americans suffers from hunger and not knowing where their next meal will come from (Gunders). The report points out that such wastage occurs on all levels of the food supply chain, from farm to landfill. For an example, on the farming level, waste occurs when farmers overplant crops as a response to economic demand, as well as when food safety scares within the supply chain prevents certain crops from being harvested. Meanwhile, on the retail level, waste is seen as a positive, with one representative from Trader Joe's stating that "a store [which] has low waste numbers... can be a sign that they aren't fully in stock and that the customer experience is suffering" (Gunders). These examples illustrate the systemic nature of wastage within the global food supply chain, showing that the global food system is struggling with its basic mission of delivering food from producers to consumers.

Finally, the global food supply chain takes an enormous toll on energy usage. Why is this important? In the words of Phillip Ackerman-Leist in his book *Restoring the Foodshed*: "Food and energy are virtually synonymous", which means that energy, defined as the ability to do work, is ultimately tied in to how people grow food (Ackerman-Leist). If all human energy was devoted to producing food, complex civilizations couldn't exist. Yet, "transporting, processing, distributing, and even storing food waste is energy intensive", according to Ackerman-Leist, and the majority of energy the supply chain uses to grow and distribute food comes from outside sources, namely fossil fuels (Ackerman-Leist). This has resulted in seven to ten calories of fossil fuels being needed to produce and deliver a single food calorie within the United States. If the price of fossil fuels were to rise in any significant way, many farms would be unable to produce and distribute the food necessary for the local population to be fed. As a consequence of this and all other trends listed above, the global food supply chain finds itself vulnerable to the slightest disruption of business as usual, endangering the environment with its business practices, prone to serious safety and traceability concerns, and generating enormous wastage while failing in its goal of feeding others with food.

All of these problems necessitate that a new food supply chain be developed. Ironically, to create this new food supply chain will most likely mean returning to an older model: to the traditional, regionalized distribution system that has historically been the norm for most human societies. This regional food system requires "diverse agricultural production, small scale processing, small scale distribution, and environmental responsibility" for all people involved (Pullman). But the key feature of a local supply chain, as stated by a paper by Christine Aubry and Leila Kebir in the *Food Policy Journal* is that the supply chain have "a very small number (or even the absence of) intermediaries between producers and consumers, and/or by the short geographical distance between the two (they ideally fulfill both conditions)" (Aubry). In other words, these shortened food supply chains can help rebuild a proximity between farmers and consumers that has been lost by the transition to a global food supply chain. This proximity can be classified as either organized or geographical. Organized proximity relates to the way "in which actors [in the supply chain] can be close, irrespective of the geographical distance". This proximity is based on two fundamental factors: membership, "the feeling of belonging to the same network or club"

according to Aubry and similitude, “the fact of recognizing oneself in a common project, mentally adhering to common categories, sharing values, sharing a certain idea of quality of life and agricultural products” (Aubry). Geographic proximity, on the other hand, is characterized by a short distance between the various actors within the supply chain. This distance though is relative to the means of transport available within one area and the geography of that area and can vary widely depending “on whether the journey is on a comfortable main road, on small mountain roads, or through city traffic jams” as well as the perception both actors in the supply chain have of each other (Aubry). Regardless, proximity is key for a short supply chain.

This short food supply chain moreover is also characterized by its diversity. It can take many forms of production and distribution, from “farmer’s markets...basket/box delivery systems, and mobile shops”, with all working to reunite the producer and consumer of food. However, a paper by the European Union Rural Review notes that local food supply chains and food systems can be broadly categorized into three types: direct sales to individuals, collective direct sales, and partnerships. Direct sales to individuals are the simplest form of the local supply chain and involve a “direct transaction between farmer and consumer” (Peters). This method allows the consumer to gain a direct relationship with the farmer about their food’s origin as well as cultural and culinary value. Direct sales also don’t have to be face to face, and are sometimes done with online shopping, with producers taking extra care to maintain their relationship with the consumer. Next, there are collective direct sales, which involve “producers cooperating formally and informally to collectively sell their products directly [to customers]” (Peters). Their customers can include consumer buying groups, which purchase products directly from farms or collective-selling outlets where several farms or cooperatives of producers work together and jointly organize the sale of their products, with sales also being made at local festivals as well. Finally, there are consumer-producer partnerships, which would “enable consumers to play a more active role in establishing and supporting local food systems...in their community” with Community Supported Agriculture (CSAs), where a consumer contributes a proportion of the farmer’s production costs and in return would receive a set amount of produce, being a prominent example of this type of local food supply chain. These are the three main means of organizing a shortened food supply chain.

Given this definition, how does a local food supply chain counter the immense ecological and energy costs, in addition to the chronic food wastage, of the current global food supply chain? To begin with, as noted by Dana Gunders, regional/local food distribution would result in “Shorter transport times and distances [that] would likely lead to lower “shrink” (loss of product) during transport and could create a market for produce with a shorter shelf life at the time of harvest”, while a closer relationship between producers and consumers of food would encourage consumers to not waste food, another major source food wastage, as “cheap, available food has created behaviors that do not place high value on utilizing what is purchased” (Gunders). Meanwhile, less food wastage would result in less energy wasted, according to Phillip-Ackerman Leist, given that whenever food is lost it also means losing the “unnecessary dispersal of pesticides, carbon, airborne particulates, and other pollutants associated with producing [the] food” (Ackerman-Leist). In terms of environmental benefits, it’s known that “food waste comprises an astonishing one-third of all material sent to landfills, and it is estimated that landfills in the United States produce approximately 20 percent of the nation’s methane emissions—energy lost and pollution unleashed” (Ackerman-Leist) so any reduction in food

wastage would reduce CO₂ emissions. Meanwhile, according to the United Nations, food security and environmental sustainability on a global basis, and especially within developing nations, will come to depend on the next 20 years on “increased and more secure production among small and medium farmers”, and corresponding local food supply chains, rather than the multi-national conglomerates currently dominating the global food system (United Nations). Finally, there are economic benefits as well with local food systems as money tends to be ‘recycled’ throughout the food systems, and local jobs are easily created, and avoid the costs involved with sustaining a global food supply chain—increased vulnerability to supply disruptions, maintaining quality and inventory management, and low responsiveness to supply chain disruptions. All these benefits point to how a shorter food supply chain would provide a better alternative to the current system.

So what are the obstacles then to implementing a local food supply chain on a wide scale? The European Rural Review has found that while many producers are interested in adopting local food systems are struggling to acquire the skills to value and market their local products. An information gap also exists with many producers not fully comprehending “the legislative and regulatory framework for adding value and developing their supply chains” as well as the technical and financial tools to support a local supply chain (Peters). For people who want to create local food supply chains, on the other hand, the primary obstacles they are encountering are an established generation of older farmers who have adapted to the global food system, as well as high land values making it difficult for new members to enter the food system. Yet perhaps the greatest obstacle facing the implementation of local food supply chain is the sheer momentum of the present global food system. As Madeline Pullman, in her book *Food Supply Chain Management*, puts it: “the vast majority of agricultural lands are already being farmed under the industrial model, and this model has proven, so far, in producing sufficient calories to meet global demand” (Pullman). In short, the current food system stands merely because it is considered the default distribution system.

Yet given all the issues raised previously in this paper it is evident that the global food supply chain is failing in its goals of providing sufficient calories for all, while simultaneously incurring high costs in both energy usage and environmental impact. So despite these obstacles, the establishment of local food systems and supply chains on a broader scale is a necessary one. Indeed, the presence of local food systems is “far from being anecdotal and marginal, these supply chains, as in other European countries, seem to be part of a basic evolution/transformation of the local agri-food system” (Aubry). The global food supply chain, in its current form, is unsustainable and will eventually stop, yet the widespread implementation of local food systems will make the end of the current system and the transition into the new one much easier to handle.

Annotated Bibliography- MLA

Source 1:

Pullman, Madeline, and Zhaohui Wu. *Food Supply Chain Management: Economic, Social and Environmental Perspectives*. 1st. Routledge, 2011. eBook.

<http://site.ebrary.com.ezproxy.neu.edu/lib/northeastern/docDetail.action?docID=10531847>

Food Supply Chain Management: Economic, Social and Environmental Perspectives provides a holistic over view of the economic, social, and environmental impacts of the current food supply chain. In particular it focuses on the public health effects of the food system, specific supply chain practices (buy local vs. commodity crop supply chains), and the impact of agricultural policy on the supply chain, and the problems within our modern food system as it stands. It does not cover any alternative food systems in depth, but merely describes current industry practices within the supply chain.

Source 2:

United Nations. Sustainable Development in the 21st Century (SD21). *Food and Agriculture: The Future of Sustainability*. New York: , 2013. Web.

http://sustainabledevelopment.un.org/content/documents/agriculture_and_food_the_future_of_sustainability_web.pdf

The 2013 U.N. Food and Agriculture Report focuses exclusively on the environmental impacts of the current food system. It discusses the challenges facing global agriculture, and how agriculture, and the modern food industry by implication, is the greatest threat to sustainability (defined in the report as “ability for generation to meet present needs without compromising needs of future generations). Among the challenges that report focuses on are the concentration of the food supply, the shift in governance of the food system towards corporate power, and how agriculture is proving to be one of the greatest pressures to the environment. The report also identifies new goals to respond to these challenges as well as nine action points for people to focus on to change the system.

Source 3:

John, Gray, Pullman Madeline , Roth Aleda , and Tsay Andy . "Unraveling the Food Supply Chain: Strategic Insight from China and the 2007 Recalls." *Journal of Supply Chain Management*. 44.1 (2008): n. page. Web. 12 Feb. 2014.

<http://onlinelibrary.wiley.com/doi/10.1111/j.1745-493X.2008.00043.x/full>

The focus of this article from the *Journal of Supply Chain Management* is the consequences of the March 2007 pet food recall from China, and the supply chain weaknesses it revealed. The article compares this incident with a rapid progression of comparable incidents, which have exposed the real potential for food supply chain contamination and disruptions. The article stresses that when organizations source via multilayered supply chains with poor visibility, a growing trend in the food supply chain they are particularly vulnerable to these risks of disruption. The article also lists the inherent difficulties and a risk posed by global food supply chains, using the contamination incident in China as an example and lists six methods to ensure supply chain quality. The article lists the current structural flaws of the global supply chain as well as the key traits that define the supply chain, but does not explore its environmental impacts.

Source 4:

Aubry, Christine, and Leila Keibr. "Shortening food supply chains: A means for maintaining agriculture close to urban areas? The case of the French metropolitan area of Paris." *Food Policy*. 41. (2013): 85-93. Web. 12 Feb.

2014. <http://www.sciencedirect.com.ezproxy.neu.edu/science/article/pii/S0306919213000456>

The article points out the emergence of short supply food chains (SSFCs) in Europe. This paper also questions whether these SSFC contribute or not to the preservation and/or development of urban agriculture, using a region in France as an example. The article also makes sure to focus on numerous obstacles such as the scarcity of land and labor and the environmental impacts that still remain controversial, that face short supply food chains.

Source 5:

"Lesson 4: What is the Food Supply Chain?." Harvard Medical School. Boston, MA. 2013. Lecture.

http://chge.med.harvard.edu/sites/default/files/lesson-plan-files/lesson_4.pdf

The lecture notes for a class at Harvard Medical School that establishes what defines a food supply chain. In particular the lecture focuses on the movement from producer, to distributor, to consumer of food along the supply chain. It focuses on the domino-like nature of a supply chain, with one disruption of the supply chain affecting the other.

Source 6:

Peters, Rob. EU Rural Review. European Network for Rural Development. *Local Food and Short Supply Chains*. Belgium: 2012. Web.

http://enrd.ec.europa.eu/app_templates/filedownload.cfm?id=E8F24E08-0A45-F272-33FB-A6309E3AD601

A report by the European Network for Rural Development that discusses the growth of local food supply chains in Europe. The report goes into the benefits these local food systems have provided to members in rural communities as well as the challenges these local supply chains face in gaining consumer awareness about them.

Source 7:

Gunders, Dana. "Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill ." *Natural Resources Defense Council Issue Paper*. (2012): n. page. Web. 12 Feb. 2014. <http://www.nrdc.org/food/files/wasted-food-ip.pdf>

This report by the Natural Resources Defense Council focuses on the various ways food wastage occurs throughout the supply chain in the United States. The report focuses on every level from the farmer to the retail store, to the disposal of the food. It then provides systematic recommendations to all members of the supply chain to reduce food wastage.

Source 8:

Ackerman-Leist, Philip. *Rebuilding the Foodshed: How to Create Local, Resilient, Sustainable Food Systems*. 1st. Chelsea Green Publishing, 2013. 29-61. Web.

<http://www.postcarbon.org/article/1658954-so-much-wasted-energy-rethinking>

This is an excerpt from a book that discusses the various ways in which local food systems address current problems within the modern food supply chain. The chapter discusses the methods in which energy is used to get food from farm to fork. It emphasizes how local food systems can help lower overall energy and consequently all other energy emissions that go into the food supply chain from production to distribution, but especially in terms of processing the food.

Source 9:

Thompson, Derek. "Cheap Eats: How America Spends Money on Food." *The Atlantic Monthly*. 8 Mar 2013: n.page. Web. 26 Feb. 2014.

<http://www.theatlantic.com/business/archive/2013/03/cheap-eats-how-america-spends-money-on-food/273811/>

This article in *The Atlantic* details how much of household income the American household devotes to food, in comparison to households from other countries. The essence of the article is that food prices have fallen dramatically and will continue doing so, but noting that households below the poverty line will not be able to enjoy these benefits.