Agri-food supply chains

Supply Chain is a sequence of (decision making and execution) processes and (material, information and money) flows that aim to meet final customer requirements, that take place within and between different stages along a continuum, from production to final consumption.1 The Supply Chain not only includes the producer and its suppliers, but also, depending on the logistic flows, transporters, warehouses, retailers, and consumers themselves. In a broader sense, supply chains include also new product development, marketing, operations, distribution, finance, and customer service.

FIGURE 1: Schematic diagram of a Supply Chain (shaded) within the total Supply Chain network

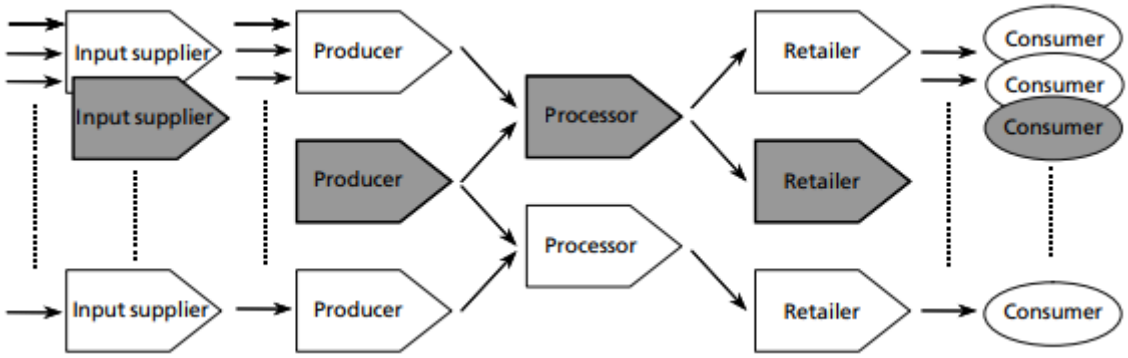
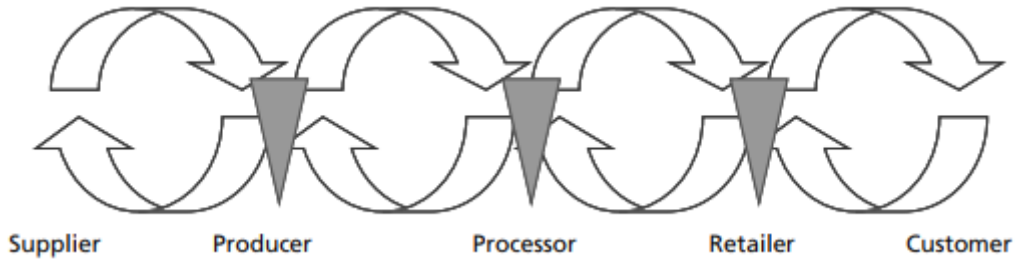


FIGURE 1 depicts a generic supply chain. It is shown within the context of what is usually referred to as a 'total Supply Chain network'. In such a network, each firm belongs to at least one SC; i.e. it usually has multiple suppliers and customers. A milk producer, for instance, obtains inputs such as feeds and veterinary medicines from a number of different suppliers. He or she delivers milk to one or more processors, who in turn, distribute the processed products through one or more retail outlets.

One traditional view of a Supply Chain is the so-called 'cycle view'. In this view, the processes in a Supply Chain are divided into a series of cycles, each performed at the interface between two successive stages (FIGURE 2). Each cycle is decoupled from other cycles via an inventory, so it can function independently, optimize its own processes and is not hindered by 'problems' in other cycles. As an example, we may think of a cycle where retailer inventories are replenished by delivering products from a processor's end-product inventory. Another cycle takes care of replenishing the processor's inventory, by the production of new end-products. A cycle view of the Supply Chain clearly defines the processes involved and the owners of each process and their roles and their responsibilities. Although this might seem a satisfactory situation, the next section will discuss some negative effects from a Supply Chain perspective.

FIGURE 2: The traditional view of supply chain processes: cycles (the triangles represent inventories of products)



REAL CASE STUDY: The supply chain for beans in Central America

Common beans (Phaseolus vulgaris) are an important ingredient in the daily diet of many people in Central America. The three largest producers of beans in Central America are, in descending order, Nicaragua, Guatemala and Honduras. Most farmers cultivate beans together with maize on the same plot as an intercrop or in pure stand. Yearly supply data per capita show that consumption is highest in Nicaragua (27 kg/capita/year), followed at some distance by El Salvador and Costa Rica (10-15 kg/capita/ year). In Costa Rica, average daily consumption amounted to 31 g per person in 1996 (Rodríguez and Fernández, 2004). However, daily consumption of 28 g per person in urban areas was strikingly lower than that of 43 g per person in rural areas. Moreover, some decline over time is apparent, as the average daily consumption in 1966 was 57 g per person. The decreasing bean consumption in general and in urban areas in particular, is considered to be undesirable from a nutritional point of view. It is attributed to the fact that more women are integrated in the work force and therefore can no longer prepare the beans, which is highly time-consuming.

Beans are often consumed in combination with a starch-rich food, usually with rice (e.g. as gallo pinto) or along with maize tortillas. Beans thus constitute an important source of supplementary plant protein in the daily food intake. Although beans are a highly acceptable commodity, utilization is prevented by several factors such as low and variable agricultural productivity, post-harvest losses, limited industrial processing for different food products and several nutritional deficiencies affecting consumers' choice. The Bean Improvement Programme of the Centro Internacional de Agricultura Tropical (CIAT) in Cali (Colombia) is an important international collaborative effort to enhance the utilization of beans in developing countries (see www.ciat.cgiar.org/beans).

There is considerable potential for increased bean supplies originating from small farms in Central America, but logistic limitations act as one of the major constraints. FAO recently published a report in which rural transport in developing countries is evaluated and strategies and guidelines are developed to increase marketing opportunities of small-scale farmers in these countries (Gebresenbet and Oodally, 2005). Major attention needs to be given to post-harvest management (especially moisture control) and wholesale storage and packaging infrastructure and services to reduce losses and improve product quality.

Beans are predominantly produced by smallholders. Beans are offered for sale on open markets and in supermarkets in various forms. They may be simply sorted and packed as whole beans, but they are also available in processed forms. These range from cooked whole beans to mashed beans (frijol molido), which are especially appreciated by consumers who are looking for convenience. Processing is done at local plants, and the required quality of the beans depends on the product to be made. New technologies in the field of food processing and packaging seem to offer opportunities for the development of new products that can serve the demands of urban consumers on the national and international markets.

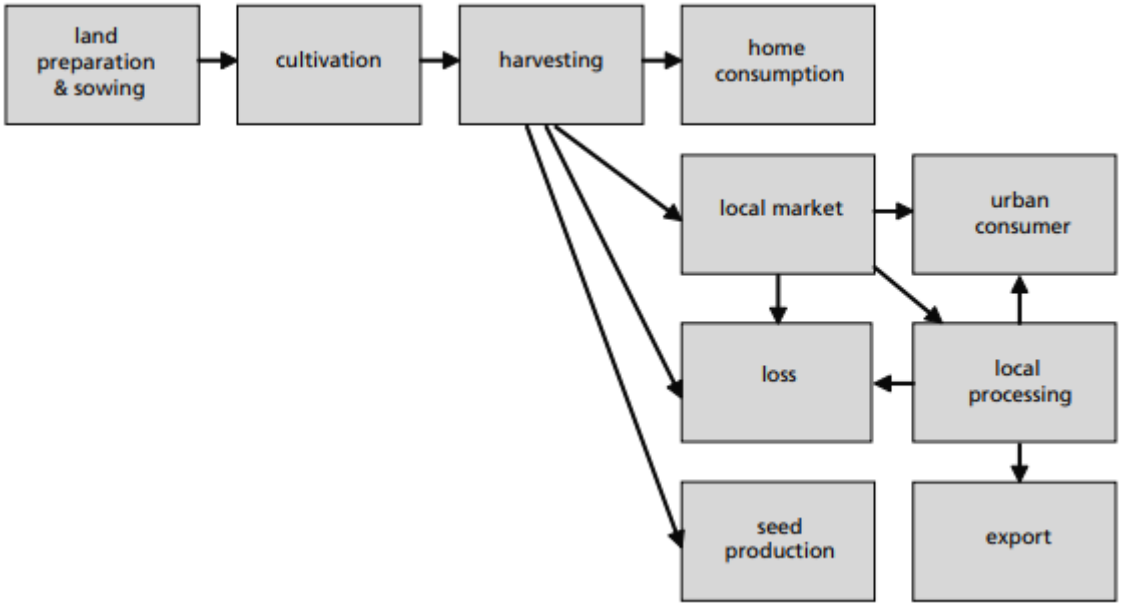
From the moment that the bean seeds are sown by the farmer until the time that they have been prepared for consumption, the produce passes many stages with different actors and different environmental circumstances (FIGURE 3). When the crop is still in the field, it may suffer from adverse environmental conditions, such as drought, and also from pests and diseases. After harvest, losses in quantity and in quality occur during storage and transportation. This is true for the home situation, but also for produce taken to the market and used for further processing. Adequate storage facilities and improved logistics could reduce these losses significantly and open new market segments for the smallholders. Regarding infrastructure, Immink and Alarcón (1992) - based on a study in Guatemala advocate to increase access to markets by planning rural roads in areas where smallholders are concentrated rather than where large production units are located. They also state that collection facilities need community-based organization to facilitate marketing and joint investments for quality upgrading.

There are several important bottlenecks for supply chain development for beans in Central America:

- Absence of uniform, vigorous seed for production and thus heterogeneity of the crop in the field and heterogeneity at harvest
- Processing problems, of which the time-consuming preparation of beans is regarded as one that seriously restricts consumption.

- The absence of dedicated supply chains from smallholder to market outlets that can reduce product losses and open new market segments for specific quality batches; this requires the improvement of logistic infrastructures and supply chain management practices.

FIGURE 3: Production and supply chains for beans in Central America



The supply chain research for beans in Central America perceives as its main aim to identify appropriate and effective alternatives for small-scale farmers and processors of beans in Central America that enable them to cope with the existing diversity in production systems and management regimes through improved matching of quality requirements for different market outlets. In this regard, an interesting option for these farmers and processors would be the establishment of producer organizations (POs). POs can support quality programs for their members thereby achieving more uniform quality of products. They can also improve market access and bargaining position of small holders. Moreover, POs can establish sustainable and trusted trade relationships with buyers in the chain.

Other supply chains case studies available at: http://www.fao.org/3/a-a1369e.pdf