

Supply Chain Management of Seasonal fruits in India: Issues and Challenges and With Solutions.

Akshara Gupta

Department of Computer
Science and Engineering
MCA
Galgotias University
Greater Noida, India

Abhay Sahu

Department of Computer
Science and Engineering
MCA
Galgotias University
Greater Noida, India

Kashish Singh

Department of Computer
Science and Engineering
MCA
Galgotias University
Greater Noida, India

Under the guidance of –

Dr. Shiv Kumar Verma

Professor

School of Computing Science & Engineering

Galgotias University

Greater Noida, India

ABSTRACT

We have seen a rapid increase in the population of India which results in several problems in various fields. This problem has also been seen in the demand for agricultural fruits. Due to their perishable nature and a very short self-life, we need their proper storage facilities as well as transportation facilities to reach the customer on time and in a fresh state to save the customer's time as well as money, one of the most important factors.

This paper's major goal is to study the agricultural fruit supply chain management process and analyse the numerous opportunities and problems that are emerging in routine product handling.

INTRODUCTION

We are all aware that the Indian economy is still centred on agriculture, thus effective supply chain management of perishable items would be essential to the country's economic growth and its aspiration to become a global leader in the food industry. Several studies have shown that an average of 20% to 30% of harvested fruits are wasted during transport from the field to a factory, one of the many difficulties in the Indian food supply chain. Therefore, we must do thorough study in the area of transportation and storage and suggest a workable solution to the issue. One of the finest natural resources

in the world is found in India. We just need to make the proper supply management chain which we are going to discuss further in this paper.[1,2]

About a million tonnes of fruit are produced annually in India, and there are over 6.3 million acres dedicated to fruit farming. Indians primarily eat mango, banana, citrus fruits, apples, guava, papaya, pineapple, and grapes.

In the Indian environment, fresh fruits are essential, and their marketing has a significant economic impact. Indian farmers may not make much money selling fresh fruit in stores, but there is a sizable market there.[2]

So, this factor has attracted many corporate into this sector. To make a better profit in the market, the corporate sector makes some arrangements with farmers and the wholesale sellers of the market and the farmers will get the same retail price as what they had in those days. This deal helps a lot for farmers to sell all their fruits easily (as they don't visit many wholesalers and do price negotiations with every wholesaler).

But that leads to drawbacks for customers and for farmers too, and this drawback helps the Indian corporate sector to make money. And this moneymaking drawback increases the price of fruits. Agricultural products are bulkier, more perishable, and seasonal than many industrial ones, marketing them is more difficult. Small land holdings held by farmers, various climatic conditions, production dispersed over

large geographic areas, primarily in remote villages, varied consumption patterns/habits of Indian consumers, and inadequate Supply Chain (SC) infrastructure all contribute to the difficulty of marketing fruits. Indian shoppers also desire fresh fruit at this time. SCM is therefore essential to the marketing of fruits. Efficiency in the supply chain promotes economic growth of the nation by increasing production and per Capta consumption. As a result, SCM presents opportunities and problems for the marketing of fruits. Effective SCM in marketing delivers value to a variety of stakeholders, including cultivators (farmers), consolidators, and consumers, in addition to improving the profitability and efficiency of retailers.[6,9]

Literature Review.

Our study takes into account the fresh fruit supply chain and sales. Thus, the perishable inventory literature is pertinent to our investigation. There are several research on controlling food perish-ability along the supply chain in order to enhance freshness and value for supply chain players.

Supply Chain For Fruits In India

The conventional retail model for fruits is heavily utilised in the unorganised retail sector. This model includes commission agents, auctioneers, wholesalers, conventional retailers of various sorts of formats, family-run "mom-and-pop" businesses, roadside shops, sidewalk shops, and cart vendors in addition to farmers and consumers.[3,4]

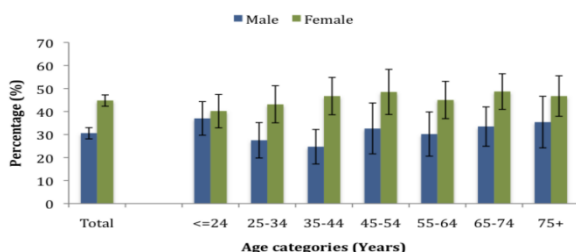


Fig 1. Consumption of fruits by their respective age, gender.

State/ut's	Fruits	
	A	P
Andaman & Nicobar	3.55	29.72
Andhra Pradesh	973.80	14219.31
Arunachal Pradesh	89.08	322.16
Assam	153.96	2210.24
Bihar	306.73	4491.24
Chhattisgarh	212.88	1930.18
D & n Haveli		
Daman & Diu		
Delhi		
Goa	11.27	81.61
Gujarat	381.50	8413.17
Haryana	52.12	550.00
Himachal Pradesh	218.03	836.96
Jammu & Kashmir	355.09	2073.74
Jharkhand	93.17	890.04
Karnataka	408.20	6936.90
Kerala	314.56	2584.01
Lakshadweep	0.22	0.48
Madhya Pradesh	203.79	5691.90
Maharashtra	1565.00	10021.00
Manipur	54.05	525.78
Meghalaya	33.59	339.36
Mizoram	57.89	344.43
Nagaland	40.16	375.74
Odisha	325.86	2148.27
Puducherry	0.48	10.01
Punjab	76.95	1528.61
Rajasthan	45.83	444.60
Sikkim	16.02	24.40
Tamilnadu	328.54	7370.04
Tripura	60.57	638.78
Uttar pradesh	328.70	5378.33
Uttarakhand	200.85	805.67
West Bengal	223.50	3194.00
Total	7135.947	84410.673

Fig 2. Area and Production of Fruits in India by their respective States.

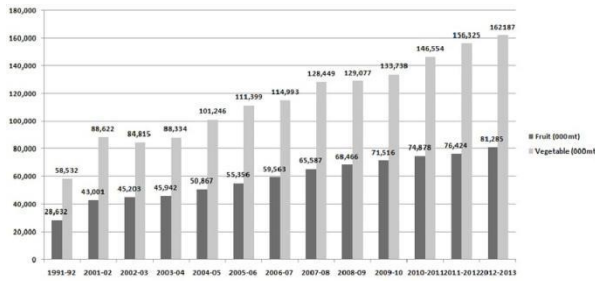


Fig 3. Year-wise production of fruits and vegetables.

State	Cold Storage Requirement in lakh MT	Present Capacity in lakh MT	Gap in lakh MT
Andhra Pradesh	23.24	9.01	14.23
Assam	9.19	0.88	8.31
Bihar	42.41	11.47	30.94
Chhattisgarh	5.43	3.42	2.01
Gujarat	27.48	12.67	14.81
Haryana	8.04	3.93	4.11
Himachal Pradesh	4.87	0.20	4.67
Jammu & Kashmir	7.37	0.43	6.94
Jharkhand	7.96	1.70	6.26
Karnataka	24.04	4.07	19.97
Kerala	27.71	0.58	27.13
Maharashtra	62.73	5.47	57.26
Manipur	0.80	0.00	0.80
Meghalaya	2.39	0.03	2.36
Mizoram	0.74	0.00	0.74
Madhya Pradesh	12.13	8.08	4.05
Nagaland	0.70	0.06	0.64
Orissa	18.35	2.91	15.44
Punjab	13.18	13.45	0.00
Rajasthan	3.91	3.24	0.67
Tamil Nadu	79.06	2.39	76.67
Tripura	1.63	0.30	1.33
UP & Uttarakhand	122.28	101.87	20.41
West Bengal	105.66	56.82	48.84
Total	611.30	242.98	368.32

Fig 4. Cold Storage Requirement of Indian States.

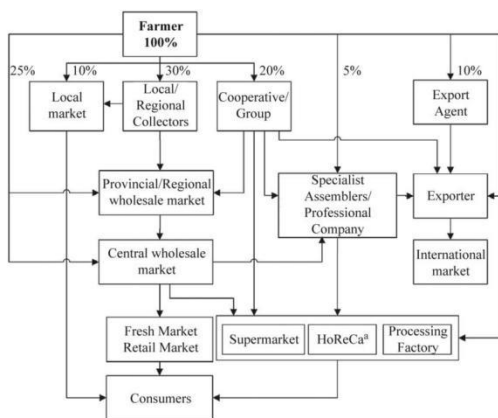


Fig 3. Flowchart of fruit supply chain followed in India.

Research Methodology

For this study, descriptive research has been employed. The supply chain of the fruit industry has been described, and an effort has been made to pinpoint the variables influencing it. The current study reviews all of the basic and recent literature that is accessible in-depth and identifies the problems that are influencing the supply chain of agricultural goods, particularly fruits.[21]

The introduction of organized retail into the marketing of fruits in India has had an impact on every aspect of supply chain procedures. Perishability, seasonality, and bulkiness have been the supply chain's ongoing challenges. In order to identify areas for development, the business models used in organized fruit retailing in India are examined and contrasted with those used in other markets.

By using a case-based method, we draw on our prior knowledge and actual problem scenarios or instances rather than just on our understanding of the problem domain or generalizing correlations between the problem description and conclusion. [7,9]

The literature that the authors have gathered consists of conference proceedings, white papers, presentations from the industry, and research papers from peer-reviewed publications. A systematic search was used to gather papers using terms like "Fruits" and "agriculture supply chain." Mango, Apple, and other later fruit supply networks were also included. For related papers, search engines were used to look through databases at Emerald. The authors have referenced a number of international journals, such as Supply Chain Management: An International Journal, International Journal of Operations and Production Management, International Journal of Physical Distribution & Logistics Management, Journal of Agribusiness in Developing and Emerging Economies, International Food and Agribusiness Management Review, UP Journal of Supply Chain Management, etc.

The literature has been separated into many areas based on the problems with the fruit supply chain, including the cold chain, transportation of fruits, infrastructure, quality management, and food supply chain, among others. Additionally, a probe has been made to detect various influences on the supply chain.

This exploratory study uses tools like in-depth interviews with participants in organized retailing as one of its research methods. The strategy will be to learn about the challenges this industry faces, its logistical

procedures, and the tools used to address them.[19,20,22]

Objectives & Variables

1. Quality of the agricultural fruit.

In India, many of the farmers are untrained and are still using old methods and equipment. Every farmer has their own method of cultivation, irrigation and also of applying pesticides, which leads to a huge variation in the quality of the fruits. To ensure a proper supply management chain, we must train the farmers and have one particular method of fruit production to ensure we have the same great quality products at our end as a result.

1. Purchasing agricultural fruits directly from farmers.

As we already know, many farmers are not aware of the rules related to trading of their products and hence they often get less amount than they deserve. The middle man participates in trading before the product finally reaches the customers, causing various problems in supply chain management and thus leading to loss on both sides, farmers as well as customers. Proper regulations should be adopted and proper teaching should be given to ensure smooth delivery of products.[15]

2. Need of Standardization.

We are well aware of the fact that there is lack of standardization in production, storage, packaging and transportation facilities of agricultural fruits in India. Standardization is really important factor to have the supply chain management become cost effective. Due to lack of standardization, several tons of fruits got rotten before reaching the customer, thus leading to loss of money and time. We need to implement standardization as early as possible to ensure effective supply chain management.

3. High costs and unreliable delivery time.

Such high logistics costs and uncertain delivery times of agricultural products also created one

of the challenges to face in ensuring a proper supply management chain.

We need to take the measures possible to reduce the cost and get the approximate delivery time to ensure the effective delivery of products to the customer.[5]

The following are some important variables in the supply chain in these markets:

- a) Farmers are allowed to join the supply chain network thanks to a contract between farmers and customers. Without this agreement, farmers wouldn't be aware of the current price, demand, and other market factors. This agreement ensures that farmers obtain the right price, consistent supply, and high-quality products. It also allows for the proper flow of market information to them.[6]
- b) Fruits are treated, known as pre-cooling, right after the delivery. To prolong the shelf life of fruits, this is done. This is not feasible in the absence of a contract agreement since small farmers are unable to handle the processing.[9]
- c) The availability of a top-notch cold transport infrastructure serves as the foundation of this supply chain. This makes it possible to transport fruits over vast distances without wasting any.[11]
- d) Fruits are packaged so that there is less pressure on them, ensuring extended life once more.
- e) Wherever storage is required, large volumes of cold storage are accessible at each level.
- f) Small farmers are often seen to cooperating together to form groups that provide them with access to the supply chain network. Small farmers working alone won't be able to satisfy the massive demand.[13]

Challenges with their solutions

A. Some earlier problems and their solutions.

Fruit supply chain management has faced a number of difficulties throughout the years, which have been solved using various methods. Some of the earlier problems and their corresponding solutions include:-

1. **Limited shelf-life :-** Fruits have a short shelf life and are perishable items. This means that they need to be transported quickly and efficiently to avoid spoilage.

The solution to this problem is to use refrigerated trucks or containers to maintain the quality of the fruit during transportation.

2. **Seasonality :-** Fruits have a specific harvesting season, which can lead to supply-demand imbalances. This can result in high prices during peak seasons and low prices during off-seasons.

The solution to this problem is to adopt a year-round fruit production system, which involves the use of greenhouses, cold storage, and controlled atmosphere storage to increase the grapes' shelf life and maintain a consistent supply throughout the year.

3. **Quality control :-** Fruits are susceptible to damage during transportation, which can affect their quality and marketability.

The solution to this problem is to enhance quality control measures, such as pre-harvest and post-harvest treatments, to minimize damage and maintain the quality of the fruit.

4. **Information flow :-** Inefficient communication and information flow between different stakeholders in the supply chain, including growers, processors, wholesalers, and retailers, can cause hold-ups and inefficiencies.

The solution to this is use of a digital supply chain platform will solve this issue. that facilitates real-time information sharing and collaboration between different stakeholders.

5. **Logistics :-** Fruits are often transported over long distances, which can result in logistical challenges such as delays, damage, and high transportation costs.

The solution to this problem is to optimize the supply chain logistics, such as route planning, mode of transportation, and inventory management, to minimize these challenges and improve efficiency.

B. Current problems and their solutions.

Seasonal availability: Fruits have a specific growing season and can be difficult to source outside of that season. This can lead to supply shortages and increased prices.

Solution: Plan ahead by building relationships with suppliers in different regions and countries to ensure a steady supply throughout the year. You can also explore the option of importing fruits from countries where they are in season.

Perishability: Fruits have a limited shelf life and can spoil quickly, especially during transportation and storage.

Solution: Use appropriate packaging and temperature controlled transportation to maintain the quality and freshness of the fruits. Consider using cold storage facilities or refrigerated trucks to prolong the shelf life.

Quality control: The quality of fruits can vary depending on factors such as ripeness, size, and appearance. Ensuring consistent quality can be a challenge.

Solution: Set clear quality standards for the fruits you source and work closely with suppliers to ensure they meet those standards. conduct regular inspections and quality checks to maintain consistent quality.

Regulatory compliance: There are often strict regulations around the import and export of fruits, which can vary by country.

Solution: Familiarize yourself with the relevant regulations and ensure compliance at all stages of the supply chain. Work closely with customs brokers and other experts to navigate any regulatory challenges.

Supply chain disruptions: Disruptions such as natural disasters, transportation issues, and labor shortages can impact the supply chain and lead to delays or shortages.

Solution: Have contingency plans in place to mitigate the impact of supply chain disruptions. This may include having multiple suppliers, diversifying transportation methods, and maintaining safety stock levels.

Overall, effective supply chain management of fruits requires careful planning, strong relationships with suppliers, and attention to detail throughout the supply chain. By addressing these challenges proactively, you can ensure a steady supply of high-quality fruits for your customers.

Case Study

Reliance Fresh:

Fresh fruits are sourced by Reliance using a variety of techniques, incorporating regional producers (direct sourcing, Mandi), interstate travel, domestic sourcing, and foreign sourcing. Farmers move fruits from their

producing location to the purchasing centers in its direct sourcing path. (also known as collection centers). The majority of the sourcing volume for fruits comes from small farmers and contract farmers, who account for 80% of the supply. Both temperature-conditioned and non-conditioned trucks are used to transport fruits from distribution centers (or city processing centers) to buying centers. A buying center serves one or more distribution centers, whereas a distribution center services a buying center. At the distribution center, cleaning is followed by sorting and grading of the fruits. The distribution center also purchases a modest quantity of fruits from the neighborhood wholesale market (mandi), which accounts for 20% of the total volume of sourcing, to close the gap between supply and demand. There is only one distribution center per store.

Reliance has taken a very different route to address the concerns of perish ability and seasonality of fruits. They collaborate closely with farmers and support them as they plan their crops. For instance, Reliance will let the farmers know about this opportunity if it predicts that 3000 tones of fruits will be needed in Karnataka in the month of April. In order to assist farmers, they will offer details on irrigation techniques, insecticides, and fertilisers. They will also help farmers acquire top-notch seeds that can be sown even under the hottest temperatures.[5,7,9,11]

Reliance keeps in touch frequently with different seed and fertilizer businesses. Additional waste reduction techniques used by Reliance include pre-cooling the harvest, better post-harvest handling (fewer human touches/contacts), and customised packaging for sensitive commodities. Reliance offers a proprietary, patent-pending packing method that guarantees little wastage during handling and delivery. Additionally, they put an emphasis on worker training and move fruits between states via a cold chain. They have been able to drastically lower the amounts of waste with the aid of the aforementioned procedures. When Reliance Fresh began operations, the chain from the collecting center to the retail stores had wastage levels of between 25 and 30 percent. From the farm to the retail stores, the current levels of wastage are in the range of 7-8%. The majority of waste happens during the actual farming process. Reliance has strict quality requirements for its purchases, therefore wastage at later stages is minimal (at most 2-3%).[6]

Conclusion

Based on the research, we found that Indian practices for SCM of fresh fruits have a clear room for development. In India, not every region of the nation has access to basic facilities like highways. As a result, the transportation sector is not very productive. The country has a variety of climates, thus during transit, the majority of fruits and vegetables decay due to temperature differences. Therefore, a cold transport system that can keep the temperature of fruits and vegetables consistent is absolutely necessary. Small-scale farmers continue to be taken advantage of by middlemen, and they are given an inaccurate market and consumer demand in perspective. Farmers can form band together to create cooperative organizations or groups so that even the smallest farmer will have access to resources. The produce of small farmers will be sold, and they will be shielded from middlemen's exploitation. These associations may partner with major merchants to guarantee healthy margins.[2,5]

Both parties will profit from a signed agreement. merchants will not have to comb mandis for high-quality fruits since farmers will obtain reliable market information, merchants can educate farmers more efficient farming techniques, and retailers will have a consistent supply of high-quality fruits. Having top-notch cold storage facilities is something retailers can afford, which reduces waste.

According to the report, the government and modern shops operating in India should adopt the recommendations.[6]

- **Better Infrastructure:-**In order to move fruits between distribution centers in various states, retailers must concentrate on improving transportation and cold-chain systems. Thus, it would lessen reliance on wholesale markets.[3]
- **Supporting large-scale operations:-**Having a distribution center that serves more stores in a city makes economic sense. This would encourage direct sourcing from farmers and eliminate needless middlemen as a result.
- **The creation of farmer cooperatives:-** Due to the increased collective volume, this would provide farmers with more negotiating leverage. The government ought to start this procedure. Retailers and cooperative groups could enter into contracts. Less supply for merchants and higher costs for farmers would result from this interruption.[1]
- **Teaching farmers good agricultural techniques:-** The majority of waste in the supply chain for fruits happens during the farming phases.

In most of India, traditional cropping patterns are common. Additionally, seeds for various seasons are available for a variety of fruits. These techniques could help deal with the seasonality issue more effectively.[13]

- **Post-harvest handling**:-This has a significant impact on the fresh produce's shelf life. Retailers should make sure that fruits get at least some human touch. The adoption of contemporary packaging and staff training could accomplish this.

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