

Understanding the Organic Foods Supply Chain: Challenges and Opportunities from Farm Gate to End Consumer

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Abstract

This research was undertaken to study the characteristics of the organic foods supply chain. Examining the industry beginning at the farm where the crops are produced and ending at the final consumer, the paper explains how the structure of this industry's supply chain affects the ability of firms to address such issues as balancing supply with demand, ensuring high-quality, reducing costs, improving efficiency, maintaining an accurate audit trail, and preventing cross-contamination with conventional goods. Through a combination of primary (in the form of a survey) and secondary research, the current state of the industry was evaluated in light of the major concerns of firms competing in this business. This analysis was followed by the identification of opportunities for improvements that would allow the entire organic foods industry to become more competitive with conventional products, thereby accelerating its growth.

Results led to insights regarding the extent of vertical integration, the degree to which organic firms operated in the conventional foods business, the nature of supplier and distribution channels, the prevalence of long-term business relationships, the characteristics of supply and demand, and finally, the role of e-Commerce and collaborative supply chain information technology. The general conclusion was that because the organic foods industry is still relatively small, the majority of firms operating purely in the organic foods space are not able to achieve the same level of economies of scale as conventional firms. Instead, organic food business must establish other ways of lowering their costs and maximizing supply chain efficiency. The small scale of the organic foods industry has led firms operating in this business to employ strategies such as vertical integration, forging strategic alliances and long-term relationships, and partnering with conventional firms. These means allow organic firms to maximize value creation and delivery, while minimizing costs and risks.

Keywords: organic foods; logistics; supply chain analysis

EconLit Classification

Q130 - Agricultural Markets and Marketing; Cooperatives; Agribusiness

1.0 Introduction

The size of the organic food industry in the U.S is estimated to be over \$6 billion. Although organic foods comprise less than two percent of total US retail food sales, the segment is growing rapidly at a rate approaching 25% per year.^a Even more popular in Europe, studies predict that by 2005 organic foods will comprise nearly 10% of that market (Thwaites 2001).

National organic standards issued by the U.S. Department of Agriculture (USDA) and finalized in March 2001 will lead to greater consumer confidence in U.S. organic products.^b For the first time, all organic products marketed in the U.S. will be subject to consistent standards and labeling. The final compliance deadline of the standard in October of 2002 will bring greater certainty to the organic industry and create yet more opportunities for growth.

As the market continues to grow rapidly, firms must develop efficient methods of moving products to customers. Maintaining quality and integrity at each stage of the supply chain poses challenges. Foods labeled and sold as organic must be handled, processed, and distributed according to methods and standards that prevent contamination. This means that tracking shipments and preserving traceability are crucial requirements. The growth of conventional retailers that carry organic products further emphasizes the need to prevent contamination. Conventional mass-market grocery stores accounted for 45 percent of organic food product sales in 2001, compared to only 31 percent in 1998.^a

^a “Mass Market Channels Expand for Organic Foods” published in the journal *In Business* (2001): 23 (5), 4.

^b “National Organic Standards Will Open Markets Domestically, Globally” published by the *Organic Trade Association*: December 20, 2000, p. 1.

Conveying accurate demand information through the industry's supply chain, from consumers back to farmers, presents another challenge. Organic farmers face an increasingly complex and larger market. In order to succeed, they must grow the right products at the right time and deliver to the right place. However, even with access to information about what consumer's desire, organic farmers must contend with major challenges in finding markets, negotiating terms, and delivering the product while simultaneously preserving quality and integrity. Meanwhile, manufacturers of organic foods face problems associated with securing adequate amounts of ingredients at reasonable prices, verifying that they are organic, and preventing contamination during processing. Retailers of organic foods face issues of their own in maintaining consistency and quality in their supply, preventing cross-contamination, and guaranteeing authenticity and traceability (Dimitri and Richman 2000).

In this paper, we formulate an initial view of the organic foods supply chain based on primary and secondary research. This provides an interesting look at an evolving supply chain in the early stages of development.

2.0 Problem Definition

The purpose of this research paper was to study the characteristics and structure of the organic foods supply chain. Examining the industry beginning at the farm where the crops are produced and ending at the final consumer, this paper explains how the structure of this industry's supply chain affects the ability of firms to address issues such as 1) balancing supply with demand, 2) ensuring high-quality, 3) reducing costs, 4) improving efficiency, 5) maintaining an accurate audit trail, and 6) preventing cross-

contamination with conventional goods. We evaluated the current state of the industry in light of the major concerns of firms competing in this business. This analysis is then followed by the identification of opportunities for improvements that would allow the entire organic foods industry to become more competitive with conventional products, thereby accelerating its growth even more rapidly.

In this paper, we studied the industry by examining individual firms from several perspectives:

- **Vertical Integration** - In light of the anecdotal evidence indicating the importance of vertical integration, we systematically studied the extent of vertical integration in the organic foods industry and the impact on supply chain efficiency. We sought to answer the question of if and how vertical integration can better meet consumer demands while protecting the organic integrity of the product.

- **Scope of the Industry** – We studied the nature of firms that market organic products in terms of the scope of their involvement in this industry. We attempted to discover what proportion of firms that sell organic goods also engage in conventional business, and to what degree these “hybrid” firms are organic.

- **The Supply Pipeline** - We investigated the supplier pipeline for firms in this industry. Sourcing channels, methods, and effectiveness were identified and evaluated. The existence and prevalence, or lack therefore, of long-term relationships and strategic alliances with suppliers for all players along the supply chain – farmers, cooperatives, shippers, manufacturers, distributors, and retailers – were studied and major reasons for formation of such relationships identified.

• **The Marketing Chain** – We also studied the marketing chain in terms of selling channels, methods, and effectiveness. Customer characteristics were examined from the perspective of purchase patterns and behavior. The paper attempts to discover whether firms can respond to buyer requirements, and if so, to what extent. As with the study of the supplier network, this section also examined the role that business alliances and relationships with long-term customers plays in helping firms to satisfy demand more efficiently and achieve other mutual benefits that last well into the future.

• **Information Systems** – Finally, we studied the degree firms in the organic foods industry adopted supply chain management information systems and processes that enable the sharing of information and coordination among firms up and down the supply chain. The paper identifies reasons for the lack of such systems and discusses how individual firms as well as the entire industry could benefit from successful adoption and implementation.

Given this context of our study, we now turn our attention to a review of the literature for insights about previous research concerning the organic foods supply chain.

3.0 Literature Review

We found little evidence of research papers that explicitly studied the structure of the organic foods supply chain in the U.S. Although several papers that deal with the supply chain of organic products in other countries have been published, these studies focused more on the production side of the supply chain and the economics of conversion to organics (Banks 1999; McDonagh 1999). Moreover, because the geographic focus of these research papers was outside of the U.S., the economic, political, and legal

environment in which these supply chains are set is different from the circumstances in the US. This renders their conclusions of little direct application.

As with the foreign studies, we found that research that examined organic foods in the U.S. mostly addresses issues related to farming (Klonsky and Tourte 1998; Ricker 1997), supply and demand economics (Thompson and Kidwell 1998; Thompson 1998), and consumer habits (Park and Lohr 1996). Although all of these research subjects are important and worthy of exploration, it is our opinion that the logistics of bringing organic products to market is just as critical.

Several authors have provided ideas for optimizing organic food supply chains based on practical mathematical models developed for application in agricultural cooperatives.

Allen and Schuster (2000) described a flexible mathematical model to manage risk during harvest, an important activity that requires managerial decision-making in logistics and resource allocation. Although the subject of the study was grapes, the resulting framework can be applied to other crops that experience loss because of poor weather conditions during harvest. This work provided a basis to stabilize raw material supply, the important first link of agricultural supply chains. Other authors accomplished similar work in harvesting and risk management (Porteus 1993a; Porteus 1993b; Jones et al. 2001). Li (2002) has provided an interesting general framework for supplier risk and considers the role of risk in supply chain coordination.

A paper published in the journal *Interfaces* studied raw materials management for an agricultural vertically integrated operation once the harvest is complete. The paper presented a simple but powerful spreadsheet model to optimize raw materials planning

and logistics (Schuster and Allen 1998). Because our preliminary research indicated that vertically integrated operations such as cooperatives play a key role in the organic foods industry, the model formulated in this study could also be used, with appropriate adjustments, to generate substantial savings in these organizations.

An important aspect of raw materials management for an agricultural cooperative is the function of materials requirements planning. In particular, capacitated materials requirements planning is of paramount importance in certain industries, of which the organic foods sector is a prime example. In the paper “Capacitated materials requirements planning and its application in the process industries,” the authors point to the inadequacy of traditional materials requirements planning systems in process industries, where capacity constraints necessitate an alternative system (Schuster, Allen and D’Itri 2000). The case study provided a framework for integrated capacity management in agricultural cooperatives, spanning from raw materials to finished product manufacturing. The framework also can be applied to firms involved in processing organic foods.

As demonstrated by the lack of publications in logistics and agricultural journals alike, logistics and supply chain management in organic foods remains an unexplored area, one which holds great potential for unlocking value at each stage of the organic supply chain.

4.0 Methodology

We studied the extent of vertical integration and strategic alliances in the organic foods industry via the identification of firms operating in the organic foods sector at all

levels along the supply chain. In addition, we explored the scope of their business as well as the presence or absence of collaborative relationships. This was accomplished through a combination of primary and secondary research. Secondary sources included data compiled by the United States Department of Agriculture, the Organic Trade Association, and the Natural Foods Merchandiser.

In addition to preliminary research via secondary sources, primary research methods in the form of a survey were utilized to solicit information and provide further insight into how vertical integration and strategic partnerships have affected the participants on an individual basis and the supply chain as a whole. Please refer to Appendix A for the survey in its entirety. The survey, in addition to soliciting feedback on the scope of the firm's operations and the presence of long-term alliances with suppliers and buyers, also gathered other information pertaining to the nature of the supply chain for this industry to answer the aforementioned research questions in section 2.0. It was distributed to firms that operate in the area of organic foods, beginning from one end of the supply chain (growers) and ending at the level immediately preceding the consumers (retailers). The survey did not include parties outside of this range such as suppliers to farmers (for instance, agricultural equipment firms or companies providing natural fertilizers and pest-management products). Business organizations targeted by the survey included growers, processors, cooperatives, brokers, manufacturers, wholesalers, distributors, and both independent and chain retailers.

5.0 Data and Results

A total of 288 surveys were sent to firms operating in the organic foods supply chain. Surveys were sent via e-mail during March 2002. A total of 62 responses were received. Of the total, 17 were not included in the survey results due to a variety of reasons that brought into question the quality of the data. The results were tabulated based on 45 surveys.

The profiles of the responding firms varied considerably. Some had operations with millions of dollars in annual revenues, while others were small “mom-and-pop” shops. Although the survey was sent to companies along every stage of the supply chain, only a handful of growers responded. However, the response rate from brokers and retailers was even lower. Most of the responses we received came from manufacturers, processors, wholesalers and distributors. Since these types of businesses reside in the middle of the supply chain, with maximum upstream and downstream visibility, we felt the sample appropriate to provide insight for an initial analysis and framework of the organic foods supply chain. Because of the non-random nature of the sample, we make no claim that the results of this survey are statistically un-biased. However, the large majority responses to particular questions provided the authors with confidence that our conclusions are valid.

The data and results section is structured and presented in the same manner as that of the survey. First, we begin with an analysis of vertical integration, using results from both survey responses and secondary research. Second, findings regarding the firms’ supply pipeline and supplier relationships are presented. Third, customer characteristics

and relationships are discussed. Finally, adoption of supply chain information systems is analyzed and reasons for the findings presented.

5.1 Vertical Integration

Approximately one-half of the survey respondents were engaged in more than one stage of the supply chain. The most prevalent combinations of functions included manufacturing and distribution, manufacturing and brokerage, growing and manufacturing, and brokerage and distribution.

The prevalence of vertical integration may be due to organic firms' attempt to achieve greater efficiency in the face of a small industry. By operating along more than one stage of the supply chain, firms are more capable of leveraging the effectiveness of their resources and capital. For instance, a manufacturer may discover that it can increase its economic returns by utilizing its industry contacts and network to distribute its products, rather than using the services of a third-party wholesaler. As another example, a broker with excess capital may expand into the distribution role by taking ownership of the products it is handling, thereby allowing the firm to achieve a higher potential return on otherwise idle capital.

Another possible reason for vertical integration is a more stable access to supplies upstream and/or buyers downstream. For example, a manufacturer may expand into the growing business by acquiring farms that produce ingredients necessary for its manufacturing operations. By so doing, the manufacturer increases the stability of its raw material supplies, in terms of both quantity and price. The availability of supplies is especially important in the organic industry because, for the most part, items have not yet become commodities and may be difficult to procure at a reasonable cost on a long-term

basis. By owning the source of its supplies, the manufacturer is able to dictate more control over its supplies and control risk.

Finally, as with the conventional agricultural industry, we found cooperatives also play an important role in the production and distribution of organic products.

5.2 “Hybrid” Firms

Approximately 45% of the survey respondent’s dealt in both organic and conventional products, with the majority claiming that operations would be less profitable or not profitable if conventional products were not offered. The pervasiveness of firms that operate in both the organic and conventional lines of business also supports the conclusion that the organic industry is still very small and may not generate the requisite profitability for many firms.

The decrease in profitability may stem from several reasons. First, as the demand for organic products is currently a very small percentage of overall demand, sales would significantly decrease if the conventional product lines were discontinued. In order to maintain the same or higher level of profitability, either the sales volume or sales price of the organic products would have to increase. Both are unlikely to happen, as there is already a significant price premium for organic goods. Thus, it is probably not possible to raise prices without hurting sales. It may also be possible to maintain profitability by reducing costs. Again, however, achieving this goal is unlikely, given that without conventional products, the firm would lose a substantial throughput volume and the concomitant economies of scale. This phenomenon is especially true for “organic” processing firms, many of whom must also process conventional goods in order to turn a profit.

Decreased profitability may also arise because of the availability of organic products. For example, at the retail level, certain consumers may prefer organic products, if they are available. However, due to natural conditions, certain goods may not be accessible year-round. Nevertheless, most customers who shop at an “organic” or “natural foods” store expect availability of conventional alternatives if the organic counterpart is out of season or out of stock. Should a retailer choose to offer only organic products, it may lose many of these customers to other stores that carry both product lines. A case in point is Whole Foods, the largest chain retailer in the US offering organic products. A substantial portion of the items found on its shelves consists of conventional goods. Without the conventional alternatives, profitability would most likely decrease, not only due to foregone profits from conventional goods, but also to the lost sales of organic products resulting from loss of customers to other stores.

5.3 Sourcing Supplies

Results of the survey indicated that the majority of organic foods firms source their supplies from more than one marketing channel. Only one-fourth of the survey participants obtained 100% of their supplies from one channel. Traditional theory suggests that it is more efficient for the individual firm, as well as the market as a whole, for each player to source from one channel. The use of different channels may create channel conflict and inefficiencies. A case in point is a firm that uses both a broker to secure a particular ingredient, while at the same time also dealing directly with the manufacturers of these same ingredients. In such a situation, conflict may arise if the broker learns of the firm’s practice and feels that it is being undercut. Moreover,

inefficiencies may arise because the firm must invest more resources and time in managing different types of relationships.

Despite the traditional arguments against sourcing from multiple channels, the fact that this practice is popular among firms in the organic foods industry can be explained by several factors. First, the nature of certain supplies is such that they are more obtainable through one channel than another. For instance, a manufacturer may require fresh produce and food additives to make its product. The former would most likely come from growers or processors while the latter would probably be sourced from other manufacturers or wholesalers who specialize in these ingredients.

Another factor revisits the aforementioned notion that because the organic foods industry is still fledging and more sensitive to the whims of natural growing conditions, supplies are more difficult to obtain. As a result, firms in this sector may be forced to procure from more than one channel in order to ensure that their requirements are met. As this sector grows and supplies become more available and stable, opportunities exist for individual firms and the entire industry to create more efficiency through consolidation of supply channel relationships.

The survey also found that many firms procure their supplies from outside the USA. Sixty percent of the survey respondents import some or part of their supplies. This result is also consistent with the concept that organic supplies are not widely available. Thus, firms must make use of all its available resources, including international suppliers. In addition, organic products are more popular among consumers in Europe than in the U.S. The organic industry is subsidized largely by many European governments, in contrast to the virtually nonexistent financial support from the U.S. government on the

domestic front. Consequently, organic supplies may be more accessible and available at a lower cost in these nations than in the U.S. As organic products gain ground in the U.S. and become more available at a lower cost, opportunities will surface that enable firms to cut shipping costs, lead-time, and currency fluctuation risks by sourcing from domestic firms.

Although the prevalence of procuring supplies abroad may be due to a paucity of resources on the domestic front, an alternative explanation may be simply lack of information. Firms may be sourcing goods from abroad because they do not have access to or are not aware of domestic sources. This in turn implies the existence of industry overlap whereby domestic firms who could have purchased goods from each other are instead sourcing from international providers. This overlap creates inefficiencies resulting from the greater costs associated with conducting international business. In addition, profits for the industry as a whole within the domestic market are also lowered because of foregone business lost to the international market. If this overlap does indeed exist, opportunities to eliminate these inefficiencies and create more business for all domestic firms will come from increased information availability. As firms in the organic foods industry begin to use the Internet more extensively, they may become more knowledgeable about domestic suppliers who can potentially provide goods at a lower cost and with shorter lead-times. Rather than using an international supplier by default simply because it has always been the firm's source, the Internet will offer firms a greater number of vendors, both domestic and international, to choose from and establish relationships.

Finally, the survey found no evidence of Internet-based sourcing. For the few firms who procure through this means, less than 1% of their supplies are sourced in this way. This phenomenon can probably be best explained by the importance of relationships in this industry, as discussed in the next section. Use of Internet sources such as online catalogs, agricultural exchanges, and e-marketplaces are counter to the formation of critical alliances that can mean the difference between fulfilling supply requirements and experiencing a stock-out. Again, as organic supplies increase, firms in the future may be more able to take advantage of the advantages conferred by Internet sourcing without fear of running into a shortage.

5.4 Supplier Relationships

The study found that, consistent with the current state of the organic foods industry, long-term relationships with suppliers are critical to the success of most firms in this business. A total of 85% of the firms participating in the survey form long-term alliances with multiple suppliers that last for many years, with quite a few surviving as long as 25 years. This represents a form of risk pooling that is particularly effective in supply chain management (Simchi-Levi et al. 2000, 39-65). The average length of the supplier relationships in the survey is approximately eight years. Although these alliances consist of both formal and informal agreements, the predominant arrangements are informal. Those based solely on legally binding contracts accounted for approximately seven percent of the relationships. The rest are built on mutual trust, word-of-honor, and reputation.

As indicated, the widespread existence of the long-term relationships and alliances in this business can be attributed to the scarcity of organic supplies. In order to

secure adequate supplies at a reasonable cost, it is necessary for firms to establish long-term relations with suppliers. Otherwise, for instance, by sourcing only on the open market, firms run the risk of being unable to fulfill supply requirements.

This hypothesis is also supported by results of the survey questions that asked participants to identify major reasons for and benefits of maintaining partnerships and alliances with suppliers. The most frequently cited reasons are stability and lower risk, two sides of the same coin. As many firms indicated, organic crops are scarce and, unlike other agricultural commodities, are not readily available. Thus, it is prudent to know one's sources and maintain close ties. Other key advantages included trust, reliability, consistency, dependability, variety, quality, timely order fulfillment, and customer service. Some firms cited benefits such as exclusive distribution, while others indicated that good relationships facilitated tracking the organic audit trail, a critical function in this industry not only for regulation purposes, but also to maintain the confidence and trust of end consumers.

Forming long-term relationships with suppliers has both its benefits as well as drawbacks. On the one hand, the firm is able to achieve greater stability, security, and consistency. However, these advantages may come at a higher cost. The firm may be paying a premium in the form of higher prices. In addition, although many firms engaged in long-term relationships believe that they have access to higher quality goods; this belief may not be well founded in cases where a firm becomes accustomed to mediocre quality. Furthermore, the nature of long-term relationships is such that they reduce competition to a certain extent, and thus, possibly the firm's access to the best products at the lowest prices. As the organic industry grows, firms will have more opportunities to

rationalize their long-term relationships and alliances that a greater industry and supplier base affords.

Finally, approximately one-half of the survey participants who form long-term relationships with their suppliers do so with both conventional and organic firms. This finding is not surprising, given that approximately one-half of the survey respondents also carry conventional products. Establishing solid relationships with both organic and conventional suppliers allow many firms to maintain greater flexibility, enabling procurement from one source when supply from the other is not available. For instance, should organic tomatoes become scarce owing to unfavorable growing conditions, many firms will still need to provide their customers with the conventional alternative. The same is also true in the reverse situation because some organic crops actually fare better than their conventional counterparts under certain circumstances. For example, under weather conditions that destroy conventional mushrooms, organic ones are able to survive.

Lastly, the survey also found that most respondents are able to fulfill their supply requirements; 25% of the participants reported that their suppliers are ALWAYS able to meet requirements and 60% indicated USUALLY. These numbers, seemingly high, given the relative scarcity of organic crops, can be explained by some of the measures firms take to ensure adequate supply, as discussed above. For instance, through the formation of long-term alliances with suppliers or by vertically integrating upstream, firms may be more able to secure required materials the majority of the time. Since more than half of the firms reported that suppliers are usually able to meet requirements, it appears that most firms are currently faring well on this front.

5.5 Distribution Channels

Just as most firms reported the use of multiple channels for supply procurement, the same is true when it comes to marketing the firms' own products downstream. A total of 75% of the survey respondents indicated that they sell through multiple channels. As with the case in supply procurement, use of multiple marketing channels may also create conflict and inefficiencies. For example, a wholesaler may have issues with a manufacturer who sells to distributors and retailers alike. Yet, because of the small size of the organic foods industry, some firms may still make the decision to push their products through more than one channel in order to increase sales. However, in the end, this strategy may not necessarily maximize revenues, as an increase in sales through one channel should lead to a decrease in the other. Furthermore, the additional time and resources that are required to deal with different types of customers along multiple stages of the supply chain also detracts from a firm's ability to focus fully on its core competencies. As demand for organic products increase in the States and abroad, opportunities exist for firms to consolidate and rationalize their marketing channels, thereby reducing channel conflict and improving efficiency.

Although virtually no firms source their supplies via the Internet, a very small proportion sell their goods using this channel. Even so, for the firms utilizing the Internet to push their products out into the market, only a very small percentage (less than 5%) is sold through the Internet. In addition, most firms who sell products over the Internet do so to end consumers. Internet sales are virtually nonexistent when it comes to business to business (B-to-B) transactions. This finding is consistent with the aforementioned lack of Internet sourcing as a procurement strategy. As with sourcing over the Internet, selling

over the Internet is not conducive to the formation of strong, long-term B-to-B relationships and may explain its scarcity. Finally, although Internet sales are scarce, the majority of the firms maintained informational websites. This may be a first step to conducting business over the Internet in the future.

According to the survey results, approximately one-half of the participants exported their products. The fact that a significant number of firms sold their goods abroad could be indicative of several phenomena. As previously mentioned, demand for organic products in certain parts of the world, such as Europe, and is considerably greater than it is in the U.S. In addition, greater retailer concentration in such regions as Europe might actually aid in communicating demand signals (Cotterill 1997). Thus, many firms in the States can cater to this demand by exporting their goods. As demand for organic products continues to grow both nationally and internationally, opportunities will also increase for US firms to sell abroad.

Along a related front, because demand for organic products domestically is still relatively small, accounting for only 2% of the overall food industry, firms in this line of business must not only find ways to expand their market within the States, but also reach out to new segments abroad. International expansion will allow firms to achieve a higher volume and thereby possibly attain economies of scale. However, although exporting goods will increase firm revenues, the question of whether profitability will rise along with sales remains to be answered. The added cost of international shipping, import duties, tariffs, currency fluctuations, and longer lead-times may make US organic goods less competitive with international counterparts. Moreover, any disadvantage experienced by US firms in the organic foods industry is further exacerbated by the subsidies many

European organic growers receive from their governments. Thus, further research can determine the level of profitability, if any, that the organic export business provides.

5.6 Buyer Characteristics

The study found that demand from buyers is in general predictable and stable. Approximately 75% reported that purchases from customers are fairly or very predictable. Further, 85% indicated that demand is stable. This finding is consistent with the distribution of purchases among organic foods end consumers and the purchase behavior of these consumers. Among organic shoppers, core users account for the majority of organic goods purchases. Those who fall into this category tend to purchase organic products as a matter of lifestyle habit, in contrast to the other shoppers who may only make a purchase only under special circumstances such as sales or promotions. Thus, a core group of organic enthusiasts buys organic products on a consistent basis and keep demand smooth and more manageable for organic retailers. Because purchase patterns at the tail end of the supply chain tend to flow upstream (with an amplifying effect), a steadier demand on the consumer level will lead to a more even demand not only for retailers, but also for other players along the supply chain (Fine 1998, 89-104). As the organic foods segment continues to enjoy increasing popularity, the predictability and stability of purchases should rise even more as more consumers choose organic goods over conventional ones on a consistent basis.

We found that about 55% of the time, the firm's supply is approximately equal to its demand. This high proportion is consistent with the previous finding that most firms enjoy stable and predictable purchase patterns, which allows firms to make more accurate

forecasts and to plan accordingly. This in turn leads to a greater correlation between supply and demand at the most favorable price.

As for other responses, approximately 25% reported that supply sometimes equals demand and 20% reported that supply rarely equals demand. In order to determine the how supply relates to demand when the two are not equal, the survey also asked participants to indicate how often their supply exceeds demand, and vice versa.

Approximately 15% of the respondents reported that supply always or usually exceeds demand, while 9% experienced the opposite. Those firms who fall in these latter categories where supply consistently does not equal demand at the appropriate price level may be operating further up the supply chain and are most likely more distant from end consumers, making it more difficult to gauge true demand on a timely basis. The information that is used to make forecasts must pass through several stages before reaching these firms, making it less reliable because of such factors as time delays and the bullwhip effect. The latter describes the previously mentioned phenomenon whereby a pattern or behavior is amplified at each stage as the information travels along the supply chain. Thus, for instance, what starts out as a small increase in demand at the consumer level may lead to huge spike in perceived demand at the manufacturing stage.

Opportunities to minimize the bull whip effect and increase the reliability of information will present themselves as the industry scales up, making it economically feasible for firms to invest in supply chain management information systems, as discussed below in greater detail below.

As with supplier relations, long-term alliances with customers play a very important role in the organic foods industry. Ninety percent of the firms surveyed have

long-term relationships with the majority of their buyers. These relationships last for many years, ranging from 2 to 15 years. Most of these alliances are informal; some take the form of legally binding contractual agreements. The ones that fall into the latter category are mostly contracts between growers and another party who agree to purchase the growers output for a particular season. The other 10% who did not report forming long-term alliances with customers mostly comprise independent or chain retailers whose customers consist of many end consumers, a situation in which long-term business alliances are not applicable.

These results stress the importance of establishing a network of trustworthy and reliable buyers for firms competing in this industry. Respondents cited stability in demand and payment as the most important reason for establishing these relationships. Because this industry is still in a growth stage, it is characterized by the existence of many small firms, many of whom must struggle to survive. Many firms will go out of business as the industry shakes out the weak. As a result, firms report that some customers are unable to make their payments. Establishing long-term relationships and working with select customers is a strategy many firms employ to hedge against the non-paying customers. Other frequently cited benefits include consistency in orders and sales, access to reliable information about the market, and dependable source of support for marketing, distribution, and sales.

Approximately 65% of the survey participants formed long-term alliances with both conventional and organic firms. This proportion is very close to the proportion of firms that formed long-term alliances with both conventional and organic suppliers. It is

also consistent with the proportion of the survey participants who sell both conventional and organic products.

5.7 Supply Chain Management Systems and Technologies

The survey found that none of the participants have implemented IT systems that share information with buyers and suppliers. This finding is not surprising, given the small scale of the industry. Implementation of internal enterprise systems alone requires a significant amount of financial investment as well as human resources. Many firms operating in this industry do not have the means or the scale to justify the implementation of such systems. Rolling out a system that encompasses organizations external to the firm, as is the case when inter-firm data sharing is involved, requires an even greater effort and comes at a much higher price. In addition, prohibitive costs are not the only constraints; firms must achieve a higher level of cooperation to implement the system successfully. This sense of partnership and trust is critical, given that firms will be sharing what may be sensitive information that has traditionally been tightly guarded. All of the above reasons explain why virtually no firms in the survey utilized inter-organizational IT systems. Many are simply not large enough to warrant the huge expenditure necessary for such projects. Furthermore, even if a particular firm has the wherewithal to support such systems, its suppliers or buyers may not.

In the future, when the industry has reached a certain scale, firms will have more opportunities and reasons to justify the implementation of such costly systems. Although expensive and resource-intensive, these systems help firms to improve such supply chain functions as inventory management and replenishment, which in turn facilitates demand forecasting and planning. Essentially, implementation of such systems increases visibility

and makes the entire supply chain more transparent for all players, enabling all parties involved to more clearly understand the true state of their supply and demand on a timely basis. The results are greater efficiency and possibly lower prices for end consumers (without compromising the profits of the firms engaged in this industry.)

Although setting in place a process and system that facilitates cooperation among firms along a supply chain is more easily rationalized when the scale of the operations is large to begin with, it can also be argued that implementing such systems even before a critical scale has been reached will enable the industry to grow faster through increased efficiency, lower prices, and hence, greater demand. This is especially true in the organic foods sector, where the price premium is usually very high, turning away many consumers. Making investments that may lower these price premiums at a time when the industry is still relatively small may appear to be unwarranted. However, doing so may bring long-term benefits by making this industry more competitive with conventional products.

On the other hand, it may be argued that other economic factors besides supply chain efficiency will also affect the growth rate of the industry. For instance, the price premium that growers must fetch in order to recoup their costly transition to organic farming currently accounts for a large proportion of the overall price premium. This portion of the price premium is less influenced by improvements in inter-organizational supply chain operations. This argument may hold for the time being. However, in the future, as more growers become certified organic, and as existing organic growers mature and recover their initial investments, prices at the farm gate will begin to fall. At that time, supply chain costs will account for a greater share of the overall price. Thus,

measures such as implementation of supply chain management systems that increases efficiency will spur the popularity and demand for organic goods.

It should also be noted that although the organic foods sector is lacking when it comes to implementing supply chain management systems and integrating operations with other firms, the same could be said of the entire agricultural industry in general. With the exception of large retailers such as chain supermarkets who implement such systems as Efficient Consumer Response (ECR) or Vendor Managed Inventory (VMI), the majority of the other players in the conventional goods market do not have systems in place that allow for the same level of collaboration that ECR or VMI requires (Soucie 1997).

6.0 Conclusions

Several key findings emerged from this study. The research effort led to insights regarding the extent of vertical integration, the degree to which organic firms operated in the conventional foods business, the nature of supplier and customer channels, the prevalence of long-term business relationships, the characteristics of supply and demand, and finally, the role of e-Commerce and collaborative supply chain information technology in this industry.

All of the above findings led to the general conclusions that because the organic foods industry is still relatively small (albeit growing rapidly), the majority of firms operating purely in the organic foods space cannot achieve the same level of economies of scale as of conventional firms. Instead, organic food business must establish other ways of lowering their costs and/or maximizing efficiency and effectiveness.

In addition, the relatively small size of the industry also means that sources of supply are limited and unstable, thereby elevating the importance of supplier relationships. Likewise, access to the buyer market is also restricted due to the relatively low demand. Consequently, ensuring a stable, predictable demand for the organic firm's products is also of paramount importance.

Thus, small scale of the organic foods industry has led firms operating in this business to employ strategies such as vertical integration, forging strategic alliances and long-term relationships, and partnering with conventional firms. These means allow organic firms to maximize value creation and delivery, while minimizing costs and risks.

The following table summarizes the results of the study:

Area of Investigation	Results	Conclusion / Hypothesis
Vertical Integration	<ul style="list-style-type: none"> • 50% of survey respondents are vertically integrated to a certain extent 	<p>The prevalence of vertical integration may be due to the following factors:</p> <ul style="list-style-type: none"> • Greater efficiency in the face of a small industry • More stable access to supplies upstream and/or buyers downstream • The importance of cooperatives, vertically integrated operations, in this industry
Organic vs. Conventional Products	<ul style="list-style-type: none"> • 45% of the firms surveyed grow or sell both organic and conventional products • Majority of “hybrid” firms report decreased profitability if conventional 	<ul style="list-style-type: none"> • Relatively low demand for organic goods necessitate carrying conventional products in order to survive for many firms • Instability of organic products may also

Area of Investigation	Results	Conclusion / Hypothesis
	<p>products were eliminated from their product line.</p>	<p>make it necessary for organic firms to offer conventional goods in order to avoid losing customers</p>
Sourcing Channels	<ul style="list-style-type: none"> • 75% of firms surveyed use multiple channels to source supplies 	<ul style="list-style-type: none"> • Use of different channels may create channel conflict and inefficiencies • Practice may be popular for firms that require different supplies because some goods may be more easily obtainable through one channel than another • Organic firms may be forced to procure from more than one channel in order to ensure that, in this more unstable industry, their requirements are met
International Procurement	<ul style="list-style-type: none"> • 60% of survey respondents sourced supplied internationally 	<ul style="list-style-type: none"> • Organic firms must make use of all its available resources, including international suppliers • Organic products are more popular in Europe and better subsidized, increasing availability at a lower cost • International procurement may also be prevalent due to lack of

Area of Investigation	Results	Conclusion / Hypothesis
		information about domestic suppliers
Internet Sourcing	<ul style="list-style-type: none"> • 1% or less 	<ul style="list-style-type: none"> • The importance of relationships in this industry discourages sourcing via the Internet, which is not conducive to the formation of critical alliances that can mean the difference between fulfilling supply requirements and experiencing a stock-out
Supplier Relationships	<ul style="list-style-type: none"> • Long-term relationships with suppliers play a critical role for 85% of survey respondents. • Average age of long-term relationships with suppliers is 8 years. • Majority of these relationships are informal arrangements based on mutual trust 	<ul style="list-style-type: none"> • Benefits of long-term relationships with suppliers: Stability, lower risk, trust, reliability, consistency, dependability, variety, quality, timely order fulfillment, and customer service, exclusive distribution, facilitation in tracking organic audit trail <p>Disadvantages:</p> <ul style="list-style-type: none"> • May be paying a price premium • May reduce competition • May become accustomed to mediocre or poor service
Type of Suppliers	<ul style="list-style-type: none"> • 50% of the firms surveyed use suppliers that offer both organic and conventional goods 	<ul style="list-style-type: none"> • Finding is consistent with the fact that approximately one-half of the survey respondents also

Area of Investigation	Results	Conclusion / Hypothesis
		<p>carry conventional products</p> <ul style="list-style-type: none"> Establishing solid relationships with both organic and conventional suppliers allow many firms to maintain greater flexibility, enabling procurement from one source when supply from the other is not available
Ability to Meet Requirements	<ul style="list-style-type: none"> 85% of respondents report that they are always or usually able to fulfill supply requirements 	<ul style="list-style-type: none"> The high percentage can be explained by the effort firms take to ensure adequate supply, i.e. forming long-term alliances and vertically integrating upstream
Distribution Channels	<ul style="list-style-type: none"> 75% of survey respondents utilize multiple channels to distribute their goods 	<ul style="list-style-type: none"> Use of multiple distribution channels may create conflict and inefficiencies Nevertheless, small size of the organic foods industry may warrant the use of multiple distribution channels in order to increase sales However, in the long run, an increase in sales through one channel may lead to a decrease in the other Additional time and resources that are required to deal with different types of customers along multiple stages of

Area of Investigation	Results	Conclusion / Hypothesis
		the supply chain may detract from the firm's ability to focus fully on its core competencies
Internet Sales	<ul style="list-style-type: none"> • For the very small proportion of firms who sell via the Internet, sales through this channel account for, at most, 5% of total volume • Many firms maintain informational websites • Most firms who sell products over the Internet do so to end consumers • Internet sales are virtually nonexistent when it comes to B-to-B transactions 	<ul style="list-style-type: none"> • As with Internet sourcing, selling over the Internet is not conducive to the formation of strong, long-term B-to-B relationships and may explain its scarcity • Informational websites may be a first step to conducting business over the Internet in the future
International Sales	<ul style="list-style-type: none"> • 50% of survey respondents export their products 	<ul style="list-style-type: none"> • Demand for organic products in certain parts of the world, such as Europe, is considerably greater than it is in the States. • Many firms in the States can cater to this demand by exporting their goods • Because demand for organic products domestically is still relatively small, firms in this line of business must reach out to new segments abroad • International

Area of Investigation	Results	Conclusion / Hypothesis
		<p>expansion may allow firms to achieve a higher volume and thereby possibly attain economies of scale</p> <ul style="list-style-type: none"> • Added cost of international shipping, import duties, currency fluctuations, and longer lead-times may make US organic goods less competitive with international counterparts • Disadvantage for U.S. firms may be further exacerbated by the subsidies many European organic growers receive from their governments
Customer Characteristics	<ul style="list-style-type: none"> • 75% of survey respondents report that purchases from customers are fairly or very predictable • 85% report that purchases are fairly or very stable 	<ul style="list-style-type: none"> • Finding consistent with the distribution of purchases among organic foods end consumers and the purchase behavior of these consumers • A core group of organic enthusiasts buy organic products on a consistent basis and keep demand smooth and more manageable
Supply and Demand	<ul style="list-style-type: none"> • 55% of survey respondents report that supply usually equals demand 	<ul style="list-style-type: none"> • Relatively high proportion is consistent with finding that most firms enjoy stable

Area of Investigation	Results	Conclusion / Hypothesis
		and predictable purchase patterns
Customer Relationships	<ul style="list-style-type: none"> • 90% of the firms surveyed have long-term relationships with the majority of their buyers. • Relationships last for many years, ranging from 2 to 15 • Most alliances are informal • Legally binding agreements usually involve contracts between growers or farmers and another party who agree to purchase the formers' output for a particular season 	<ul style="list-style-type: none"> • Results stress importance of establishing network of trustworthy and reliable buyers for firms competing • Respondents cited stability in demand and payment as the most important reason for establishing relationships • Other frequently cited benefits include consistency in orders and sales, access to reliable information about the market, and dependable source of support for marketing, distribution, and sales
Type of Customers Associated with Long-Term Relationships	<ul style="list-style-type: none"> • Approximately 65% of the survey participants form long-term alliances with both conventional and organic firms 	<ul style="list-style-type: none"> • This proportion is very close to the proportion of firms that form long-term alliances with both conventional and organic suppliers • It is also consistent with the proportion of the survey participants who sell both conventional and organic products
Inter-organizational / Supply Chain Management Information Systems	<ul style="list-style-type: none"> • None of the survey participants have implemented IT systems that share information with 	<ul style="list-style-type: none"> • This finding is consistent with the small scale of the industry • Implementation of

Area of Investigation	Results	Conclusion / Hypothesis
	buyers and suppliers	<p>systems requires a significant amount of capital investment and human resources</p> <ul style="list-style-type: none"> • Many firms operating in this industry do not have the means or the scale to justify the implementation of such systems • Rolling out a system that encompasses organizations external to the firm also requires a higher level of cooperation

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Appendix A

Survey

*****About your business*****

1. Please enter a "Y" next to each of the following that describes your business:

Grower / Farm:

Growers Cooperative:

Retailers Cooperative:

Consumer Cooperative:

Broker:

Processor:

Manufacturer:

Wholesaler / Distributor:

Independent Retailer:

Chain Retailer:

Others (please specify):

2. What are your main crops or products?

3. If you are a grower or farmer:

Please indicate the total number of acres:

Please indicate the number of acres that are certified organic:

Please indicate the number of acres that are in transition to organic:

Please indicate whether you are part of a growers cooperative:

4. If you operate or are part of a growers cooperative:

Please indicate the number of farms that are part of the cooperative:

Please indicate the total number of acres these farms represent:

Please indicate the number of acres in the cooperative that are certified organic:

Please indicate the number of acres in the cooperative that are in transition to organic:

5. If you are a broker, processor, manufacturer, wholesaler, or distributor, please indicate your approximate annual volume in either tons or sales dollars:

6. If you are an independent retailer, please indicate the size of your store in square feet:

7. If you are part of a consumer cooperative, retailers cooperative or chain store:

Please indicate the size of your store in square feet:

Please indicate the number of stores in the cooperative or chain:

8. Do you also sell conventional products?

If yes:

What would be the impact on your profitability if you were to sell ONLY organic products? Please choose one of the following: Not profitable, Significantly less profitable, Somewhat less profitable, Same profitability, Somewhat more profitable, Significantly more profitable:

Approximately what percentage of your sales dollars comes from organic products?

*****About your suppliers*****

1. Please indicate the percentage of your supplies that you source from for each of the following:

Direct from Growers / Farms:

Grower Cooperatives:

Brokers:

Processors:

Manufacturers:

Wholesaler / Distributors:

Others (please specify):

2. Have you ever sourced your supplies over the Internet?

If yes, what percentage of your supplies is sourced via this method?

3. Do you source your supplies from businesses outside the USA?

If yes, what percentage of your supplies comes from businesses outside the USA?

4. How many suppliers do you use on average?

5. Are your suppliers combined able to meet your requirements? Please choose one of the following: Rarely, Sometimes, Usually, Always:

6. Do you use contractual agreements to source goods from your suppliers?

If yes, what percentage of your supplies is sourced via this method?

7. Have you established any long-term relationships with any of your suppliers?

If yes:

How many suppliers does your business have a long-term relationship with?

How long has the relationship(s) lasted? (Or, if it no longer exists, how long did it last?)

Is the long-term relationship an informal alliance, or is it a formal arrangement bound by contract?

Is the alliance with an organic, conventional, or hybrid supplier?

Please provide a very brief description of the alliance:

Please list the main benefits that you gain from the long-term relationship:

8. Do you have an IT system that shares information with the IT system of any of your suppliers?

*****About your buyers / customers*****

1. Please indicate the percentage of your sales that you sell or ship your products to for each of the following:

Growers Cooperatives:

Retailers Cooperatives:

Consumer Cooperative:

Brokers:

Processors:

Manufacturers:

Wholesalers / Distributors:

Chain Retailers:

Independent Retailers:

Farmers Markets / Roadside Stands:

Restaurants / Chefs:

Subscription Services:

Others (please specify):

2. Have you ever sold your products over the Internet?

If yes, what percentage of your products is sold via this method?

3. Do you export your products to businesses outside the USA?

If yes, what percentage of your sales is exported?

4. What are the main factors that you take into consideration when deciding what to grow, produce or sell each season?

5. What are your main sources of information when it comes to forecasting price and/or demand for your product(s)?

6. On average, how would you describe purchase patterns from your buyers / customers? Please choose one of the following: Very stable, Fairly stable, Unstable, Very unstable:

7. On average, how would you describe the predictability of purchases from your buyers / customers? Please choose one of the following: Very predictable, Fairly predictable, Unpredictable, Very unpredictable:

8. Does demand from your buyers approximately equal your supply? Please choose one of the following: Rarely, Sometimes, Usually, Always:

9. Does your supply exceed demand from your buyers? Please choose one of the following: Rarely, Sometimes, Usually, Always:

10. Does demand from your buyers exceed your supply? Please choose one of the following: Rarely, Sometimes, Usually, Always:

11. Do you normally enter into contractual agreements whereby you agree to sell a part or all of your output to a buyer(s) (NOT including contracts with cooperatives)?

If yes, approximately what percentage of your output is sold via this method?

12. Have you established any long-term relationships with any of your buyers?

If yes:

How many buyers does your business have a long-term relationship with?

How long has the relationship(s) lasted? (Or, if it no longer exists, how long did it last?)

Is the long-term relationship an informal alliance, or is it a formal arrangement bound by contract?

Is the alliance with an organic, conventional, or hybrid buyer?

Please provide a very brief description of the alliance:

Please list the main benefits that you gain from the long-term relationship:

13. Do you have an IT system that shares information with the IT system of any of your buyers?

End of Survey

