Supply Chain Management of Locally-Grown Organic Food: A Leap Toward Sustainable Development

Demand for organic food is growing at a much faster rate than ever before, but not without numerous operational challenges. Farmers, retailers and food processor manufacturers are thus looking to streamline their supply chains while addressing ever-expanding market requirements.

Executive Summary

Burgeoning consumer interest in healthy cuisine has not only revolutionized the organic food industry, but it has opened myriad new markets. Beginning life as a niche market with a small consumer base, addressed by a limited number of retailers, organic products are now a preferred choice of many quality-conscious domestic shoppers.

With food expenditure growing about 7.67% from 2010 through 2012, the demand for organic food through the retail sales medium is anticipated to increase consumer food expenditure. Produce enters the market primarily through supermarkets and grocery stores, after it originates from large farms in the U.S., Mexico and South America. However, there are numerous small farms that are certified organic and also sell their produce in local markets such as farmers markets and restaurants.

This white paper highlights the challenges associated with the organic food supply chain and outlines business improvement opportunities in this fast-growing market. To start things off, let’s explore the difference between conventional and organic food.

The Evolution of Organic Farming

The food that our ancestors consumed for thousands of years was grown with virtually no artificial chemicals. Natural methods and nature itself assisted farmers in maintaining soil fertility.

However, to address the needs of an increasing population, artificial fertilizers and pesticides were used starting in the 1920s to increase crop production. Later, genetically modified seeds (or genetically modified organisms – GMOs) were developed to increase resistance to weather, pests and soil conditions. The results of using such chemicals and GMO seeds were remarkable. The total area of cultivated land worldwide increased 466% from 1700 through 1980; yields increased dramatically, due primarily to selectively-bred, high-yielding varieties, fertilizers, pesticides, irrigation and machinery. However, over the course of decades, the negative impact of such farming practices – called conventional farming –
has far exceeded its positive results. Apart from degraded soil, resistant pests, expensive cleanups, rampant human diseases, water contamination and dead zones in the ocean are thought to have resulted from conventional farming.

Fortunately, as organics have become more mainstream, more farmers are learning about the environmental and economic impact of their conventional methods. Some are even making the switch to organic farming.

In the U.S., depending on whose definition is used, crops that are raised without using synthetic pesticides, synthetic fertilizers or sewage sludge fertilizer — and which have not been altered by genetic engineering — are generally referred to as “organic crops.” Similarly, organic animal products come from animals that have been fed 100% organic feed and raised without the use of growth hormones or antibiotics in an environment where they have access to the outdoors. While there are variations between what qualifies as organic from country to country, the concepts are fairly standard.

According to the USDA, organic farms and processors:

• Preserve natural resources and biodiversity.
• Support animal health and welfare.
• Provide access to the outdoors so that animals can exercise their natural behaviors.
• Only use approved materials.
• Do not use genetically modified ingredients.
• Receive annual onsite inspections.
• Separate organic food from nonorganic food.

Why Organic?
Among the myriad reasons (summarized below) for growth in organic farming practices, the primary one is the move toward a sustainable local food system (see Figure 1).

Per the USDA, the rationale is manifold:

• **For health:** Scientific evidence shows there are no significant differences between “organic” and “conventional” crops in terms of taste and nutrition.

Although organic agriculture regulates how food is grown and processed, it does not guarantee nutritional content or pesticide levels in the food. Pesticides show up throughout our environment: in rain and snow, soils, Antarctic glaciers, etc. Even the most carefully managed organic crop could contain traces of pesticides or genetically engineered cells.

However, scientific studies show that organic foods contain much lower concentrations of pesticides than conventionally grown foods. Organic foods must meet all the health and safety requirements of conventional food, and have some additional safety standards of

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**The Organic Food Lifecycle**

![Figure 1](image_url)
their own, such as more stringent regulation of manure use. Thus, there is good reason to believe that organic agriculture may lower certain health risks.

- For the environment: Organic standards focus primarily on environmental issues. Although they cannot eliminate environmental impacts, they seek to minimize the likelihood of water pollution, to build soil quality and to enhance biodiversity.

- For economic reasons: Organic food usually costs more than conventional food. While the price of organic food is a deterrent to many consumers, for most farmers the high prices of organic commodities are very attractive.

- For other social and ethical reasons: Many consumers and farmers think that organic agriculture does a better job of supporting small and family farms. Areas with numerous small- and medium-sized farms tend to have more stable and prosperous communities than rural areas dominated by very large farms. Some people favor organic agriculture's consideration of animal welfare. Although organic agriculture has historically been practiced by small and medium farms, the standards do not address farm size; as the organic market has grown, so has the percentage of large organic farms.

Organic Food: Market Trends

Figure 2 illustrates the healthy growth in the U.S. market for organic products. And internationally, the latest research from Organic Monitor (OM) finds worldwide sales of organic food and drink approached $35 billion in 2012. According to OM, growth is occurring in all regions; however, demand for organic products is mainly in North America and Europe. Organic product sales are projected to rise in the coming years.

According to the 2013 statistics published by Research Institute of Organic Agriculture (FiBi) and International Federation of Organic Agriculture Movement (IFAOM), the countries with the largest organic markets in 2012 were the U.S., Germany and France. These statistics further state that the largest single market was the U.S. (approximately 44% of the global market), followed by the European Union (approximately 41%). The highest per-capita consumption was in Switzerland, Denmark and Luxembourg. The highest market shares were reached in Denmark, Switzerland and Austria.

Other vital attributes of the organic food market include:

- Alternative food systems: Organic food grown on large machine scale (over 500 acres), referred to as the “industrial organics,” originate from undiversified farms for large

United States Organic Food Market Value & Value Forecast

Source: Data Monitor
Figure 2
corporations. These farms tend to have large fields of a single crop or to raise only livestock. They generally sell wholesale, and almost never directly to the customer. Industrial organics are always certified. The customer, in almost all cases, never talks to the grower(s) from these farms.

Recently, it has been observed that consumers of food from industrial organics have limited knowledge about their source of food, causing concern among consumers. These concerns are directly related to economic, environmental and social ideals such as production systems, size of the operations, distribution systems and channels and capital intensity.

This trend has given rise to the popularity alternative food systems (AFS). AFS (depicted as “Others” in Figure 3) are perceived as sustainable and economically, socially and environmentally more viable than standard systems. The slow food movement,8 box delivery and local farmers markets are good examples of innovative food systems that are based on low-carbon food distribution systems.

- **Market segmentation:** The market segments for organic food are expanding and can be classified into seven categories, according to popular 2013 Chicago IRI research. However, the two shopper segments that account for about half of the natural and organic sales are termed True Believers and Enlightened Environmentalists. The former believe in the benefits of natural products for themselves and their families, and the latter care about protecting the environment. Currently, these consumers constitute a large portion of organic food buyers. But retailers and supermarkets must pay attention, since the organic grocery space is set for a dramatic growth in the food industry.10

- **Future growth:** According to The United States Organic Food Market Forecast & Opportunities, 2018,9 the greatest demand for organic food is generated from the U.S. residential sector. The growth forecast for the organic food market of the U.S. is at a compound annual growth rate of about 14% from 2013 through 2018. Also, organic fruits and vegetables will continue to dominate the market through 2018. As organic food market revenues expand, the demand for organic meat, fish, poultry, etc. will gain market share. Further, according to forecasts, the education and restaurant sectors will also contribute substantially to the organic food market, due to rising awareness of the benefits of organic food.

### Points of Sale of Fresh Organic Products in the United States

![Points of Sale of Fresh Organic Products in the United States](http://archive.peruthisweek.com/blogs/business/pag/34)


Figure 3
The 2014 Farm Bill highlights the steps taken by the government to promote organic farming. This is good news for the food retail industry as well. According to the USDA, this bill will:

- Provide $72.5 million annually for the Specialty Crop Block Grant (SCBG) Program.
- Provide new resources for organic farmers, including funding the Organic Cost Share Program at $11.5 million annually.
- Increase funding for pest and disease management and disaster prevention to $62.5 million per year, and $75 million in FY 2018 and beyond.
- Rename FMPP to “Farmers Market and Local Food Promotion Program” and provide $30 million annually.
- Continue to reserve funds in the business and industry loan program for locally- and regionally-focused businesses.
- Advance growth of local and regional food systems with $65 million for Value-Added Product Market Development Grants.

**Food Supply Chain Challenges**

Challenges across the supply chain are not necessarily exclusive to organic food. Conventional food also is affected by factors such as problems with the supply chain or inventory management. Organic farming, however, has unique challenges related to the cost and logistics of moving locally or regionally produced organic produce to the market.

The concept of food mileage (see Figure 5, next page), which refers to the distance food is transported from the time of its production until it reaches the consumer, gains prime importance in the case of organic food. The situation of small and medium farms is also to be noted. Currently, the production of produce in small to medium farms is rather limited, amounting to a few hundred tons. Such farms are not very lucrative for mainstream grocery chains. Further, many buyers seem to be ambivalent about channels of distribution.

For some buyers, on the other hand, trust is the vital component for deciding whether to buy organic food products via a particular avenue. In fact, often consumers are not convinced about the value of buying organic food. Consumer consumption decisions regarding organic food products could, however, be hugely impacted by food mileage, price and the certification process.

Lastly, there is a large knowledge gap spanning the marketing system in place, the value chain (i.e., activities that a firm performs to deliver a valuable product or service for the market) and the value delivery network (i.e., supply chain network) in the organic food system.
Key organic food supply chain challenges include:

- **Food origin and mileage:** In the past decade, the country of origin of the food and food mileage are becoming increasingly important. Maintaining supply volumes and supply continuity are major concerns for most food companies. Thus, investing in developing countries is viewed as a way to lock in supply. In Canada, imported organic products represent CA$252 million, of which 74% comes from the U.S., Chile, Mexico, China and Italy. The origin of organic food possesses both predictive and confidence values. It helps consumers evaluate food origin and infer whether it offers desired qualities, has credible production control and carries legitimate certification. Further, organic food import also highlights the issue of food mileage, and is linked to agricultural sustainability, as “organic food imports” do not match with local food production, freshness and community cohesion.

- **Size of farms and collaboration:** The majority of organic farms are small, privately-owned, family enterprises. Whether they are small plots in an emerging country providing food to a handful of citizens or larger-acreage plots in North America and Europe, these independent operations often struggle with economic scale. This challenge is particularly evident in sectors such as dairy, pigs, fruit and vegetables, where scale and linkage with primary processing is critical.

Further, organic food requires more resources, particularly human resources, during production. Farming is a capital-intensive business, and productivity is enhanced with investment in new equipment. Similarly, marketing channels are more difficult to access for smaller producers.

Better collaboration of the various participants in the food value chain with farmers can help alleviate this problem.

- **Conversion takes time:** Unfortunately, even when a farm decides to convert to organic, the transition isn't simple or instantaneous. It varies slightly depending on the certification agency, but typically farms must:
  > Learn new farming methods and processes.
  > Farm organically on the previously conventional soil for at least three years (aka the transition period).
  > Have periodic, comprehensive inspections by third-party agencies.
  > Register with applicable county, state or national offices.
  > Submit fees ranging from five hundred to several thousand dollars depending on the size of the farm.

After a farm has been certified organic, it requires ongoing inspections from a third party to ensure its land and produce continues to meet organic standards.
• **Market volatility**: Fresh produce markets are above all characterized by perishable products, seasonal production and a strong dependence of supply on climatic conditions. These characteristics entail high degrees of uncertainty and risk about market prices and quantities, which has traditionally deterred local farmers from negotiating contracts in the produce trade.

However, better risk management and streamlining of the supply chain can help assure farmers of their profits and increase their willingness to trade with the large retailers. These long-term contracts with retailers will also enhance farmers’ ability to obtain working capital financing, which has traditionally been a challenge for small farmers. By signing contracts with big-box retailers, farmers gain security that they can present to the banks to gain more favorable terms for loans and financial aid for investing in capital equipment.

• **Integrating the food value chain**: To date, the food supply chain has shown itself to be remarkably adaptive to evolving consumer demands (see Figure 6). With the increasing popularity of organic food, however, success will require adapting to changing demographics and consumer preferences, as well as managing in an increasingly global and complex business environment. This requires collaboration in several areas:

  - Progressive farmers are investing in crop field trials and breeding programs either individually or collectively through agreements and producers associations and cooperatives. These farmers need to collaborate with other members of the value chain. In addition to sharing consumer information and preferences, these farmers need to better collaborate with manufacturers of organic fertilizers and pesticides.

  - Food processors are extremely important members of the food value chain that will need to support the expected demand of organic food. To do this, they will require significant changes to product lines, distribution channels and supply chains.

  - Leading global producers are already working to address new consumer demands, globally diverse diets and calls for sustainable supply chains and manufacturing processes. However, collaboration throughout the value chain is extremely important to this group, as the manufacturing of food – the central activity of the value chain – requires both up- and downstream collaboration.

  - Food and product safety (F&PS) has become a critical area of concern for companies. New regulatory requirements, increased supply chain complexities and ongoing scientific developments present many challenges and opportunities. Leading companies are investing in securing their supply chain, developing plans to manage recalls and enhancing product labeling and traceability. They are building compliance systems to ensure they are in accordance with all regulatory requirements.

**What is a Value Chain?**

![Figure 6](image-url)
regimes where their products are consumed. Such systems include regular verification procedures to ensure ongoing compliance. Systems are also improving supply chain transparency through track and trace technologies. Once again, extensive collaboration and cooperation between the various elements of the value chain is necessary to ensure these systems operate effectively.

- **E-commerce:** For online grocery shopping to grow, the costs of home delivery must be reduced, the delivery window must be small and punctual and neighborhood pickup points and/or in-store pickup activities must be expanded. Retailers will need to cooperate closely with others along the value chain to fulfill consumer needs through joint efforts for warehouse operations, including inventory management, order management and fulfilment, creating and operating online stores and providing home delivery. To accommodate these requirements and create new value for consumers, both vertical and horizontal collaboration and consolidation will be needed. In the coming years, retailers must invest in innovative technologies to meet the changing needs of consumers who expect not only to purchase products at any time and from any location, but to also have full pricing and product transparency before making their decisions. For example, to improve warehouse operations, grocers could install more efficient automated storage and retrieval systems in their warehouses, or deploy better order management systems.

### Organic Producers by Region

![Organic Producers by Region](image)

**Note:** Percentages are as of early 2014.

**Figure 7**

### Looking Ahead

The following recommendations are critical for enhancing the entire organic foods value chain.

- **Accountability and traceability:** It is interesting to note that the consumption of organic food seems to be directly linked to consumer values and trust orientations. Two major trends in consumption deserve special mention: regular organic food consumers using standard distribution channels (supermarkets), and hardcore consumers adopting alternative channels. The trends, described above, are omnipresent in organic food distribution.

Direct channels (such as farmers markets) address consumers that want to interact with the producers and inquire about their production methods. This avenue satisfies consumer curiosity about food origin and their desire for some additional food handling and cooking tips. The conventional distribution channels, as we know, are characterized by longer channels, where consumers do not feel connected with producers and where the consumers have limited knowledge of the origin of their food. By ensuring better tracking and traceability of organic produce, food retailers can build trust among consumers. As a result, consumers buying from the big box retailers will have as much visibility into the origin of their food as those buying from farmers markets.

So how do grocery shoppers examine produce or meat items and trace their sources? Apart from the traditional bar-code and radio frequency identification (RFID) technologies, which have been widely adopted to improve tracking and traceability of food items, other related technologies have emerged recently. For example, a system called HarvestMark, developed by YottaMark, is a specialized tool for tracking and authenticating products. The HarvestMark is a code printed on the label of a product. The code can be scanned by a shopper with an iPhone or Android smartphone, and data is then immediately available showing the grower, growing methods used and other pertinent product information. In the case of animal products, the methods employed in raising and feeding can be checked.

Another popular technology not widely known about in this context is speech recognition. Practically any application can be easily modified to accept speech input because of the recent development of terminal emulation-based speech recognition technology. Speech
• **Minimizing lead time from farm to shelf:** Sometimes, retailers store produce in their food warehouses for as long as 12 days, on top of which is the transit time from the distribution center to the store. In the case of alternative food systems, this step is greatly reduced (e.g., box delivery) or even eliminated (e.g., farmers markets). Based on our survey of local farms (see Appendix), it takes less than 48 hours (from the time the crop is harvested) for the farmers to sell their produce to customers and about seven days for some of the efficient food co-ops to do the same.

• **For a retailer to minimize the lead time from farm to shelf and thereby increase the shelf life of fresh food,** a holistic approach is required to revamp warehouse management, order management and transportation management. We can help assess potential areas of rework for a retailer and further assist in the implementation of integrated automated storage/retrieval systems, automatic identification products, conveyors, order-picking systems, RFID, sortation equipment and software and systems integrations.

• **Streamlining logistics to minimize food mileage:** With the increasing emphasis on sustainability, a large number of food retail giants are conscious of the miles their food travels before reaching the customer. Food miles is a major factor used to assess the environmental impact of food, including the impact on global warming. By promising to improve the logistics associated with their food network, these companies can exercise corporate social responsibility for creating a greener environment.

• **Airline food industry’s green field:** Apart from chain restaurants and the regular retail industry, one particular industry that needs a special mention is airline food. In-flight catering represents an important multi-billion-dollar segment of the aviation industry today. Due to the problems with quality control, ground transportation and timeliness of food service subcontracted from hotels and restaurants, more airlines are moving toward creating airport-based flight kitchens around the country.

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**Quick Facts**

• A new ozone-based technology, called Purfresh (www.purfresh.com), can help minimize decay, control ripening and enhance food safety without the use of chemicals, making it an ideal solution for organic food. We can guide clients through the steps to integrate this USDA- and FDA-approved system with their current transportation systems.

• These days, improved optics allow 2D bar codes on paper to be read at greater distances (over 50 feet) than 1D bar codes. This helps companies to implement real time data access systems for their delivery drivers, sales and service staffing inspectors and other personnel.

To better serve the flourishing demand for locally-grown, organic food, it is imperative that industry giants such as big retailers, chain restaurants and the airline food industry look to restructure their existing supply chain models. To achieve this, their first step should be to improve collaboration with local farmers and involve them in the planning of their value chain delivery networks. The planning itself must begin with the redesign of their transport networks, from farms to consumers, since food miles is a primary factor in the determination of the freshness of food, carbon emissions and the cost of delivery.
Appendix

Survey Methodology

We surveyed local farms, natural food co-ops and farmers markets in California and Minnesota wherein the author visited organic farms and interviewed the farmers. The questions asked were as follows:

• Did you start off as an organic farm? If not, how long did it take to convert to organic farming?
• What services/products do you provide?
• What are your motivations for running an organic farm?
• Do you feel satisfied with the profit you make?
• Which is your biggest challenge as an organic farmer?
• Is handling of organic food a real issue? What is the shelf life of ready-to-eat produce?
• How do you ensure the health of the soil? Is there an additional dependency on the weather?
• How do you transport your produce to the market/destination?
• Is it true that yields are lower as compared to conventional produce? Do you believe organic farming is at least as profitable as conventional farming?
• Could you elaborate on the intermediate steps involved in the distribution of your produce from the farm to consumers?
• Any other valuable insights that you would like to share with us?

The inputs from these farmers helped shape the content of this paper.

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• “The World of Organic Agriculture: Statistics and Emerging Trends 2014,” FiBL and IFOAM.
• Documentary: Food Inc., narrated by food writer Michael Pollan and Fast Food Nation author Eric Schlosser.
• Documentary: Fed Up, narrated by Katie Couric and Laurie David, and directed by Stephanie Soechtig.
• Key topics and highlights of the 2014 MOSES Organic Farming Conference held in Wisconsin:
  > Theresa Podoll and David Podoll shared insights of their two families’ farms in Fullerton ND.
  > Activist and author Anna Lappé informed farmers that organic farming is “climate-smart farming.”
  > Permaculture guru Mark Shepard (restoration agriculture) explained how farmers can work with nature to transform their farms into systems that produce food sustainably and involve less work.
Footnotes

1 According to a 2013 research report by TechSci Research. In fact, U.S. consumers generate the highest demand for organic food in the world, with about 81% of American families reportedly purchasing organic food at least once a year, according to 2012 estimates from the Organic Trade Association.


5 Organic Monitor is a specialist research, consulting and training company that focuses on global sustainable product industries, www.organicmonitor.com.

6 German: Forschungsinstitut für Biologischen Landbau (FiBL) is an independent, nonprofit research institute with the aim of advancing cutting-edge science in the field of organic agriculture.

7 The World of Organic Agriculture, Statistics and Emerging Trends 2013, published by FiBL and IFOAM.

8 Slow food is an international movement founded by Carlo Petrini in 1986. Promoted as an alternative to fast food, it strives to preserve traditional and regional cuisine, and it encourages the farming of plants, seeds and livestock characteristic of the local ecosystem.

9 IRI, formerly Symphony IRI Group, is a market research company that provides clients with consumer, shopper and retail market intelligence and analysis focused on the consumer packaged goods (CPG) industry.


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