Examining market challenges pertaining to cold chain in the frozen food industry in Indian retail sector

Ms Anju Bharti
Assistant Professor
bhartianju4147@gmail.com

Abstract: India is a country of geographic diversities- varied soil-types, habitats, climates and vegetations. India is a major producer of food (fruits, vegetables, wheat, pulse, milk, spices, etc.) in the world after China. This industry is the front end of the agriculture sector, which is a significant economic component, employing nearly 60% of the country's population and contributing to around 25% of India's gross domestic product. With access to a large natural resource base of 161 million hectares of arable land, 15 million hectares of fresh water reservoirs, the largest livestock population in the globe and diverse agro-climatic conditions, India is a favourable destination for growth in the food industry. The Indian food industry is expected to reach $258 billion from the current level of $181 billion. Though India's share in the global market is still nearly 1% only, there is increasing acceptance of horticulture produce from the country. However, on the other side, there have been staggering losses in the frozen food sector due to ill-equipped and weak cold chain infrastructure of the country ensuing post post-harvest losses. However, the current scenario reveals that there is a tremendous scope for the development of cold chain facilities. This article is an attempt to draw the attention of the reader towards the potential as well as the challenges that exist in the frozen food business in India

Keywords: Cold chain, frozen food, geographic diversities, infrastructure

I INTRODUCTION

Food sector of India, in the last decade or so, has attracted attention of the world owing to the tremendous potential the geography, climate and soil offers. Though, a leading producer of food in the world, it is not known for the exports of food products. The poor export figures are attributed to inadequacies in infrastructure for supporting the supply chains of perishables in the country, the cold chain.

There are issues of concern, that need attention, like huge losses in perishables (food) because of infrastructural deficiencies. The huge wastage of perishable food occur due to factors like: lack of pre-cooling and storage facilities, dearth of refrigerated carriers, fragmented supply chains, poor scarce application of latest tools and technologies, poor product knowledge and lack of professionals. The collaboration among stakeholders like government bodies, private corporations, cooperatives, farmers and federations is imperative but the building up phase is still in the nascent stage.

A well organized cold chain reduces spoilage, retains the quality of the harvested products and guarantees a cost efficient delivery to the consumer given adequate attention for customer service. The main feature of the chain is that if any of the links is missing or is weak, the whole system fails.

In spite of high production of food, the demand for food remains highly unfulfilled within the country
and outside. India contributes less than 1.5% to the international food trade. This is primarily attributed to highly inefficient, inadequate and weak supply chains for food that requires temperature controlled conditions to retain quality, safety and curb the decay process – the cold chain. Thus, the food retail supply chain is vital.

A. Cold Chain
Cold chain is a temperature controlled supply chain and the term is specifically used in context of food (vegetable, fruits, meat, fish, milk and milk products, ice cream etc.) and pharmaceutical industries. It is a supply chain for perishables that ensures that there are minimal temperature fluctuations for goods in transit from place of production to the point of consumption. The temperature required in a cold chain depends on the nature of product (foodstuffs like fish, dairy products, butter, meat and meat product) under transit. Cold chain management refers to maintaining the proper temperature of the products through all the handoffs in the cold chain until it reaches the consumer[1]. **Freezing foods can preserve them in a good condition, as acceptable to the customer as the fresh product, for long periods by preserving the wholeness and quality. It restrains bacteria and slows down the biological reaction that deteriorates the food.**

Developing countries acutely require institutions, infrastructure and human capital in place to improve efficiency in cold chains and also to exploit the competitive advantage that these countries (like China, India) may posses by virtue of climatic conditions, vast spans of arable land or other factors. Increasing efforts have been made by developed countries to help countries lagging behind to minimize product losses and increase profitability. With technological advancement and improved equipments, as well as continuous improvement of cold chain management, the logistics of moving perishables around the world will be greatly enhanced.

B. Objectives of the Study
Following are the broad objectives of this study:
i) To identify the existing market challenges pertaining to cold chain in the frozen food in Indian retail sector.
ii) To delve into various factors that have an impact on the effectiveness of Cold Chains.
iii) To determine the factors that affect the shelf life of frozen food products.

II REVIEW OF LITERATURE

A. Evolution
According to Fernie and Sparks [2], cold chains have been evolving since 1980s. Earlier, cold chains simply meant storing at a specific temperature in warehouses and refrigerated vehicles. There was no awareness of integrating the supply chain links and as a result billions’ of dollars worth of losses occurred every year.
B. Storage Facilities

Warehouses are a critical component in the Cold Chain Logistics. Duiven and Binard [3] describe cold stores or refrigerated warehouses as facilities for handling and storing perishables under controlled temperatures in order to maintain product quality.

C. Food Packaging

Packaging is a necessary element because the proper insulation materials can keep the temperature of the product as a cushion while they are in the weak links of the supply chain.

D. Distribution: Challenges

Apart from food production, distribution of food is a big business [4]. Transport is an important link in the cold chain as temperature maintenance and safety enhance shelf life of perishable food. The takes in food, pharmaceutical, and chemical cold chains are high.

E. Technological Aspect of Cold Chain

Sahin et al.[5] establish that the trade related to temperature sensitive food has seen a surge in recent years; consequently international trade continues to grow at 6% per annum [6].

F. Technology: Indispensable Element in Cold Chains

Rathore and Saxena [7] explain the transit of perishable food products like fruits and vegetables, mild and milk products, meat and fish and other frozen food such as ready-to-eat food, etc.

III FACTORS AFFECTING EFFECTIVENESS OF COLD CHAIN

India has a huge opportunity to become a leading global food supplier if only it has the right marketing strategies and of course agile, adaptive and efficient supply chain. In spite of high production of food, the demand for food remains highly unfulfilled within the country and outside. Viswanadham [8] has identified the following constituents of a Cold Chain:

- Pre-cooling facilities
- Cold Storages
- Refrigerated Carriers
- Packaging
- Warehousing
- Information Management systems (Traceability and Tracking etc.)

The huge wastage of perishable food occur due to factors like: lack of pre-cooling and storage facilities, dearth of refrigerated carriers, fragmented supply chains, poor scarce application of latest tools and technologies, poor product knowledge and lack of professionals. There is also a need to bring in efficiency in existing cold chain networks. Without an efficient supply chain there is a high cost of wastage for the companies. The cold chain network can be made efficient by development of basic infrastructure.
The initiative would lead to improvement of roads, railways, ports, airports and power. Developing countries acutely require institutions, infrastructure and human capital in place to improve efficiency in cold chains and also to exploit the competitive advantage that these counties (like China, India) may possess by virtue of climatic conditions, vast spans of arable land or other factors. With technological advancement and improved equipment, as well as continuous improvement of cold chain management, the logistics of moving perishables around the world will be greatly enhanced [9]. The study would also pave the way for corporate to venture into the food industry in a big way.

IV CURRENT STATE OF INDIAN AGRICULTURAL INDUSTRY

Agriculture is the backbone of Indian economy

- Contributes ~ 13.9% to the GDP (2011-12)
- Employs ~ 52% of the work force
- Contributes ~ 10.2% of exports (2008-09)

* Annual production
  - Foodgrains ~ 259.32 million tons (2011-12)
  - Fruits ~ 75.30 million tons (2011-12)
  - Vegetables ~ 150.60 million tons (2011-12)

* Largest producer of milk, livestock, sugar, tea and cauliflower
* Second largest producer of rice, wheat, fruit, vegetables and tobacco
* Maize production, 6th in global rank, 2.4% of World production, used for food.

<table>
<thead>
<tr>
<th>Fruits and Vegetables</th>
<th>India is the world’s second largest producer of fruits and vegetables</th>
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<tr>
<td>Milk and Milk Products</td>
<td>With 127.3 MT in FY2012-13, India is the largest producer of milk in the world.</td>
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<tr>
<td>Meat and Poultry</td>
<td>India is the largest producer of buffalo meat(1.5MT) and the second largest producer of goat meat(0.6MT)</td>
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<tr>
<td>Marine Products</td>
<td>With 8.9 MT productions in FY2012-13, India is the second largest producer of fish in the world.</td>
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<tr>
<td>Grain Processing</td>
<td>India produced about 259.3 MT of food grains in FY2012-13</td>
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<tr>
<td>Consumer food</td>
<td>Among the fastest growing segments in India, it includes: packaged food, aerated drinks etc.</td>
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*Source: Ministry of agriculture, APEDA, Meat and poultry board, FAOSTAT, August, 2013 (MT-Metric tonnes, FY-Financial year)*
V TOOLS REQUIRED FOR COLD CHAIN MAINTENANCE: PACKAGING

Packaging has become the competitive tool to reach the consumer and the task assumes increasing responsibility with more and more of competitive and substitute products being introduced. This has opened the sector for introduction of modern technology for processing and packaging as well as entry of host of new organizations from all sectors of the economy both domestic and overseas.

A. Standardisation

Standardization is a powerful tool for improving supply chain efficiency. There are two kinds of standards in the food supply chain. The first one is the food standard that concerns itself about the content and manufacturing process, packaging etc. There are several such standards for dairy, poultry etc. The second standard concerns logistics and IT systems like standardization of cartons, pallets and IT software so that seamless transfer of goods and information is possible.

B. Food Safety and hygiene

Food safety is a growing concern across the world. There is increasing need to provide greater assurance about the safety and quality of food to consumers.

C. Training

The food supply chain is going through a period of great change and needs to be supported through new organizational forms manned by specialists. Training, coaching, counselling and mentoring have to be extended to all the parties in the supply chain.

D. Government Policies

Food and Agriculture are important national activities and affect the well being of the population of every country. In formulating the policies of farming, production, processing, distribution, retailing and financing of these activities, the Governments plays a leading role.

E. Increasing Awareness

About 30% of the fruits and vegetables grown in India get wasted annually due to lack of awareness about proper handling and storage requirements as well as poor infrastructure, insufficient cold storage capacity, unavailability of cold storages in close proximity to farms, poor transportation infrastructure, etc.

VI IMPORTANCE

The temperature controlled supply chains or cold chains are a significant proportion of the retail food market. The market shares of fast foods, ready meals and frozen products have increased in recent years. There are several food temperature levels to suit different types of products. Freezing has been successfully employed for the long-term preservation of many foods, providing a significantly extended shelf life. The extreme cold simply retards the growth of microorganisms and slows down the
chemical changes that affect quality or cause food to spoil [10]. Competing with new technologies of minimal processing of foods, industrial freezing is the most satisfactory method for preserving quality during long storage periods [11]. With the growing demands to keep and distribute temperature sensitive products in potent condition, organizations are seeking better solutions to maintain and monitor cold chain. The success of implementing cold chain management involves continual monitoring of product temperature throughout distribution and having appropriate corrective action plans in place.

A streamlined, well maintained cold chain helps to:

- Reduce costs
- Improve product integrity
- Increase customer satisfaction
- Reduce wastage and returns of expired stock

**VII MAJOR DEVELOPMENTS AND INITIATIVES IN INDIAN COLD CHAIN SECTOR**

In last two years a number of private entrepreneurs have invested in cold chain infrastructure

1. An important development is the movement of refrigerated wagons through Railway network under Public Private Partnership model.

2. Growth of Organized retail network including Cash & Carry operations by International retail chains is driving demand for value added perishable food products.

**VIII OPPORTUNITIES**

The present cold chain capacity in India stands at 19.5 million tonnes which is lesser by 15% of the annual horticulture production. The positive future outlook for food processing, agriculture and retail, calls for the development of integrated and intelligent cold chain networks across the country. According to industry analysts, integrated cold chains and supply chain management would help India in saving INR 750 bn annually by reducing wastage of perishable horticulture produce by 30%, besides garnering additional export revenue of INR 250 billions. India is facing a shortage of cold storages, leading to a loss of about 40% of the agri-produce post-harvest. The Indian cold chains market is largely untapped and dominated by the unorganized sector thus offering immense investment and development opportunities. Though India has potential of becoming food supplier of the world it lacks right marketing strategies and efficient supply & cold chains management. Additionally, Ministry of Food Processing Industries is implementing a scheme for cold chain, value addition and preservation of infrastructure whereby financial assistance is provided for strengthening cold chain infrastructure.
IX CHALLENGES
The biggest challenge lies in connecting the remote villages of India to the robust supply chains so that all stakeholders get benefited and wastages can be mitigated to the extent possible. By building an efficient and effective supply chain using state of the art techniques it is possible to serve the population with value added food while simultaneously ensuring remunerative prices to the farmers. Few challenges:-

- Lack of an integrated approach and efforts for effective policy formulation.
- Viability of cold chain continues to remain a question mark for many reasons; existing facilities are outdated and poorly maintained.
- Awareness and hence demand for Cold Chain services continues to be low.
- Lack of availability of technically qualified people to support efficient operations.

Also, the supply chain need to be designed and built as a whole in an integrated manner with the processes of new product development, procurement and order to delivery processes well designed and well supported using IT tools and software.

X SUGGESTIONS
By building an efficient and effective supply chain using state of the art techniques it is possible to serve the population with value added food while simultaneously ensuring remunerative prices to the farmers. The surplus of cereals, fruits, vegetables, milk, fish, meat and poultry can be processed as value added food products and marketed aggressively both locally and internationally. Investments in cold chain infrastructure, applied research in post harvest technologies, installation of food processing plants in various sectors and development of food retailing sector are mandatory for achieving gains in this sector. Strategic growth plans for achieving both national and international competitiveness of the food industry are essential.

However, lack of electricity, power supply and other supporting infrastructure are a big deterrent in setting up such facilities.

The economic impact of cold chains will be felt in the villages. Farmers will get better realisation for their produce due to improved quality and shelf life.

XI CONCLUSION
The business system is tuned to food habits (cooking at home) and convenience (kirana stores) of rural and urban folks of the previous generation. Factors such as rapid growth in the economy, the technological innovations in home appliances such as refrigerators microwave ovens, rise of families with dual incomes and the changing food habits of the population all point to the increasing need for healthy processed food. The safety and nutritional quality of frozen products is to be emphasized only when high quality raw materials will be used, good manufacturing practices to be employed in the preservation process, and the products kept in accordance with specified temperatures.

The frozen food market is one of the largest and most dynamic sectors of the food industry. In spite of considerable competition between the frozen food industry and other sectors, extensive quantities of
Frozen foods are being consumed all over the world. The food supply chain needs the attention of the academicians, the industry and the Government for its enhancement.

REFERENCES