



## Opportunities for Quality Improvement in Food Supply Chain

### KEYWORDS

Supply chain management, Food security, Product quality, traceability

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**ABSTRACT** Customers are nowadays more and more demanding not only on the product availability but also on the attributes like quality and safety of the food products. In dealing with the supply chain management, one has to consider the efficiency and responsiveness of the chain. The concept of supply chain management is about matching demand and supply. SCM is about the integrated planning, coordination, and control of all business processes and activities within and outside the organization in the supply chain network to deliver superior consumer value at less cost. This paper discuss about the different opportunities possible in the food industry to be implemented so that the agri- business could be more quality driven. The study addresses all activities to be followed by different supply chain players so that efficiency and responsiveness of the chain could be improved. Customers are nowadays more and more demanding not only on the product availability but also on the attributes like quality and safety of the food products. In dealing with the supply chain management, one has to consider the efficiency and responsiveness of the chain. The concept of supply chain management is about matching demand and supply. SCM is about the integrated planning, coordination, and control of all business processes and activities within and outside the organization in the supply chain network to deliver superior consumer value at less cost. This paper discuss about the different opportunities possible in the food industry to be implemented so that the agri- business could be more quality driven. The study addresses all activities to be followed by different supply chain players so that efficiency and responsiveness of the chain could be improved.

### 1. Introduction:

At the beginning of the twentieth century, there were less than 20 cities in the world with a population of one million or more. Around 75 per cent of these cities were in low and middle income countries (Cohen 2004). By 2008, more than half of the world's population lived in urban areas. This figure is expected to increase to 70 per cent by 2050. The Eleventh Five Year Plan of the Government of India finds that 'the contribution of the urban sector to India's GDP has increased from 29 per cent in 1950-51 to 47 per cent in 1980-81. The urban sector presently contributes about 62 per cent to 63 per cent of the GDP and this is expected to increase to 75 per cent by 2021.

Today, food supply chains are complex, global networks, creating pathways from farms to consumers, involving production, processing, distribution and even the disposal of food (see Boehlje (1999), van der Vorst (2000). Food supply chains are distinct from other product supply chains. The fundamental difference between food supply chains and other supply chains is the continuous and significant. Change in the quality of food products throughout the entire supply chain until the points of final consumption (see Sloof, Tijsskens, and Wilkinson (1996), van der Vorst (2000). Quality refers to delivering the product at right time at right quantity.

#### 1.1 Stages of supply chain management:

**Strategic Planning:** Strategic objectives define target markets, products, marketing mix plans and the role of logistics value added activities such as service level. It also include service availability, capacity and quality element.

**Demand Planning:** Demand planning requires historical data for creating data base using forecasting techniques, casual forecasting. One of the main issue in Food SCM is lack of visibility into downstream demand.

**Supply Planning:** Supply planning is characterized as a process that involves activities related to material flow and processing as well as the flow of information and material in both directions of the chain. The supply planning comprises safety stock planning, supply network planning, distribution planning, transportation planning and vehicle scheduling.

#### Operations:

Operation information reflects the activities necessary to

receive, process, ship and invoice customer orders. In this stage day to day operation of produce taken from farm gate till it reaches the end customer. It include order management, distribution operations, Transportation and shipping.

### 2. Methodology:

To study the existing model of supply chain we have selected kanyakumari district of Tamilnadu and have selected banana to study its present supply chain model. The selection of the study area and product is based on purposive sampling. From the selected sample frame different supply chain players (suppliers, farmers, retailers, wholesalers, intermediaries) were selected based on stratified random sampling. Observational study was conducted to the samples to analyse the traditional functioning of supply chain and the effect on food security. Based on the SCM model, we have made an attempt to understand the role of SCM in developing food security and traceability.

### 3. Result and Discussion:

#### 3.1 Traditional Supply Chain and Food accessibility issues:

In the traditional Mandi system, farmers make initial sales to brokers through commission agents. The produce then goes through the hands of several vertical layers of brokers and, finally, to buyers. Unfortunately, the system is non transparent, often exploitative of farmers, and leads to excessive wastage and value loss due to over handling and inadequate storage and transport conditions.

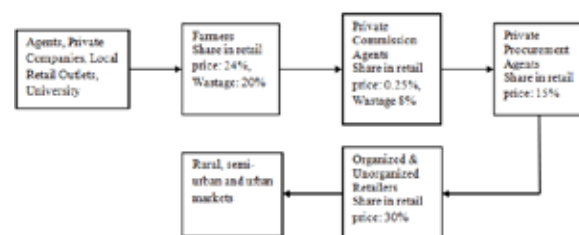


Fig.1 Traditional Supply Chain model with wastage

#### 2.2 Improved Supply Chain Model for perishable produce:

##### 3.2.1 Direct farmer to buyer procurement model:

Under this model, the actors enter into non-binding agreements and organize a group of farmers to supply the needs

of the buyer. The procurement is based on partnership arrangements between the farmers and buyers and does not generally constitute contract farming under a strict definition of the term.

### 3.2.2 Farmer-Intermediary-Buyer model:

Under this model, a commercial intermediary establishes a partnership with organized groups of farmers, and acts as the link between the farmers and the buyers. The technical assistance and extension services are offered by the intermediary, and the buyer interactions stop with the intermediary.



Fig. 2 Improved model of Supply Chain management

### 3.3 Opportunities provided by the improved supply chain model:

**Demand based production:** The improved food supply chain model could give ample opportunity to convert farmers from supply based production to demand based production. This is only possible after getting a clear database of both demand and supply. This helps to plan for the farmers before they plant and improve it helps to boost their profits.

#### Understanding Customer preference and product acceptance limit:

SCM gives information to the farmers about the changing preference of customers through the technology. ERP collects information from all chain partners and would be accessible to all chain partners. ERP technique uses past data to predict the demand in an area.

**First ripening first out (FRFO):** This is the inventory model to be followed by the agent to clear the perishable stocks. Based on the time for a product to ripe the stock would be cleared.

**Prediction of product quality and adaptable logistics:** The farmers could predict the quality of their produce even before the harvest and base on the quality of produce different distribution channel should be followed. To improve efficiency in the chain different grades of material should be shipped with different ways of packaging.

**Fleet Position Tracking:** Connected Farm enables visibility into real-time fleet positions so managers can make intelligent decisions to optimize operator performance. Knowing the location of each vehicle can improve fuel usage, reduce application mistakes, and prevent theft.

**Fleet Productivity:** Connected Farm captures productivity information which includes time spent idling, moving, and travelling. Productivity and delay reasons can then be viewed online so that better decisions can be made about fleet management.

**Open-Source Intermediation –** Another variant of farm-firm linkage is open-source intermediation, involving provision of information about market prices, crop, and good cultivation practices to farmers without any buy back guarantee. The model of open-source intermediation can be adapted for specific supply lines, as and when an opportunity arises.

**Remote Assistant:** Connected Farm reduces employee downtime by remotely accessing the integrated display in

real-time to diagnose a problem. The operator never leaves the cab which leads to time savings and greater efficiency.

**Vehicle to Vehicle Data Exchange:** Connected Farm eliminates the need for USB storage devices by transferring guidance lines, coverage maps, tank levels, and yield data between multiple vehicles using wireless technology. Operators in the same field are able to share information to minimize overlap and crop inputs, while reducing their carbon footprint.

**Office to Field Data Exchange:** Connected Farm eliminates the need for USB storage devices by transferring guidance lines, drainage designs, applied variety maps, yield data, and variable rate prescription maps between the office and field using wireless technology. Using Connected Farm allows quicker access to information, resulting in better farm management decision

**Mapping and Scouting:** Connected Farm utilizes a free app for smart phones and tablets to map field boundaries, scouting data, and other points of interest. Maps and scouting data can also be saved and viewed online.

**NDVI Readings:** Connected Farm utilizes a free app for smart phones and tablets for entering NDVI (Normalized Difference Vegetation Index). Crop readings and nitrogen rates can also be saved and viewed online

### 4. Conclusion and Recommendations:

The traditional supply chain model has layers of intermediates which reduce the income level of farmers, information flow. The new model of supply chain can reduce a layer of intermediate to one or two. This would help in adding value to the products by appropriate channelizing. The food accessibility and traceability could be increased to a great extent in the improved model. The adoption of technology like global positioning, EDI, RFID tag helps in tracing the product even from the farm gate. After green revolution, the food produce are available but the problem is accessibility and quality constraints of food. Accessibility of food could only be improved by proper supply chain management and demand based farming activities. Following are the few recommendations to be followed for food accessibility and traceability:

- Retailer/Buyer orders for produce for the entire season across outlets applications must be developed by agents and the information must be known to farmers.
- Split orders across various regions supervised by various field extension agents.
- Assistance for farmers during production, harvest and post harvest phases using technical information made available in the handheld or accessed from an external server.
- Agents must ask an expert module which allows farmers to ask a query which will be answered by experts associated with the region in the application.
- Regular alerts must be provided by agents to the farmers on their cell phones during the entire production cycle.
- Once the produce is harvested, the agents collect and ship the produce to various distribution/collection centres. Details of collection and shipment are recorded in the application. The agents usually take upon the role of the procurement agent, since it is the responsibility of the agents to enter details of collection and shipment into the handheld device. In future versions, more role-based responsibilities can be added into the application.
- Application alerts to the retailer with consignment details and an ability to trace produce to the production base.

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