

Food Cold Chain Management System – From a Structured Theoretical Analysis to a Conceptual Framework on Perishable Commodities in India

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ABSTRACT

Agricultural system always had a transition period. This transition came very slowly from production for consumption to production for marketing or for exchange. Agriculture is characterised by fairly large and year to year seasonal fluctuations in production whereas consumption pattern remains almost same and unchanged. Therefore it is necessary to store and preserve large quantities of farm products for a longer period due to this conflicting nature of demand and supply pattern. Traditional storage structures and practices need to be transmuted for ensuring the quality of farm products. Cold chain management is a contemporary system that rely on modern technologies to control and monitor the temperature of perishable farm products to conserve its freshness and quality throughout the entire supply chain. It is also highly beneficial in price stabilization, proper distribution and marketing of commodities. The present paper focuses on the need of effective cold chain system in reducing the harvest and post-harvest losses of perishable commodities.

KEYWORD: cold chain management, supplychain, storage structure, perishable commodities. Agriculture

Statement of Intended Contribution

An attempt was made by the researcher to answer the following questions;

- Why do India fails in feeding its population though it has adequate food resources?
- What is the reason for increasing the share of post-harvest losses of perishable goods over the years?
- What are the bottlenecks of Indian Cold chain system in preventing post-harvest losses?

The present study attempts to identify the major bottlenecks in the marketing of agricultural produces particularly perishable products like fruits and vegetables. Food losses are the main issue to be addressed in the present scenario due to the non-availability of adequate infrastructure. It is the area where government and other authorities need to look into as it affects the food security of the nation in the long run.

Introduction

The Cold chain management system has become a linchpin in the wheel of agriculture sector in India. Every year India wastes nearly 18 percent of fruits and vegetables due to the absence of adequate storage facility. The Cold chain system can potentially solve post-harvest losses and can ensure extended life cycle for perishable products. It maintains the quality and freshness of perishable goods by slowing down the respiration rate and transpiration rate and by lowering microbial activity. Cold chain sector is a combination of base

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storage and refer (refrigerated) transport and it includes pre-cooling facility, refer containers, cold storages, warehouse information management system, finance and insurance institutions and traceability. The Cold chain facility helps the farmer's to reach faraway markets to capture a large buyer base so that they can bring their harvest to more valuable end use. For strengthening the farmer's income, special attention should be given for developing cold chain facilities across the nation.

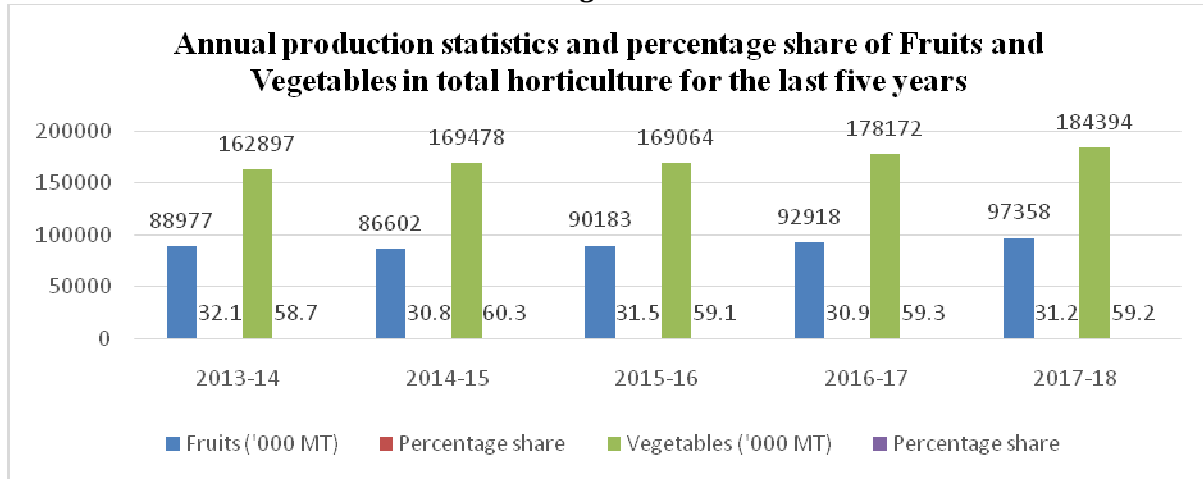
Production of fruits and vegetables

Indian agriculture shown a remarkable growth in the production as well as area expansion of fruits and vegetables over the few years. Area under horticulture grew by 2.6 percent per annum and thereby annual production increased by 4.8 percent over the decades. The production of vegetables has increased from 162.89 Million Tonnes to 184.40 Million Tonnes since 2013-04 to 2017-18 and production of fruits has increased from 88.98 Million Tonnes to 97.35 Million Tonnes. An analysis of annual production and percentage share of fruits and vegetables from 2013-14 to 2017-18 is depicted in figure 1 and figure 2. Figure3 depicts the major leading states in the production of fruits and vegetables from 2013-14 to 2017-18

Andhra Pradesh, Uttar Pradesh, Maharashtra, Gujarat and Karnataka were the five leading states in the production of vegetables since 2013-14 to 2017-18.

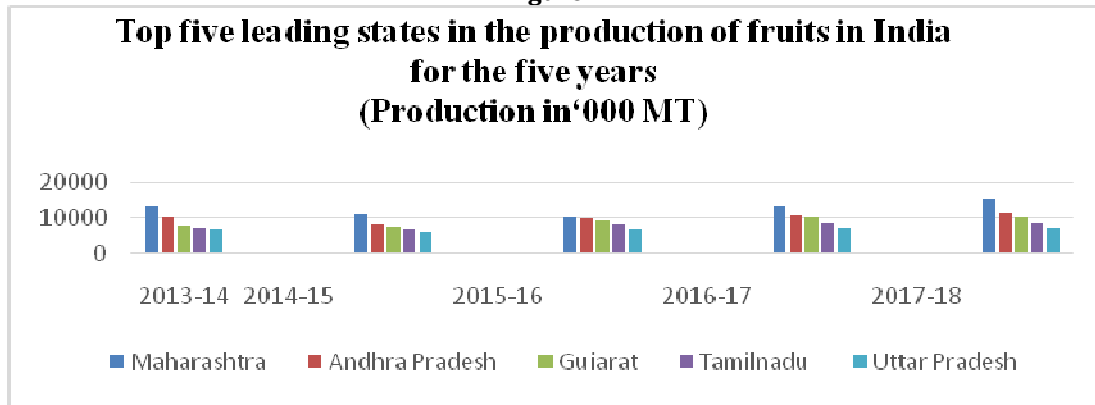
Uttar Pradesh, West Bengal, Madhya Pradesh, Bihar and Gujarat were the five leading states in the production of fruits since 2013-14 to 2017-18.

Figure 1



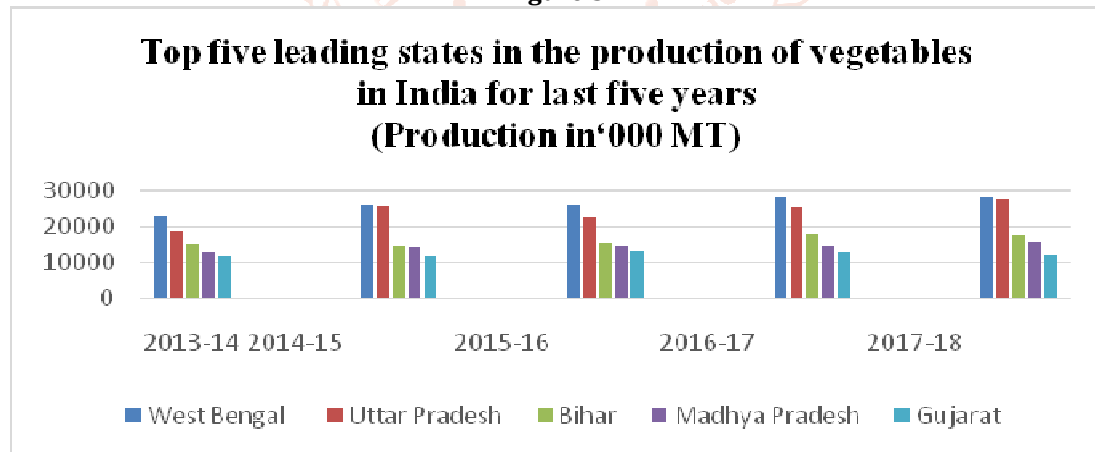
Source: Ministry of Agriculture and Farmers Welfare

Figure 2



Source: Ministry Of Agriculture and Farmers Welfare

Figure 3



Source: Ministry of Agriculture and Farmers Welfare

Post-harvest losses of fruits and vegetables

India continues to fail in feeding its population, even though it has abundant agricultural resources. India ranked 103 among 119 countries as per Global Hunger Index. As per the latest report of FAO (United Nation’s Food and Agriculture Organization, 2019), India wastes nearly one lakh million worth of food every year and 40-50 percent of food gets spoiled before reaching the neediest consumers. Every single day, close to 194 million people go hungry all over the country. India needs to feed nearly 225-230 million tonnes per year.

By taking into consideration, the growing need of preserving food for ensuring the food security of the nation, suitable mechanism need to be developed for minimising the harvest and post-harvest losses of fruits and vegetables.

Harvest and post-harvest losses of major food grains are depicted in table 1

Table 1

Crops	% Average loss (CIPHET Nanda etal2012)	% Average loss (CIPHET Nanda etal2015)
Apple	12.3	10.39
Banana	6.6	7.76
Citrus	6.4	9.69
Grape	8.3	8.63
Guava	18.01	15.88
Mango	12.7	9.16
Papaya	7.36	6.7
Sapota	5.8	9.73
Onion	7.5	8.20
Tomato	13.0	12.44
Cabbage	6.9	9.37
cauliflower	6.9	9.56
potato	9.0	7.32

Source: CIPHET Report, 2015

Ever year India wastes nearly 18 percent of fruits and vegetables due to lack of post harvesting storage mechanism. According to MFPI (Ministry of Food Processing Industry), post-harvest losses of food grains are 25 million tonnes whereas fruits and vegetables constitute 12 million tonnes and 21 million tonnes respectively.

Systems for post-harvest loss handling

Post-harvest management is one of the major intervention to improve the farm production by doubling the income of farmers. India is lacking a sustainable supply chain management system due to its unorganised nature. Therefore, India needs an effective cold chain system which will integrate the supply chain for vegetables and fruits from the post-harvesting stage to ultimate consumption stage.

Cold chain system remains untapped due to several reasons like high initial investment for setting up, high share of single commodity, lack of adequate basic infrastructure, lack of awareness for handling perishable goods or lapse of service either by the storage provider or the transporter.

Table 2 depicts the Gap analysis of cold chain infrastructure in India

Table 2

No	Infrastructure component	All India Requirement(A)		All India created(B)	All India Gap
		Holding Capacity/ Storage size	Numbers	Number/ storage capacity	
1	Pack-House	11,21,274MT	70,080	249nos	(69,831)Nos.
2	Cold Storage (Bulk)	341,64,411MT	-	31823700MT	(32,76,962)MT
3	Cold Storage(Hub)	9,36,251MT	-		
4	Refeer Vehicle	4,94,608MT	61,826		(52,826)Nos.
5	Ripening Chamber	91,306MT	9,131	812nos	(8,319)Nos.
6	Onion storage structure	70,06,028MT	2,80,241	-	-

Source: NCCD, 2015

Gap analysis indicates that Present capacity is nowhere close enough to support cold chain management system. A study conducted by Indian institute of management, Kolkata has discovered that nearly 10 percent of agriculture produce get cold storage facility in India.

Challenges in cold chain management system

Misallocation of cold storages

Majority of the cold storages are concentrated into few states of the nation and rest are undeserved. As per the report of Emerson (2013), 60 percent of India's cold storage capacities are utilised just by 4 states-West Bangal, Uttar Pradesh, Gujarat and Punjab.High share of a single commodity pause a problem for preserving other commodities.

Potato accounts for 75-80% of the storage capacity.

Under developed refeeer transport

According to the report on Global capacity by international Association of Refrigerated warehouse (2010), nearly 104 MT of perishable farm products are transported between the

cities of the country every year. Out of which approximately 100 MT moves via non refeeer (non-refrigerated) mode and only 4 MT are transported by refeeer mode.

Untrained handling of perishable products

In India, a warehouse with air condition is considered as a cold storage. Different commodities require different temperature handling mechanism, which may not be known to the cold storage staff and those who handles the products including transporters. It ultimately leads to inventory losses.

Non-prioritization of vegetables

Most of the pack houses in India are mainly focused on fruits and there is little emphasis for vegetable sector. Some of the

exotic vegetables are handled properly and others are outside the attention of pack houses.

High capital cost

Entrepreneurs may not find cold storage as a viable option for investment as it requires huge set-up cost. It was estimated that approximately 3-4 Crores in Indian rupees is required for setting up of 5000 MT cold storages and to set up a 1000 MT multi-purpose cold storage, investment of around 20 Crores are required.

Conclusion

India ranks first position in the production of Banana, Mango, Lime, Lemon, papaya and Okra and it is a pride factor that it is the second largest producer of vegetables and fruits. Food wastage of fruits and vegetables are also in the range of 18-40 percent. Post harvesting management system in India is still at its nascent stage. India needs an effective cold chain system to reduce the harvest and post-harvest losses and to provide an extended life cycle of perishable products. In turn, it will ensure the food security of the nation. Effort should be made from the Government to ensure the proper functioning of the cold chain system where 100 percent FDI is admitted in this sector. India needs to mobilise large scale investment in cold storages, refrigerated transports and on other logistics management systems.

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