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Factors Affecting Supply Chain Management in Agribusiness: A Review of Key Concepts

Anil K. Chojar

Disha Institute of Management and Technology, Raipur, C.G. State, India. Corresponding author.
E-mail: anilkrchojar@yahoo.com

Abstract

Commercial interest in supply chain management in agribusiness firms has increased due to greater urbanization and globalization. While product differentiation, improved quality, more cost-effective transport, and timely delivery have contributed to the development of supply chains from farm-gate to retail level, it is the consumer demand for variety, quality, and year-round availability that has provided the stimulus for the formation of these chains. Traditional agricultural and food businesses that focus only on price are unable to meet consumers' expectations. Individually, chain members lack the means to respond to consumers' demands. Understanding the concepts of supply chain management provides a means to manage the changes required in the system to efficiently respond to consumer needs, integrating and coordinating the efforts of all supply chain members. These changes include consolidating organizations at the farm, processor, and supermarket levels; organizing production to achieve economies of scale; and gaining market share and competitive strength to survive global competition. This paper highlights the importance of critical factors like mutual trust; leadership by one or two chain members; the use of information technology (IT) in input procurement, production planning, and market access; realignment of strategies to develop improved production methods to meet consumer preferences and food safety standards; and the intelligent use of market information to help small farmers to overcome production challenges and respond to the challenges of global markets.

Keywords: consumers; delivery; farm-gate information; linkages; processes; quality; suppliers; timeliness

Abbreviations:

- APEDA – Agricultural Processed Products Export Development Authority
CPFR – collaborative planning, forecasting, and replenishment
GCMMF – Gujarat State Cooperative Milk Marketing Federation Ltd.
HPMC – Himachal Pradesh State Horticultural Produce Cooperative Marketing Federation Ltd.
IT – information technology
ITC – Indian Tobacco Company
NABARD – National Agricultural Bank for Rural Development
NDDB – National Dairy Development Board
SC – supply chain
SCM – supply chain management
3-PL – third party logistics
TQM – total quality management
USD – United States dollar
WTO – World Trade Organization
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Introduction

Commercial interest in supply chain management (SCM) in agribusiness is increasing in India due to greater urbanization, changes in consumer lifestyles, and increased competition among producer cooperatives, traders, and newly formed food and agricultural commodity business companies, which are now becoming involved in procurement and distribution channel management (Eisenhardt, 1989; Cooper et al., 1997; Thompson, 2001; Woods, 2004). Globalization, as evident through the establishment of several retail networks with specialized horticultural produce departments in different regions of India, has resulted in the requirement for efficient and smooth backward linkages with upstream suppliers. This greatly improves the timely delivery of farm products that meet the requirements of downstream customers. Factors responsible for the development of supply chains from farm gate to retail include the following: (1) the availability of a greater variety of food grains, oilseeds, and horticultural products; (2) improvements in product quality, both in the fresh and processed forms; (3) the availability of improved rail, road, and air networks; (4) the ability to transport products in a more cost-effective manner; (5) overcoming the seasonality of supply by linking geographic regions that have different agro-climatic conditions and seasons; (6) the development of cold chains; (7) giving greater freedom for consumers to choose fresh, frozen, or processed products; and (8) providing

innovations in packaging that offer consumers more convenience (van Roekel et al., 2002a; Hanf and Pall, 2009). In addition, consumers' awareness of food safety and the health and nutritional aspects of food products have greatly increased (Hanf and Pall, 2009). These supply chains (SC) extend across regions within the country, and in some cases, they go across borders and are connected to supply chains in other continents as well.

Owing to the interplay of several new variables, as outlined above, there has been a significant reorientation of SC strategies from earlier supplier-driven distribution chains to consumer-driven SCs. Traditional agricultural and food businesses that focus only on price have been unable to meet the shift in consumer demands and preferences. In these traditional marketing systems, each member of the chain acts as an individual who is responsible for only a small part of the process; and the subsequent transport, processing, and retailing of the product is left to other SC actors who also work independent of other channel members (Simchi-Levi et al., 2005). SCM concepts have provided a means to manage change by incorporating processes operating either in-house via a group company or outsourcing to efficiently respond to consumer needs (Thompson, 2001; Woods, 2004). These changes, which require integration and effort from all SC members, have resulted in the consolidation of cooperatives and organizations operating at the farm, processor, and retail levels (FAO, 2006). Their activities range from organizing production to managing channel costs through economies of scale, gaining market share, and enhancing competitive strength to survive global competition (Thompson, 2001; Trienekens et al., 2003).

In the last two decades, deregulation has opened many agribusiness markets around the world (Thompson, 2001; Woods, 2004; Hanf and Pall, 2009). This has created avenues to reengineer business strategies and to create new SC relationships. As a field of study, SCM draws contributions from several disciplines, which includes operations management, logistics, materials management and inventory control, planning and scheduling, controlling manufacturing operations, industrial and retail marketing, economics, human resources, and financial management, backed by engineering processes in handling/storage and processing at successive stages of the SC (Simchi-Levi et al., 2005; Trienekens et al., 2003). A few well-known examples of successful SCM in agribusiness operating from the farm to retail level in the Indian domestic market include the National Dairy Development Board (NDDB) subsidiary Mother Dairy's Safal, Gujarat State Cooperative Milk Marketing Federation Ltd. (GCMMF) Amul, and the recently launched retail outlets of Subhiksha; the Himachal Pradesh State Horticultural Produce Cooperative Marketing Federation Ltd. (HPMC) retail centers for apple and other juices; Food World and the new retail stores of Reliance and many other retail chains, including Spencer's, that are operating at local and regional levels.

Supply Chain Management Concepts

SCM in agribusiness implies managing the relationships between the businesses responsible for the efficient production and supply of agricultural products from the farm gate to consumers with the broad objective of meeting consumers' requirements in terms of quantity, quality, and price (Jaffee, 1994; Lambert and Cooper, 2000; Handfield and Nichols, 1999; ITC Ltd., 2007). Meeting customers' requirements involves integrated management of the transactions and relationships between firms, as well as processes within firms (Thompson, 2001; Woods, 2004; Hanf and Pall, 2009). Managing these relationships provides an opportunity for negotiating the share of the value produced within the chain among chain members (Burt, 1997; Trienekens et al., 2003). Moreover, joint planning of collaborative strategies aims to improve the shared value (Eisenhardt, 1989; Woods, 2004). Traditional supply chains in developing countries typically involve many players and are tightly linked with long-standing social structures (Coleman, 1990; Burt, 1997). As developing countries enter into World Trade Organization (WTO) arrangements, their agricultural industries will be subjected to increased competition in their home markets, and at the same time, they will have better opportunities to meet global standards in export markets (Woods, 2004). SCM provides an integrated approach to plan the improvements required in the management of their agricultural production and marketing systems to meet future challenges (UNCTAD, 2004; Woods, 2004).

A supply chain comprises all activities resulting in the flow and transformation of goods and services from the raw material stage to the finished or processed stage for ultimate consumption by the final consumer (Russell and Taylor, 2004; Stevenson, 2006). Along with the flow of goods and services, the flow of information is an important attribute and requirement in the supply chain (Krajewski et al., 2007; Russell and Taylor, 2004; Simchi-Levi et al., 2005).

An SC is made up of raw material suppliers, including equipment and other associated services that are required for processing various inputs, and the distribution channels that finally conclude with the retail consumer (Thompson, 2001; Russell and Taylor, 2004; Krajewski et al., 2007). An SC is a sequence of business processes within interrelated organizations, inclusive of their facilities and activities, which are involved in producing and delivering a product or service to the final consumer (Krajewski et al., 2007). Facilities include warehouses, factories, processing centers, distribution centers, retail outlets, and offices (Stevenson, 2006). The activities of the various members (actors) within the SC include sales forecasting, purchasing, inventory management, information management, quality control, scheduling procurement and production, distribution, delivery, and customer service (Thompson, 2001; Hanf and Pall, 2009).

Typically, an SC consists of four basic processes: (1) acquiring customer orders, (2) purchasing raw materials and components from suppliers, (3) producing products, and (4) fulfilling or executing customer orders (Krajewski et al., 2007). In an SC, suppliers are often described as upstream supply chain members, and distributors, including warehouses, up to retail or supermarket level, are described as downstream supply chain members. At each stage of the SC, actors may be required to hold inventory to insulate them from uncertainties (Russell and Taylor, 2004).

Information is the key factor in managing and coordinating the SC at both ends in order to meet the prime objective of the chain: to meet customers' requirements (Lambert and Cooper, 2000; Porter, 2001; Chan, 2005). A local retail store or a supermarket that sources eggs, milk products, or vegetables directly from farmers is the most basic SC. On the other hand, supply chains of multinational food companies like Brooke Bond and Nestlé operate with a great number of linked suppliers and customers. Every customer in their SC is a supplier to the next in the chain until the final consumer purchases the product from a retail outlet. Interestingly, upstream chain members also have their pool of suppliers to produce or to assemble their inputs (Demeter and Gelei, 2005; Stevenson, 2006; Krajewski et al., 2007).

SCs are also referred to as value chains, which highlight the fact that value is added as goods and services pass through the chain (Woods, 2004; Stevenson, 2006; Krajewski et al., 2007). The value chain highlights the contribution each actor in the chain makes to the development of customer value. Each actor within the value chain has both a supply component and a demand component. The supply component begins at the origin of the chain and, for each actor, concludes with the internal processes within the firm. The demand component of the chain starts at the point where the firm's output is delivered to the next customer. The demand component encompasses the distribution and sales aspects of the value chain. The length of each component depends upon where each firm sits in the value chain. The closer the firm is to the final customer, the shorter its demand component and, conversely, the longer its supply component (Stevenson, 2006).

In addition to managing the flow of goods and services along the SC, a manager will try to achieve a level of synchronization in the SC that will make the chain more responsive to the needs of downstream customers while simultaneously lowering costs. Synchronization means coordination and cooperation and sharing information among SC actors (Russell and Taylor, 2004; Krajewski et al., 2007). Apart from sharing the same goals with suppliers, customers must be able to count on the quality and timeliness of product deliveries and services at attractive and competitive prices (van Roekel et al., 2002; Thompson, 2001). For example, a few top-class luxury hotel chains are managing their supply chains for food items, like broiler chicken and selected vegetables, by vertically integrating all stages along the SC from

producing and rearing basic raw materials to cultivation and harvesting of the produce for further processing, deep-freezing, storage, and distribution to their many hotel locations (Russell and Taylor, 2004).

The need and importance of SCM is increasing due to the following factors: (1) the implementation of lean production and total quality management (TQM) practices in organizations aimed at improving quality and reducing operational costs (Lambert and Cooper, 2000; Stevenson, 2006; Hanf and Pall, 2009); (2) increased levels of outsourcing including the coordination of supplies of products and services to sorting and grading, packaging, loading, unloading and transportation of raw materials and semifinished materials to final products to save time and costs (Williamson, 1985; Hanf and Pall, 2009); (3) competition is leading to the production and marketing of new products with shorter life cycles and increased customization, coupled with shorter lead times (Thompson, 2001; Hanf and Pall, 2009); (4) increased globalization, which has brought opportunities for many suppliers to widen their global market share or to support global brands by maintaining the supply of raw materials, shortening lead times, making use of currency differences in valuation of products, and meeting the needs of products that are desired by the prevailing cultures or societies in different countries (Hakansson and Snehota, 1995; Thompson, 2001; Woods, 2004); (5) the increasing importance of e-commerce (King, 2002; van der Vorst et al., 2002; Krajewski et al., 2007); (6) the need to manage and reduce transportation costs, either through bulk order movements that achieve reduced transportation rates or by procuring raw material ingredients in a concentrated form (Bowersox et al., 2008); (7) outsourcing third party logistics management activities (3-PL), which means giving responsibilities of warehousing and distribution to other companies that specialize in these areas (Russell and Taylor, 2004; Bowersox et al., 2008); and (8) the need to manage inventories, as they play a key role in the success or failure of the supply chain. While shortages can affect work processes and have far-reaching consequences, excess inventories add costs. Distorted information from one end of the SC can lead to an accumulation of inventory at each stage of the SC, resulting in an undesirable investment in raw materials, semifinished and finished products, transport costs, inappropriate production estimates, and high operational costs (Krajewski et al., 2007).

These distorted flows of information in the SC create a phenomenon called the bullwhip effect (Krajewski et al., 2007; Russell and Taylor, 2004). It occurs when slight to moderate uncertainty and variability for each actor is magnified by operational managers. In order to protect its own self-interest, each actor in the SC resorts to stockpiling excessive inventory to meet the need just in case “demand flares up.” Thus inventory stockpiles become progressively larger when viewed backward through the chain from the final customer to the origin of the SC (Simchi-Levi et al., 2005).

Successful SCM requires (1) mutual trust among SC members; (2) effective communication; (3) supply chain visibility to access data on inventory and shipping, delivery time, etc.; (4) the ability to detect and manage unplanned events related to delayed shipments and low inventories and to take corrective actions; (5) measuring performance metrics related to quality, delivery times, response times, inventory turnovers, etc. (King, 2002; Woods, 2004; Simchi-Levi et al., 2005; Industry Canada, 2006; Stevenson, 2006; Singh, 2007).

In order for the SC to become more competitive and more responsive, it requires active management initiated by one or more members of the SC (Singh, 2007). While all products reach consumers through an SC, not all chains have sufficient commitment and interaction to consistently improve efficiency, customer value, and competitiveness.

Given the diversity of consumer interests and their propensity to select products that meet their needs, factors like improved logistics, better information flows, reduced transaction costs, product quality maintenance, and the integrity of SC actors enhance the operational effectiveness of a chain (Thompson, 2001; Woods, 2004; Chan 2005; Christopher and Gattorna, 2005; Bowersox et al., 2008). Adopting these approaches is important in matching competitors and gaining access to markets. However, to remain competitive, the SC must aim to introduce innovations in product and service design that are hard for competitors to match.

Other SCM strategies should (1) work towards mutual dependence to such an extent that the costs of switching to a new supplier or customer are sufficiently high to inhibit the development of new relationships (Jaffee, 1994; Vieira, 2003; Chan 2005); (2) learn how to create value together and then collaborate to consistently utilize the new value as a source of competitive advantage (van der Vorst et al., 2002; Woods, 2004); (3) develop collaborative planning, forecasting, and replenishment (CPFR) that focuses on information sharing, planning, forecasting, and inventory management. CPFR begins with an agreement between major partners to develop a joint market plan outlining what products are to be sold and promoted and how within the given time frame, shipments are to be processed and inventory is to be managed (VICS, 2004; Bowersox et al., 2008; Hanf and Pall, 2009); and (4) use established relationships to develop a new range of products and venture into new segments or new markets (Vieira et al., 2003; VICS, 2004). Chain relationships are built on the relationships developed between managers of the partner organizations. Developing relationships requires significant effort, and the maintenance of these relationships requires an ongoing investment. As the investment in a relationship grows, so the cost grows to duplicate a similar relationship. Hence, the cost of leaving a relationship increases over time, leading to interdependency (Rindfleisch and Heide, 1997; Demeter and Gelei, 2005).

Perspectives for Chain Partners in Developing Countries

Globalization offers opportunities to producers and exporters in developing economies. One such opportunity is the year-round provision of fresh agricultural and horticultural produce. To meet new consumer demands, transnational companies, as well as retailers and importers, are expanding their international operations (Hanf and Pall, 2009). This means that the demand horizon has expanded and is no longer confined to the local or regional level. Fresh produce can now be shipped to many parts of the world at competitive prices (Little et al., 1994; van Roekel et al., 2002; Woods, 2004).

The availability of information from various global markets, coupled with information technologies (IT) and improved logistics, helps traders to respond quickly to the consumer demand and facilitate the flow of merchandise (Lambert and Cooper, 2000; van der Vorst et al., 2002; Russell and Taylor 2004; Schiefer, 2005; ITC Ltd., 2007). Concerns regarding food quality and safety, government-implemented trade regulations and tough retail standards have increased quality requirements throughout the world (van der Vorst et al., 2002; Trienekens et al., 2003). However, in the developing countries and emerging economies, companies face particular challenges in adapting to these changing requirements. Producers in the developing countries are capitalizing on opportunities by entering into partnerships with other businesses in global food chains. In some cases, local farmers have linked their production activities to the interests of transnational companies, thus achieving vertical integration in a cross-border supply chain (Jaffé, 1994; van Roekel et al., 2002b; Woods, 2004).

Cross-border supply chains are a unique channel by which new forms of production technologies, labor processes, and organizational relationships and networks are introduced into the host country (van Roekel et al., 2002; FAO, 2006; Trienekens and Willems, 2007). When PepsiCo reentered India in the 1980s, it formed backward linkages with tomato farmers in Punjab. Since its processing requirements were higher and the company wanted to keep the costs of procurement and operations low, it had to introduce new farm technologies to increase the yields by three to four times the average yields prevalent at that time (Goel, 2003; Singh, 2005; PepsiCo, 2007; USAID, 2009).

Fresh grape exports from the Indian states of Maharashtra and Andhra Pradesh by producer cooperatives that started in the 1990s, with financial assistance from the National Agricultural Bank for Rural Development (NABARD) and the Agricultural Processed Products Export Development Authority (APEDA), provide another example where importers from Western Europe, particularly England, helped introduce new production technologies based on consumer preferences in those countries (NABARD, 2001; APEDA, 2007; Trienekens and Willems, 2007; MSAMB, 2008).

With the increasing consolidation of agro-industrial markets worldwide, investments and business processes in local markets are projected to increase throughout the world (Lambert and Cooper, 2000; Thompson, 2001; Woods, 2004; van Roekel et al., 2002b). More efficient SCM will benefit not only the companies directly involved but also stimulate social and economic development within the host country. Cross-border SCM can stimulate the development of local agro-industry by generating employment, increasing local food production, undertaking value addition, introducing new technologies, reducing wastage, increasing export earnings, and introducing improved food safety and nutritional standards (van Roekel et al., 2002a).

To realize new opportunities for trade and income, chain partners in developing countries—producers, processors, and exporters—must adapt to the quality and safety standards of importers and retailers in the importing countries (Trienkens, et al., 2003; van Roekel et al., 2002a; Handfield and Nicholas, 1999). In order to adapt, they must first understand the market, plan their activities accordingly, and have the technology and management wherewithal to improve production systems (Lambert and Cooper, 2000). SC partners are increasingly being told to (1) minimize costs in order to meet increased worldwide competition; (2) optimize supply chain performance through the intelligent handling of inventories, product variety, and transport; and (3) reduce warehousing costs and the number of market intermediaries (van Roekel et al., 2002b; Bowersox et al., 2008; Hanf and Pall, 2009; ITC Ltd., 2007).

Extensive research has gone into the building and implementation of improved SC in recent years. Successful cross-border SC have been found to provide economic incentives for development (Cooper et al., 1997; Lazzarini et al., 2001; van Roekel et al., 2002a and 2002b ; Goel, 2003; FAO, 2006; Trienekens and Willems, 2007). However, the major concern of cross-border SC is the integration of small-scale producers into the chain and market-oriented production and delivery processes. The time taken adapting to global networks; realigning production patterns, varieties, seasons, and geographic areas; and integrating the processes to meet changing market situations are the key challenges that need to be understood (Little and Watts, 1994; van der Meer, 2000; Thompson, 2001; FAO, 2006).

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