

# Agricultural Supply Chain and Food Security

*by Aslim Sjah*

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## Agricultural Supply Chain and Food Security



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### Definitions

A supply chain consists of participants that produce and deliver products (including goods and services) from its earliest suppliers to its ultimate customers. In between the points of initial suppliers and final customers, there can exist several participants, including manufacturer, distributor, retailer, and others who are involved in production, delivery, and other activities related to production and delivery. In a simple way to describe, a supply chain shows the flow of products from its earliest process of production and follows through with its delivery to final customers. The product flow is accompanied with the flows of funds and information related to the products. Funds flow from customers to product producers through participants in between, with each participant along the flow receives a share of the funds. Information flows in any direction, from customers to suppliers, or vice versa, depending on the information contents. The main use of information in supply chains is to match production and delivery of

products to the request of customers. Customer satisfaction results in higher willingness of the customers to pay for the products, and at the end producers and subsequent participants in the supply chain gain more profits. Since the flow of product value in the reverse direction of the product flow and with each point within supply chains attempts to increase the product values, then supply chains are transformed into value chains. Supply chain management is a system that integrates planning, organizing, implementation, and controlling of all stages of supply chains, by making use of flowing and visible information, for efficient and effective operation of each participant and the whole supply chains. Efficient and effective supply chains generate high profits for all participants, and then those profits can be directly or indirectly utilized for several purposes, including reducing hunger, achieving food security, and improving nutrition for the people.

### Introduction

Although agricultural development has historically aimed to increase production to feed the growing population (Helmas 2004), the focus has shifted recently toward increasing the income of both the growers and then the society as a whole. This shift marks the transition from <sup>3</sup>bsistent agriculture to commercial agriculture. Currently, commercial agriculture is dominated by agribusiness principles, which strive for larger

3 positive impact by developing linkages forward and backward (Davis and Goldberg 1957), and this development has led to an increased focus on agricultural supply chains (Boehlje 1999; Cook and Chaddad 2000). As the focus shifts, supply chains receive more attention due to their efficiency and high return on investment. Also, agricultural supply chains integrate many participants (e.g., producers, growers, manufacturers, traders, and consumers) who each receive benefits, resulting in higher total gains for multiple parts of the community (Boehlje 1999; Cook and Chaddad 2000; Lazzarini 4 al. 2001).

This chapter discusses how agricultural supply chains can play several societal roles, such as reducing hunger, promoting food security, and improving nutrition. First, the chapter describes how supply chains create value. Then, it explains how supply chains are managed and discusses agricultural supply chains. Finally, the chapter presents the diverse roles in society that agricultural supply chains can play.

### Supply Chains and Value Chains

A supply chain is designed to produce and deliver products in a manner that minimizes cost and maximizes efficiency. Supply chains are comprised of several points at which products (including goods and 26 vices) are produced and then delivered from a point of origin to a point of consumption. The simplest supply chains connect several 3 participants, starting with the source supplier at the earliest stage of production and then continuing 5 to the manufacturer, distributor, retailer, and finally the customer (Crandall et al. 2010; Pujawan and Mahendrawathi 2010). These 16 participants are involved from the earliest process to the ultimate customers, i.e., starting from the suppliers of the suppliers to the customers of customers (Christopher 1992; Feller et al. 2006). An example of a supplier of supplier is the supplier of corn seeds to corn growers, who in turn become corn suppliers. Similarly, the customer of customer can be popcorn customers, who buy popcorn from popcorn producers, and these popcorn producers are the customers of corn

producers or corn traders. Between these two points of the chains, there are many more participants to complete the chains. Several points of chains can have their own chain with additional participants to that chain point, and they form a “sub-chain.” The whole main chains and their sub-chains form “ultimate supply chains,” as described, for example, by Vorst et al. (2007). Depending on the length and complexity, a supply chain can be classified as being one of three types: direct, extended, or ultimate (Mentzer et al. 2001). Direct supply chains are the simplest, involving only a company and a customer for the flow of products, funds, and information. Extended supply chains include all the participants of a direct supply chain, in addition to suppliers of suppliers and customers of immediate customers. Ultimate supply chains involve all of these participants, plus additional participants between points of the chain in the flow of products, funds, and information. 7 These additional participants may include financial providers, third-party logistics suppliers, and market research firms (Mentzer et al. 2001). Financial providers can connect to any participant in the supply chains, such as to producers, suppliers, manufactures, traders, and even customers. Third-party logistics suppliers may enter the chains to handle works in delivering products of producers or traders. Market research firms may help several companies in the supply chains for providing related market information and therefore make connections to, for example, crop producers and product manufacturers. Thus, ultimate supply chains do not only involve producers and suppliers; they can also include transporters, warehouses, retailers, and customers. The extended list of participants 13 enables ultimate supply chains to engage in new product development, marketing, operations, distribution, financial 30 and customer service (Vorst et al. 2007). At the end of a supply chain, customers who receive and consume the products feel satisfied only if the products meet the customers’ requirements or specifications. If the supply chain can achieve a satisfactory product, then customers will be willing to pay a high price for it. Thus, participants in the supply chain can increase the value of their products by ensuring the supply chain produces

and delivers products to a standard for which customers are willing to pay. In this sense, supply chains become value chains. As products flow down the supply chain from suppliers to customers, the value (i.e., the money that customers will pay) flows up the chain from customers to suppliers, branching to all participants in the production and delivery process (Crandall et al. 2010; Feller et al. 2006; Mentzer et al. 2001).

Unlike the unidirectional flow of products and value, information flows both up and down the supply chain between suppliers and customers, carrying different content in either direction. Up the chain, information about customer requirements flows from customers to suppliers. Suppliers and subsequent participants (in between suppliers and customers) respond to this information by adjusting production to provide “satisfactory” products, according to customer requests. Suppliers and subsequent participants here have slightly different tasks in providing products to customers. Suppliers produce the requested products in the aspects related to product contents, such as product quality, materials of the products, appearance of the products, and so forth. Subsequent participants like traders and transporters provide and deliver the products as requested by customers in terms of, for example, amount and timing of products to be available for customers. In the opposite direction, information on product requirements (or more accurately product specifications) flows from suppliers to customers. This information on product specifications are provided to customers for customers to review (to check) and then respond to products by indicating their interest in terms of customer reception to the products. Producers may have attempted to respond to customers’ specifications in producing the products, yet customers may have not been satisfied with the products, with a consequence that some products or some portions of the products may not be bought or paid for by the customers.

In summary, suppliers produce and supply their products according to customer requests. As a result, customer requirements become the product requirements. This alignment of customer requests with product specification is one the

purposes of supply chains and value chains (Crandall et al. 2010; Pujawan and Mahendrawathi 2010). The shared information among the participants of the supply chain is ultimately used to make decisions in supply chain management (Cooper and Ellram 1993; Crandall et al. 2010; Vorst et al. 2007). As producers produce and customers request the same products, then no products are wasted or left unconsumed. Similarly, producers save costs in not producing unnecessary products, and other participants save costs in not transporting or delivering “incorrect” products.

### How Value Is Created in Supply Chains

As previously described, value in supply chains originates from a customer’s willingness to spend money in return for receiving satisfying products. Thus, product values depend on customers’ conditions and preferences at the time (Womack and Jones 2003), as customers will place higher value on products if they are in conditions of need. In a critical condition like life is threatened, products are valuable whatever their quality and specification are. Obviously, product quality is not the main consideration for the customers, rather it is availability that is more important at that time.

Although not all conditions are critical to customers and the customers have no option except to accept the available choice, yet a lesson can be learnt from this situation. That is, needs can exist due to certain conditions but also can be created and then be made aware to customers (and would-be customers) (Aaker 2001; Aaker and Moorman 2017). Therefore, the main goal of suppliers is to determine what products customers need. Products that are highly needed will be valued higher than less needed, indicated by a higher price for the product. Finding products that customers need and value is called in economics literature as handling the issue of “what” to produce (Cramer et al. 2001; Seitz et al. 2002; Sjah 2010).

Furthermore, perception on product value can be increased by informing the product, its usefulness, and its advantage, to current and would-be consumers. Thus, there are two ways to increase

value of a product: one is from the product itself (internal) and the other from the product perception (external). The main internal value of products sources from product quality (McIver 2001; Seitz et al. 2002; Tregarthen 1996) and its safety for use or consumption (Koufteros and Lu 2017; Siddiqui et al. 2014). Following the identified products, the promoting activity should be taken seriously to increase product acceptance and purchase by consumers (Dunne 1999; Kohls and Uhl 1990; Smith 2002).

Value is indicated as total revenue generated by the company providing the products. However, the concept of “value” in supply chains has recently been expanded to cover not only economic value but also environmental and social value. The inclusion of environment aspect in product value means that products are valued at a higher level when their production and delivery methods are designed to protect the environment, such as soil, water, and air. Similarly, in social aspect, products that are processed and delivered with regard for human rights, such as those produced and delivered without child labor and with workers’ right protection, are valued more highly (Vorst et al. 2007).

### Supply Chain Management

Supply chain management refers to the implementation of systems to plan, organize, actuate, and control all stages of the supply chain, all in an effort to maximize operation efficiency and effectiveness (Crandall et al. 2010; Pujawan and Mahendrawathi 2010; Vorst et al. 2007). Increased efficiency results in reduced operation costs, whereas increased effectiveness results in greater customer satisfaction and therefore adds value to the product. Combined, a reduced operation costs and increased value will maximize profit and give suppliers a competitive advantage. To achieve this, participants in the supply chain make decisions regarding both internal operations and in relation to other participants of the chain, in pursuit of total supply chain profits that will proportionally benefit all participants.

CSCMP (2013) defines supply chain management as the implementation of planning and the management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. As the management involves all activities and related participants, then it is important to do coordination and collaboration between channel partners, such as suppliers, intermediaries, third-party service providers, and customers. Supply chain management eventually becomes the integration of supply and demand management within and across participating companies. Lack or less participation of a participant in a supply chain causes collaboration and integration will not happen, with further consequence of not achieving operational efficiency and effectiveness. Vorst et al. (2007) add another point to the importance of the integration of management activities and related participants in supply chains on meeting product requirements as requested by consumers. To put it in the simplest way: it is impossible for suppliers to provide and deliver “right” products to consumers without “accurate” information on products requirements as requested by consumers.

To maximize the total profit of the supply chain, supply chain management implements different approaches compared to traditional management. In traditional management, individual firms do not collaborate, so they take their own risks and profit. However, supply chain management integrates all participating firms, causing them to share the risks and profits of the supply chain (Cooper and Ellram 1993).

Today, collaboration and integration are increasingly required to deal with increasing complexity in business and related influencing forces. There are many factors which influence a business, but they all can be grouped into three main factors: technology (such as in production and information), people (such as people’s culture and norm), and globalization (such as political force). Collaboration among participants in supply chains allows individual organizations to secure supplies (e.g., by contracting future quantity and price of the supplies with a supplying company), integrate complementary skills and assets, share costs and risks, increase bargaining

power, and scale up operation (Crandall et al. 2010; KPMG 2013). Collaboration also enables greater visibility along the supply chain, which can provide key information for supply chain management. Visibility is meant to access from related participants in the supply chain on information related to and needed to adjust products and its delivery to intended points in the supply chain. Another advantage of collaboration is greater control over influencing factors. Information visibility together with greater control over influencing factors enables participants in the supply chain to reduce production costs, both for the participants and the chain. An example is an input for a production can be made available through an agreement between the two parties, such that production is not disturbed or delayed by insufficient or lack of input supply. As input supply is guaranteed, then the producer does not need to store the input more than the amount needed for the time, and thus the producer can save storage cost, one of the production costs. Similarly, the supplier of the input also saves its cost by, for example, eliminating unnecessary input stocks. Finally, collaboration can give access to new skills and resources, which is useful for creating innovation. Collaboration including using skills and resources by one participant within a supply chain will in turn reduce costs of individual participants in the supply chain (Crandall et al. 2010; KPMG 2013).

### Agricultural Supply Chains

Agricultural supply chains are supply chains for the flow of agricultural products (along with flow of funds and information related to the products). It needs to be recognized that agricultural products are transformed from one form to another during their delivery to customers via production and/or manufacturing processes. Therefore, agricultural supply chains can consist of several different activities, starting with supplying inputs to farms, processing the inputs (i.e., farming the crops), and subsequent processes until final products are ready for consumption (Aramyan et al. 2006). As with other product supply chains,

agricultural supply chains can be extended to include more collaborating participants (companies) to increase operational efficiency and effectiveness (Crandall et al. 2010; Mentzer et al. 2001). The participants in agricultural supply chains can have exchangeable roles, following the transformation of one product to another. For instance, a consumer of beef becomes a supplier of beef burgers in the United States, and there are more such examples in other regions.

Various authors use different terms to refer to “agricultural supply chains.” Some authors use the term “agri-food” or “agribusiness” in place of “agricultural” and use the word “value” in place of “supply.” Therefore, various terms can be used to describe these supply chains, such as agri-food supply chains (European Network for Rural Development 2019; Ganeshkumar et al. 2017), agribusiness supply chains, agricultural value chains, agri-food value chains (Stone and Rahimifard 2018), or agribusiness value chains (KPMG 2013).

Depending on the perishability of the agricultural product, agricultural supply chains are grouped into two types: fresh agricultural products and processed food products. Fresh products (e.g., fresh vegetables, flowers, and fruits) have a short shelf life, whereas processed products (e.g., snacks, canned food products, juices, and deserts) have a relatively longer shelf life. In either case, it is crucial to deliver products to consumers before they spoil or get rejected by the customer, thus losing their value. Fresh product supply chains may include participants such as suppliers of inputs and services, farmers, auctioneers, wholesalers, importers and exporters, retailers, and specialty shops. The main processes include fresh product handling, conditioned storing, packaging, transportation, and trading. Given the short shelf life of fresh products, supply chain management must especially ensure that products are delivered on time to consumers (European Network for Rural Development 2019; Vorst et al. 2007).

In contrast, activities in processed food supply chains include conserving and conditioning the products during their extended shelf life. Although processed products do not perish as quickly as fresh products, they may still lose

quality with time; thus the activities carried out by all participants in all stages of the supply chain must be tightly regulated to ensure timely delivery. Improper handling on any one of the stages will cause loss of quality, which decreases value. Even worse, the spent costs (for food processing and other activities related to this processing) will not be recovered (European Network for Rural Development 2019; Vorst et al. 2007). The loss of quality and value of processed foods, instead of increasing quality and value of the foods, as a consequence of improper handling shows the importance of supply chain management.

In both types of agricultural supply chains, information plays crucial role and must therefore be available to all participants when planning their activities. Information is not only on customer requirements on the requested products but also on specific characteristics of the agricultural products, such as its nutrition contents, perishability, and the sorts. One of the tasks on supply chain management is to ensure information is available as needed or visible by participants in the supply chains. All participants in the agricultural supply chains must share information with each other to align their capacity, conduct other related activities, and coordinate the timing of supply for processing, delivery, and consumption (Cooper and Ellram 1993; Vorst et al. 2007). In agricultural supply chains, as in other types of supply chains, each participant conducts its own activities, and these activities are related to other activities. For instance, in addition to processing foods, a supplier who processes foods needs to do other activities like ordering the input supplies, recruiting workers, promoting its products, delivering the products, and communicating with other participants.

### **Roles of Supply Chains**

The benefit of supply chain participation is twofold: it allows companies to streamline their operations and to increase the value of their products. First, supply chains and value chains aim to optimize operation of all companies involved. Each participating company reduces its operational cost

and increases its effectiveness (i.e., it increases delivery and produces high-quality products that are more likely to satisfy customers). Since information is accessible as needed, each participating company reduces its operational costs by utilizing the information to match up their activities and therefore does not carry out unnecessary activities. As information on market demand has already been available for certain products, a supplier can save its market survey, and this means the company reduces its operational cost. Similarly, a supplier produces and delivers products accurately in terms of, for example, quality, quantity, time, price, and place, and thus the supplier's work is efficient and effective. Combined, reduced costs and increased delivery leads to increased profits for each participating company. Second, on the consumer side, supply chains allow companies to supply and deliver products on a level that satisfies customers. This satisfaction of customers is necessary, as it causes customers to willingly sacrifice more of their money for the products they receive, causing companies to receive higher revenues. The increased profits on both production and consumer sides can then be used for many other purposes, such as improving the condition of the company (such as improving the company's return on investment, increasing salary for the company workers, and the sorts) or funding activities that further the company's social responsibility (CSR), i.e., its beneficial presence for the community. For information, currently, companies are given responsibility to provide some amount of funds for the benefits of communities living around the companies or receiving impact from the operation of the companies.

The roles of supply chains include gaining higher profit, benefiting community, helping reduce hunger, helping achieve food security, and helping improve nutrition. Each of these roles is discussed below.

### **Supply Chains Can Benefit the Greater Community**

When involved in a supply chain, companies gain higher profits. The higher profits are generated from two sources: reduced operational costs and



increased value of products. On one side, reduced operational costs are caused by increased operational efficiency and effectiveness of each company participating in a supply chain. On the other side, the value of products is increased as the customers are willing to pay higher for the products, due to the rightness or suitability of the products to customers' request (Kalidas et al. 2014).

Since companies receive higher profits for their involvement in a supply chain, the companies can use the profits for several purposes. One of the companies' responsibilities nowadays is to provide some amount of funds for the community living around the companies or receiving impact from the companies' operation. This responsibility is called corporate social responsibility (CSR). Basically, CSR funds are companies' donations to community groups, not individuals. The amount of CSR funds is proportional to the companies' profits; the higher the profits, the more CSR funds must be provided. The community can then spend these funds for several uses, either for certain groups in need or for the community as a whole. In addition to that benefit received by the community, Kalidas et al. (2014) point other forms of benefits like better control of product safety and quality, high customer satisfaction, and on-time arrival of products for the customers.

### Supply Chains Can Help Reduce Hunger

Supply chains can help reduce hunger at least in three ways. Firstly is, as mentioned in the previous point, that companies participating in a supply chain gain higher profits, some of which is in turn spent proportionally for the provision of corporate social responsibility (CSR) funds. Community can use these funds for providing foods in the community; hence it helps reduce hunger for the community. Secondly, supply chains produce and deliver products to customers. This implies that supply chains can provide jobs (and also incomes) for workers working in the companies (the participants within supply chains). Workers then can use their incomes to meet their needs, such as buying foods. Therefore, supply chains can help reduce hunger, at least for these workers and their families. Finally, efficiency,

effectiveness, and specifications of supply and delivery of products (including foods) in supply chains lead to reduced food waste, since supply chains produce and deliver products in accordance with demand from customers. The reduced food waste can be used or more accurately be allocated for consumption by other community groups; therefore it helps reduce hunger for those community groups.

Reduced hunger is in line with increased food security. Increased food security means increased availability, access, and consumption of food (Aneesh 2017; FAO 2008; Ramasamy and Hiepe 2009). How hunger can be reduced through the implementation of supply chains is explained in the next section.

### Supply Chains Can Help Achieve Food Security

Before going to the role of supply chains in food security, it needs to briefly describe what food security is, in order to understand food security parts in which supply chains can help. Food security is a condition of sufficient food availability, access, and utilization or consumption (Aneesh 2017; FAO 2008; Ramasamy and Hiepe 2009). Food availability sources from food production (Swaminathan and Bhavani 2013). Sufficient food production is a prerequisite of food availability. Clearly, food will not be available without food production. Food availability in simple way is to provide food sufficiently to meet people's food needs in the area where they live, such as in a village or a state. However, sufficient food availability means nothing for the people, until the foods are accessible and consumable by them. In the aspect of food security access, people have to have access and consume the foods. Food is accessible by people who have sufficient income to buy the foods, and the foods can be reached physically (e.g. foods are sold in nearby local market places). In the final aspect must be accomplished by utilization or consumption by the people and families. People are still in the situation of food insecurity, although food is available and accessible to them.

Supply chains can help achieve food security in most parts. The third pillar of food security,

food consumption, depends more on the people's decision on consuming the food or not, and their decisions are influenced by their perception on the food need, regardless of food availability and access. Here, not much supply chains can do about. However, agricultural supply chains can help in the first pillar (i.e., food availability) and in the second pillar (i.e., food access) of food security. Food can be made available by producing foods, and this can be made available more by complementing the food production with avoiding food losses, not wasting the already produced foods, and avoiding production of unwanted food. Supply chains here can help in increasing food availability (supply) in several ways, including producing food with efficient and effective technology (such as the technologies of seed culture, irrigation, crop maintenance, and crop harvesting), providing the technologies of harvest and post-harvest handling that avoid food losses, and providing information on right products and specifications therefore avoiding food waste. Access to food is assisted directly by supply chains by increasing people's income to be able to buy the food and indirectly by creating physical access to food places where people can reach them. Increased income for people is possible as supply chains create jobs and income for their chain participants and their workers. It is the income that people can use to access food, i.e., to buy the food. Furthermore, participants (companies) in the supply chains can provide donation to community (called CSR fund), partly allocated from companies' operational profits, and this companies' provision can increase community access to food directly when the fund is directly channeled to individual, or indirectly when the fund is channeled to community as to provide facilities (infrastructure) to access food.

There are some reports on past and current practices that indicate food availability or supply could be realized more by reducing food loss and avoiding food waste. There was about one-third (1.3 billion tons) of total food production lost or wasted in most parts of the world, both in developed and developing countries. Food loss and waste differ by regions, commodity types, and stages of the supply chains. The food loss or

waste occurs in the supply chain, from initial agricultural production through to final consumption, especially during production and delivery of the food (Gustavsson et al. 2011). Recent report by FAO (2019) shows that food loss and waste have not much been reduced. Food loss (excluding food waste) is reported as much as around 14% of food loss occurs particularly during post-harvest, excluding the stage of food retailing and consumption. Therefore, lots of actions need to be taken to avoid food loss and waste. One of the report highlights is the importance of implementing agricultural supply chain management in an integrated way, commencing with obtaining sufficient and right information on where food loss and waste occur in the supply chains and across the regions (FAO 2019).

Implementing supply chains, which operate at a high efficiency and effectiveness, will reduce or avoid food waste, partly or totally, depending on how efficient and effective the operation of a supply chain. This reduced or avoided food waste is allocated as food supply, as a component of food security. These foods can then be supplied to people around the world. Hence, supply chains can help to a certain degree in achieving food security.

### Supply Chains Can Help Improve Provisions of Nutrition

The jobs and incomes created by supply chains can enable more people to buy foods with high nutrition. Furthermore, due in part to increased education campaigns promoting healthy foods, current customers value nutritious foods more than ever before. As the supply chain mechanism is designed to respond to customer needs, implementing supply chains may cause more nutritious foods to be available in the markets. This shows another role that supply chains can help improve nutrition for the people, who spend their income (that could be sourced from supply chains, too) for buying nutritious foods and through consumers' increased awareness for nutritious foods requested in a supply chain.

In addition, supply chains are managed to reduce or avoid food loss and food waste (FAO 2019; Gustavsson et al. 2011). This also means that supply chains reduce the loss of nutrition contained

in the food loss and waste, or put in opposite way, supply chains help improve nutrition for people who consume sufficient and right foods.

## Conclusions

The shift focus of agricultural development from increasing production to increase income for growers and other related participants brings supply chain concept to the front. Supply chains involve several participants who take different roles in the supply and delivery of products (including goods and services) to consumers. Products must be delivered as specified by consumers, so that consumers value and will be willing to pay for the products. As such, the supply of products is transformed into value by consumers, meaning that supply chains become value chains. To maximize revenue and profits for all participants, management must be applied in the supply chains, called as supply chain management. Supply chain management is needed to solve mainly the problem of unmatched products supplied and delivered from the point of suppliers with the requests from the point of customers. The mismatch between the supplies and demand is mainly caused by insufficient information flows the needed participants in the supply chains. Supply chain management attempts to utilize related information for the basis in planning and further management activities, and therefore related information should be visible to all participants in the supply chains. All participants in supply chains must collaborate and integrate their activities for gaining higher profits for all.

Supply chains for agricultural products are called agricultural supply chains, agri-food supply chains, agribusiness value chains, or other combinations of “agriculture” and “supply”/“value.” Generally, there are two types of agricultural supply chains: fresh agricultural products and processed agricultural products. For fresh agricultural product supply chains, fresh products are handled in stages of conditioned storing, packaging, transportation, and finally trading. Management of fresh product supply chains must ensure the timely delivery of products to

consumers, before products lose their freshness. In contrast, processed food product supply chains involve products that are conserved and conditioned for an extended shelf life, by avoiding or reducing microorganisms to destroy the foods. To ensure quality is maintained, agriculture supply chains require product processing and delivery are tightly regulated. For both fresh and processed product supply chains, improper handling during at any stage causes loss of product quality and then its value. Thus, it is crucial that participant activities in the supply chain are coordinated and regulated during product processing and delivery. All participants must communicate with each other in order to align their capacities, conduct other related activities, and coordinate the timing of product processing, delivery, and consumption. If participants can successfully collaborate, they will benefit from reduced operation costs and increased product value, ultimately increasing both individual profit and total profit of the supply chain. With this increased profit, supply chains can assume an increased role in society; for example, supply chain participants can help increase food availability, reduce hunger, and improve nutrition.

## 5 Cross-References

- ▶ [Achieving Food and Nutrition Security: The Role of Agroecology](#)
- ▶ [Addressing Food Security Issues: Understanding and Anticipating the Future](#)
- ▶ [Agribusiness](#)
- ▶ [Agricultural Extension Systems Toward SDGs 2030: Zero Hunger](#)
- ▶ [Agricultural Productivity: Supporting the United Nation's Sustainable Development Goals](#)
- ▶ [Agricultural Value Chain for Food Security: Challenges and Opportunities from SDG2](#)
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- ▶ [Value Addition of Agricultural Production to Meet the Sustainable Development Goals](#)

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