

Perceptiveness on the Enhanced Cold Storage Facilities

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Abstract

There are tremendous changes in the demand of varieties of food, eating habits and the lifestyle. This change had an impact on the availability of cold chain. The cold chain facilitates the transportation and warehousing of the produce in refrigerated condition. Various produce that are perishable and seasonal to be made available for the consumers throughout the year is one of the aims of cold chain industry. There is a huge loss of agricultural products due to the lack of cold storage facilities. This study focuses to understand the means by which quality products without losing the freshness, genuine taste and appearance can be made available to consumers.

Keywords: Cold storage, chain, agricultural produce, warehousing, transportation

1. Introduction

Cold storage is useful for storing different products and can be stored for an extended period. Cold storages store the products like dairy products, meat and poultry products, dry fruits, pulses and pharmaceutical products. All the fruits and vegetables cannot be sold immediately after harvesting, so storing them for future purpose is essential. Some can be processed and stored. Storing them in a cold condition helps the product to stay fresh and new. This helps prolong the shelf-life of the produce, avoid wastages, and preserve the quality. The cold storages are of great help to store the products that are not available throughout the season. The demand for the offseasonal products can be met through cold storages. It is clear that cold storages are of significant use to preserve the products and generate revenue for the hard work that is put forth for producing it. It is estimated that about 133 billion rupees (a capacity of 450MMT every year) worth produce go waste due to the incompetent storage facility, in that 11.36% are fruits and 14.04% are vegetables. Our country has to improve the cold storage facilities at the level of 61 million tons. The present storage capacity is about 26.85 million tons. This can be explained in terms with a capacity of 28.68MMT. Developing cold storages to reduce wastages help the farmers and the economy of the country to develop. This can also help to deliver fruits and vegetables at a competitive rate to the consumers. It is expected that the cold storage market would grow at a compound annual growth rate of 15% in the next five years. Temperature controlled transportation is expected to grow by 17%.

2. Literature Review

There has been a substantial focus to increase food production and become self-sufficient. For the past many years, the emphasis is to increase food production productivity by investing in research (Kader 2005). For attaining the goal, the attention is on the post-preservation to increase the returns and provide food security. According to the U.N., tons of foods are wasted every year (Gustavasson, et al. 2011). While discussing the post-production infrastructure related to agriculture, storehouses and cold storages are primary concerns. These facilities help to hold the agriculture inventory for longer duration without damage or decay. The shortfall of food production is mainly due to the lack of quality preservation during post-harvest.

The loss of production of perishable goods happens due to the lack of availability of resources. Another significant wastage is the lack of cold-storage during the post-harvest of the produce. Cold storage helps to reduce the wastages related to perishable foods. The storage mechanism assists in increasing the preservability and avoids contamination by the microorganism. The production of food grain in India is increasing every year. In 2018-19, about 286 million tones compared to 2019-20 were around 296 million tones. The production of vegetables and fruits annually is around 300million tones, and even horticulture is also increasing. Even though production is increasing, the amount of waste is very high to about 67 million tones about to Rs.92,000 crores. In India, every year around the concentration on cold chain industry could improve the storage of food produce, increasing productivity. At present, the number of cold storages in our country is around 7700. The absence of cold chain facility creates a block to appreciate the efforts put by the farmers. Some reports reveal its contributions to economic development (Winrock 2009). The food waste affects the shortage of consumption and affects greenhouse gas emissions (Gustavasson, et al.2011). The methane production causes this in landfills where the food waste is decomposed (Buzby and Hyman, 2012) and creates

climate change (DFI Committee report, 2017). From these facts, the significance of the reduction of food waste is obvious.

In India, the surplus of food is procured through different associations like Food Corporation of India, National Agricultural Cooperative Marketing Federation, and other agencies run by the state government. The wastages that occur are immense compared to the quantity it is produced.

Table 1: The percentage of wastage of the produce

Perishable produce that goes waste	Percentage
Fruits and vegetables	4.6 to 15.9
Inland fish	5.2
Marine fish	10.5
Meat	2.7
Poultry meat	6.7

Source: World Food India, 2017

There is an increase in the number of cold storages in India, but the number of cold storage capacity is not adequate compared to the production of vegetables and fruits. The shortfall of cold storage is reported to about 126 lakh tons compared to the production of fruits and vegetables of about 300 million tones. (National Centre for Cold Chain Development, 2015). In 2018, India was ranked as a leading producer of food and meat stands in first and second place in fruits and vegetable production globally but bagged only 103 positions in the Global Hunger Index out of the 119 countries participated. This reveals the poor management of the produce that is produced annually (Aravindaraj et al., 2019).

The considerable availability of cold storage facility has been skewed to specific product and few states. This results in reduced utilization of the capacity. It is recorded that only 68% of capacity has been utilized only for potato, while 38% is for storing other commodities. The potatoes are harvested during January - March and for the rest of the months, it has to be preserved using refrigeration. This assists in the availability of fresh potatoes throughout the year

and helps earn from the hard work. Thus cold storage facility is a boon to the consumers and farmers.

However, despite the growth, the number of cold storages in India is still inadequate compared to the requirement. As per the National Centre for Cold Chain Development (NCCD), there is a shortfall of 126 lakh tons of cold storage capacity. The statistics reveal that from 2014 there are about 1312 cold storage facilities with a capacity of 53.64 lakh MT funded by agricultural ministry and ministry of food processing industries until 2019. The reports revealed that more than 90% of the cold storages are for small scale usage and are run by private sectors, and the rest are managed by public and co-operative sectors.

Table 2: Percentage of cold storage facility in different states

Sl.No.	States	Percentage
1	Andhra Pradesh & Telangana	6
2	Bihar	3
3	Chhattisgarh	1
4	Gujarat	15
5	Haryana	3
6	Karnataka	3
7	Kerala	3
8	Madhya Pradesh	3
9	Maharashtra	7
10	Odisha	2
11	Punjab	8
12	Rajasthan	3
13	Tamil Nadu	2
14	Uttar Pradesh	33
15	West Bengal	3

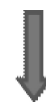
An essential aspect of a cold chain is maintaining temperature for storing and distributing so that products can be stored in a controlled temperature, this help to keep the products freshly for an extended period. For preserving the produce in an edible

condition for a long time, an ambient state has to be created. While discussing the temperature control, two segments have to be noted: the warehousing and transportation.

Nowadays, the cold storages are built with equipment that can regulate the air within the cold chambers. The air within is sucked out and substituted with inert gas. This reduces the oxygen level inside, resulting in less physiological actions of the produce stored inside the chamber. The advanced technology used helps in adding the shelf life of vegetables and fruits that are stored in the chambers.

Table 3: Key products and end user segments

Key Products	
Temperature Controlled Warehouse	Temperature Controlled Vehicles
Potatoes, Fruits and Vegetables, Meat, Sea Food, Milk & Milk Products	Meat, Ice Cream, Milk & its products Pharma products, Confectionery



Technology

End Users

Wholesalers (70-75%) Organized Retailers (10-15%) Food Service (15-20%) Others (3-5%)

Source: Cold Chain opportunities in India - Yes Bank Dutch Embassy Collaborative Study

After the initial processing like sorting, grading and packaging the fruits and vegetables or any other produce is first taken to the pre-cooling centre before it is transported to the cold storages. Depending on the requirement, different storage methods are utilized. Some of the requirements like the duration of storage and the stage (raw or ripe) should reach the destination and increase shelf life. From the cold storages, it is transported to the distribution centre and from there to the retailers. There are situations where the produce is transported to the food processing units for converting it into processed items.

3. The Problem Statement

The study by NCCD11 reveals that cold-chain that is developed in our country requires a large investment. There is a requirement of 35.1 million tons of capacity against the existing capacity of 32.86 million tons. A study by NCCD explained the refrigerated transport requirement of around 62000 refrigerated transport units. There is a shortage of cold chain of fruits and vegetables compared to pharmaceutical products, imported foods and processed food. Another study shows a shortage in the creation of ripening chambers, reefer vehicles and pack houses.

Table 4: Projected growth rate of cold storage market

Refrigerated storage market	CAGR rate of 15%
Refrigerated transportation market	CAGR rate of 17%
Meat and fish cold storage market	CAGR rate of 9%
Pharma cold storage market	CAGR rate of 16%
Diary cold storage market	CAGR rate of ~ 17.5%
Refrigerated/Reefer trucks market	CAGR rate of 85.3%

The growth at this projected rate will help to manage the situation well. There is a requirement for interventions to improve the present situation.

4. Discussion

The temperature-controlled warehousing and transportation are the main segments that have to be focused on understanding the challenges they face. Refrigerated trucks, cold boxes and stores, refrigerators and freezers have to be well managed so that the fresh produce can be preserved well. The produce has to be preserved at a proper temperature to remain fresh when transported, stored and distributed from production to the end-user. In developing countries, it is estimated that (International Institute of Refrigeration) about 23% of foods that get perished quickly are lost are due to improper storing

capability. There is a requirement of an integrated cold chain which is environmentally and socially friendly.

The use of technology has improved the storage process more effectively. The primary concern is related to food safety. Bar-coding is one way by which accurate information regarding the origin of the product and its harvesting process but lacks in providing the details about the transportation. However, this data is helpful when it is taken for refrigeration.

Various data is captured like temperature, time, location, and other relevant information for the products to reach the destination safely. Association of new technology like the internet of things and cloud technology, are emerging areas that support supply chain, especially cold chain. Blockchain is another technology that ensures food safety.

Major logistics providers have relied on analytics and research teams to make sense of the data they generate from their operations. With immense data in hand, companies are utilizing the use of artificial intelligence techniques to automate numerous processes. Many issues related to cold chain logistics and warehousing can be avoided or reduced with the application of these techniques. Reducing transportation cost, expressing shipping without fluctuations in temperature and reducing lead time are beneficial aspects.

With the adoption of 'Internet of Things' linked to cold chain, it can collect data volumes to forecast and improve the cold chain's performance. It helps identify the risk areas like usage of a particular route that is prone to spoilage during a particular period due to weather conditions. The data collected during a period helped the machine learn and predict the feasible route, warehouse condition, status of the products, and transport means. With the collected, large data machine can predict the solution to the issues.

Processing Industries provides integrated cold chain, preservation and value addition infrastructure facilities without any break, from the farm gate to the consumer to reduce post-harvest losses. This will enable to link

groups of producers to processors and market through a well-equipped supply chain and cold chain, thereby ensuring remunerative prices to farmers and year-round availability of food products to consumers.

Integrated Cold Chain Availability Platform is envisaged as a national database that enables active linkage between multiple cold-chain assets across owners, promoting the integration of use through collaboration.

5. Conclusion

Some of the measures that can be adopted include linking the pre-cooling stage at the production level itself and justify the investment required in the initial stage itself—strengthening the supply chain links by connecting agriculture industry, transportation firms, and engineering companies related to the cold chain. The association of these organizations will facilitate to provide the necessary cold chain requirement. Investment in research and development to develop reasonable technologies to cater to the need of small- and large-scale manufacturers based on their requirement is another crucial area that needs attention. Viability of the investment has to be considered before investing in any cold chain area for better results.

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