

Problems in Supply Chain Management of Seasonal Fruits

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ABSTRACT

Demand and supply is a theory that explains how sellers and buyers interact for a given resource. The project discusses both the demand for seasonal fruits as well as the availability of seasonal fruits in India. It discusses the issues with seasonal fruit supply chains and how to improve them. It explains various aspects such as warehousing, transportation, perishability etc. due to which the sellers faces losses. It also focuses on the issues that buyers and sellers faced during COVID-19 and how they were affected because of it.

Keywords: Supply chain management; Warehousing; Storehouses

INTRODUCTION

In India, around 60% of fruit quality is lost in the stockpile from the ranch to the last shopper. Customers really wind up paying around 35% beyond what they could be paying in the event that the stock was improved, in light of wastage just as various edges in the current stockpile structure. The rancher in India gets around 30% of what the purchaser pays at the retail location. Contrast this and the circumstance acquiring in the USA, where ranchers can get up to 70 percent of the last retail cost and wastage levels are just about as low as 4 to 6 percent. One can undoubtedly comprehend the advantages that could be produced from copying those practices and tapping that aptitude for the inventory in India. As production network management includes acquiring the right information sources (natural substances. Parts and capital Equipment's): changing over them proficiently into completed items and dispatching them to the last objections: there is a need to concentrate regarding how the organization's providers acquire their bits of feedbacks [1,2]. The inventory network point of view can assist the retailers with recognizing prevalent providers and wholesalers and assist them with further developing efficiency, which eventually cuts down the client's costs. Simultaneously, market coordinated operations helps arranging the foundation to fulfill need, then, at that point, carrying out and controlling the actual progressions of material and last merchandise from starting place to points of utilization, to meet client necessities at a benefit. Till now most retailers in India have put significantly into the front end, however moderately minimal toward the back and store

network. Indeed, even in nations like the USA. Germany and England, where coordinated retail is exceptionally evolved; production network productivity is a central issue. The idea of retail area in India is not quite the same as different nations all over the planet. The coordinated retail area in India is exceptionally divided and there are tremendous shortcomings in the store network [3,4].

The main piece of retailing business is to track down a harmony between putting resources into front-end and back-end tasks. The channel elements will change over next a few years as the retailers begin filling in size and their haggling power is probably going to increment. Likely that would bring a shared comprehension among fabricates and retailers of some sort or another to foster solid production network organization. In such a situation, both the current administrators and new administrators should invest cooperative amounts of energy to transition away from failures in the store network organization.

India is one nation where the agriculture contributes a massively in its GDP. Indian agriculture area produces 64% business and 18% of nation's commodity. India is second biggest maker of fruits on the planet. India won the second biggest fruit exporter. India's portion is just 1% of world exchange. India has an enormous chance to turn into a main worldwide food provider if by some stroke of good luck it has the right advertising systems and obviously lithe. Versatile and effective production network. India has variety in many its populace with a few strict gatherings with various food propensities and culture. This variety ought to be utilized to benefit to turn into

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the "Halal Food Hub". "Natural food center point", the "Veggie lover food center" the "Ocean bottom center point" among others [5]. The food production network is intricate with transitory merchandise and various little partners. In India, the foundation interfacing these accomplices is extremely powerless. Each partner: ranchers, wholesalers, food makers, retailers all work in storehouses. Likewise, request gauging is absolutely missing and the ranchers attempt to push what they produce in to the market. Information incorporation, monetary stream the board, supply request coordinating, cooperative anticipating, data sharing, products development synchronization through proficient vehicle planning are all around rehearsed in high innovation enterprises with massive advantages. These accepted procedures should track down their direction in to the fruit supply. Cold chain coordinated operations supply should exploit innovation enhancements in information catch and pressure along the inventory network and supply request coordinating. Additionally, the store network should be planned and worked overall in a coordinated way with the cycles of new item advancement, acquirement and request to conveyance processes all around planned and very much upheld utilizing IT apparatuses and programming [6]. The food production network can be partitioned into various areas. Farming, cultivation, and hydroponics are the essential makers, the makers who process the nourishment for prepared to eat or cook design along with the bundling organizations are in the moderate stage, and the retailers, wholesalers and food providers are in the last phase of the production network. At each stage esteem is added by the new proprietorship like processors, merchants, packers, and so forth, and the expense and benefits are important for the business. The food things can go to the last purchaser from any of the three phases: from ranchers as new produce. To the food providers straightforwardly from the producer lastly from the retailer (little or large) to the shopper. The development of products starting with one partner then onto the next is worked with by the in house or outsider strategies specialist cooperative. The data the executives is finished by the all the partners and their data frameworks are totally interconnected consistently. When it comes to the seasonal fruits, there is also a point to ponder upon that the supply chain functions for the duration till fruits are available and remains non-operational during rest of the year. What we depicted above is the condition of pecking order in the high level nations. In India and other agricultural nations.

LITERATURE REVIEW

Scope of supply chain management in fruits and vegetables in India

Sheoran A2 ICSIR-National Institute of Science, Technology and Development Studies, Pusa Gate, KS Krishnan Marg, New Delhi, India: The purpose of Supply chain management is to maintain efficient system that can help in reducing post-harvest losses, enhances farmer's realization, reduce consumer price, resulting in optimal results for farmers, growers, wholesalers and customers.

We need address issues like the one of perishability as it leads to high marketing costs, market gluts and price fluctuations.

Secondly, we can reduce the postharvest losses through processing technologies such as thermal processing (bottling and canning), freezing, and dehydration of fruits. For example canned cherries.

Thirdly inducing demand-driven production to reduce wastage and facilitating the export of surplus produce after meeting the internal demand.

COVID-19 and supply chain disruption: evidence from food markets in India

The supply disruption was marked by unanticipated lockdown which lead to stock out due to panic buying. Restrictions due to COVID further impacted the arrival of fruits in the man dies. Supply chain disruptions during the lockdown were more severe for fruits that travel long distances to reach the markets. Example Ratanagiri Alphonso Mango to other states due to border restrictions. There were media reports on a collapse in daily truck movement during the lockdown, as the state governments implemented strong border controls.

Cold chain: a weak link in the fruits and vegetables supply chain in India

It is astonishing to know that India generates waste of about 2 lac crore worth of fruits. In order address this problem and perishability of fruits we need a robust cold chain system. Cold chain system is a logistics system that provides suitable conditions for fruits so that the problem of shelf life of perishable goods can be solved through thermal and refrigerated packaging methods and logistical planning in order to protect the quality of shipments.

But unfortunately, as per FICCI report, India does not have a comprehensive cold-chain network because of which more than 50% of produce is transported using bullock carts or trucks with no packaging or packaged in gunny bags. Also, most of the transportation is done in un-refrigerated open trucks.

Food loss analysis: causes and solutions - mango supply chain in India by the food and agriculture organization of the United Nations

The critical loss points in this supply chain include quantitative loss of 12 percent as a result of sorting mainly in the form of cracked fruit due to faulty harvesting. The traditional method of ripening is a CLP with quantitative loss of 19.75 percent and 20 percent qualitative loss due to decay and uneven fruit ripening. The losses incurred at different steps in the supply chain have a direct impact to the smallholder farmers. On-farm losses and those incurred after harvest mean loss opportunity for sale. These losses can be minimized through on-farm trainings, use of plastic crate as they provide adequate ventilation and retard the ripening of mangoes while in transit and consequently the onset of decay thus extending the shelf life of mangoes in retail market.

Online sales of fruits and vegetables gaining traction-Ravindra Ojha

In India 16% of fruits and vegetables is destroyed. During the pandemic the farmers and the end-consumers are the top gainers due to online business. COVID restricted the movement of people which made the owners shift to fresh farms produce to no. of houses in least prices and good quality. E-business transformed into a well synchronized manner and problems like inventory management, transportation routes, last mile delivery attracts many qualified people to solve them which enhances value-creation in the supply chain.

Digital integration to enhance market efficiency and inclusion of smallholder farmers: A proposed model for fresh fruit and vegetable supply chain.

The hurdles in the supply chain of fruits and vegetables are inefficient marketing channels and an inadequate marketing structure that cause high and volatility in prices, leading to a lower income reaching the farmer. Agriculture marketing policies in India are encouraging private players to invest in agribusiness and work directly with farmers through contract farming. The main focus of this research report is how to improve the efficiency in the supply chain of fruits and vegetables. This focuses on removing intermediaries in the supply chain and improving the quality, inventory and packaging of the fruits and vegetables produced. It also focuses on increasing the transparency between farmers and consumers and also tries to solve the transportation problem through a full proof model with better equipment's (Figures 1-7).

Trends and innovations in value chain management of tropical fruits

The traditional route of supply chain is followed by maximum number of fruits suppliers which involves a lot of intermediaries until they reach the final consumers. In each stage of supply chain there is a lot of post-harvest loss. Factors like temperature, oxygen, light moisture etc. contributes to deterioration of fruits. The value chain in fruit industry deals with value addition in monetary terms and quality management in each stage. It is important to have a shorter supply chain to avoid any kind of losses and delivery of good quality fruits to the consumer. Hence, proper packaging, better irrigation techniques, pre-cooling storage, and transportation services helps a lot in removing losses and can give farmers the bargaining power.

Supply chain management of fruits and vegetables in India

Marketing of fruits and vegetables is complicated due to small land held by farmers, climatic conditions. Production spread in different geographical areas, varied consumption habit of Indian consumers and poor supply chain infrastructure. Also consumers demand fresh fruits for which efficient supply chain is needed. An efficient supply chain contributes in economic development by increasing production levels. Due to lot of intermediaries and lack of education framers are exploited as they don't have the correct picture of the market and what the

market demands. To solve this they should form a small association and tie up with large retailers to get good margin. An agreement with them will help them to follow good farming practices and know about the markets and the retailer will get fresh fruits and vegetables for sale.

Objectives of research

- **Perishability:** Losses due to shorter life-span
- **Warehousing and Transportation:** Ensuring efficient warehousing and transportation
- **COVID-19 Impact:** supply chain disruption due to COVID-19
- Non-functionality of supply chain during non-season
- Buying behavior of consumer with respect to seasonal fruits.

METHODOLOGY

Data collection

This research paper aims to spell out the supply and demand of seasonal fruits in India and how the aspects like perishability, warehousing, transportation, buying behavior of consumers and lockdowns due to COVID-19 pandemic has impacted the demand as well as the supply chain of seasonal fruits in the market.

For the purpose of our study, we have conducted a survey by taking two aspects which are consumers to see the demand side of the market and retailers and local vendors to see the supply side of the market. The consumer aspect was covered entirely through questionnaire survey and the retailers and local vendors was unstructured interview where we visited the local market and retail stores and got the questionnaire filled as per the responses received. Each interview took about 10-15 min each.

It is a qualitative research survey and we did the survey so that we can know the different mind sets of vendors and consumers. It will help us in knowing where the gap in the supply chain is and how the supply chain of seasonal fruits works and also how they prevent the losses of fruits.

We almost got 58 responses from the consumer's side and almost 15 responses from the retailers and local vendor's side.

Data analysis and interpretation



Figure 1: Retailers and vendors.

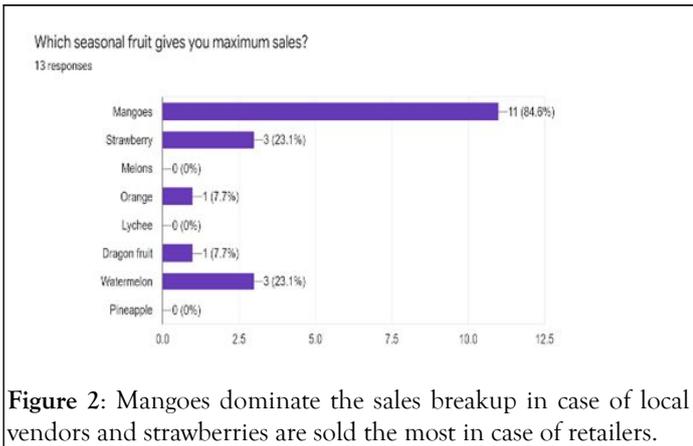


Figure 2: Mangoes dominate the sales breakup in case of local vendors and strawberries are sold the most in case of retailers.

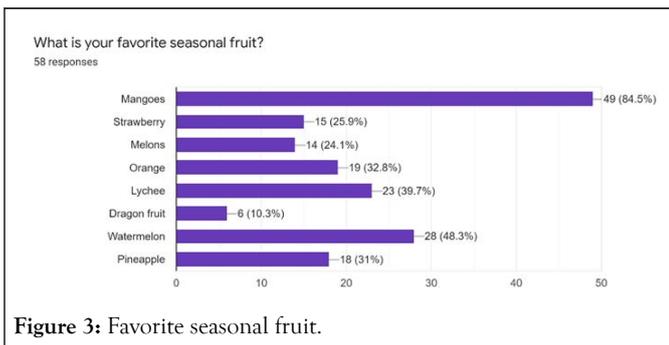


Figure 3: Favorite seasonal fruit.

Table 1: Hypothesis testing.

Hypothesis	1	2	3
Question	Your Frequency of purchasing seasonal fruits is	How do you find the quality of seasonal fruits available in your area?	Are the fruit markets available in your surroundings enough to cater your demands for seasonal fruits?
Null hypothesis	maximum people buy seasonal fruits at least twice a week	maximum people find fresh quality of seasonal fruit in their area	yes fruits are enough to cater the demands
Alternative hypothesis	maximum people do not buy seasonal fruits at least twice a week	maximum people do not find fresh quality of seasonal fruit in their area	no fruits are enough to cater the demands
Assumption	40% of people buy seasonal fruits twice a week, and 30% buy once a week & the rest of the it is divided equally between other option	60% of people find fresh quality of fruits others are distributed proportionately in other option	More than 80% responses will be YES and remaining will be NO.
Level of significance	5% or 0.05	5% or 0.05	5% or 0.05
Value of p	0.0000030285	0.0001385309	0.8955329032
Status of H0	Rejected	Rejected	Accepted
Conclusion	Since the P value is lower than the alpha we will reject the null hypothesis, which means that alternate hypothesis is true. Which means maximum people do not buy seasonal fruits twice a week they either prefer to buy once a week or thrice a week	Since the P value is lower than the alpha we will reject the null hypothesis, which means that alternate hypothesis is true. Which means that people do not find fresh quality of fruits in their area/locality they have to travel or eat what is available	Since the P value is higher than the alpha we will accept the null hypothesis, which means that alternate hypothesis is false. This concludes that consumers demand is catered well enough the fruits are never out of supply and available at all time.

We can see that most people prefer mangoes *i.e.* 84.5% and from this we can see that the demand for mangoes is high.

Even Lychee and watermelons are considerably demanded while the least likable fruit is Dragon fruit with 10.3%.

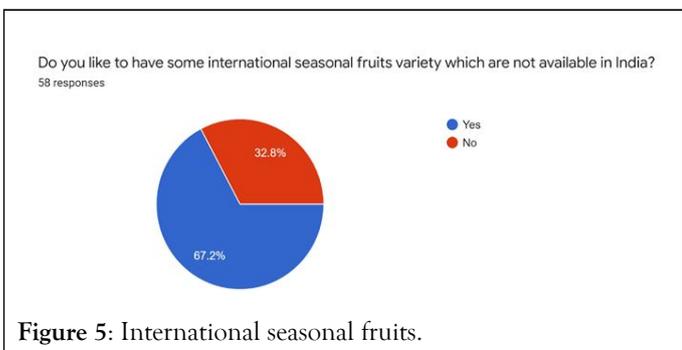
From this we can conclude that mangoes are the fruits that are demanded as well as sold the most and suppliers get most of the revenue from mangoes and thereafter from strawberry (Table 1).

Hypothesis Testing (Chi Squared X^2 Test)

Consumers



Through this we can interpret that the seasonal fruits seller charge either more than the value of fruits or charge the same as the value. They never charge below the value. Which means that most of the consumers are happy with the price they are paying for the fruits they are receiving and it also states that people are ready to pay more for good quality seasonal fruits despite of it being over-priced?



This means that there is demand for foreign seasonal fruits which are not available and if they are made available people will be willing to purchase it and pay more amount of money.

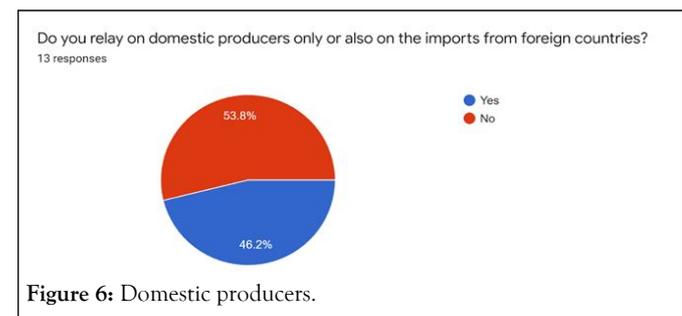


Table 2: Local vendors.

Hypothesis	1	2
Question	Which is the primary reason for the losses that you incur in selling of seasonal fruits?	How much quantity of seasonal fruits you lose due to the above reason.
Null hypothesis	maximum loss is due to warehousing and transportation	maximum people lose at least 5%-15%
Alternative hypothesis	maximum loss is not due to warehousing and transportation	maximum people lose more than 5%-15%

This concludes that maximum vendors buy their fruits from domestic producers only there are only few suppliers who import their fruits in comparison to its demand.

In market as we can see in the above pie chart there is huge demand for international fruits but the supply for the same is low which means that the consumers are not getting what they want from the market and it is the opportunity for the suppliers to raise their business by catering to the needs of the consumers.

Q) How can you prevent fruits from getting perished after purchasing them?

From the responses received most of consumer refrigerates the fruits to prevent them from perishing and or consuming it as soon as it was purchased.

Q) How do you solve the problem of perishability?

Even the local vendors keep the fruits either in cold storage or by selling it the day they get it.

RESULTS AND DISCUSSION

This suggests that if most of the people store the fruits in cold are so that they don't ripe or they sell or consume/buy in daily basis.

There are no more methods known or used by people to save the fruits from getting perished (Table 2).

Hypothesis testing (Chi Squared X² Test)

Assumption	30% loss is due to warehousing, 20% due to transportation, 40% due to unsold stock and 10% due to Weather pattern changes	60% of people loses 5%-15% and others are distributed proportionately
Level of significance	5% or 0.05	5% or 0.05
Value of p		0.7121925094
Status of H0	Rejected	Accepted
Conclusion	Since the P value is lower than the alpha we will reject the null hypothesis, which means that alternate hypothesis is true. Which concludes that losses are due to unsold stock or mainly due to unsold stock and not much from warehousing and transportation?	Since the P value is higher than the alpha we will accept the null hypothesis, which means that alternate hypothesis is false. This interprets that maximum people only loses 5-15% of the fruits they buy or produce and that to mainly because of unsold stock.

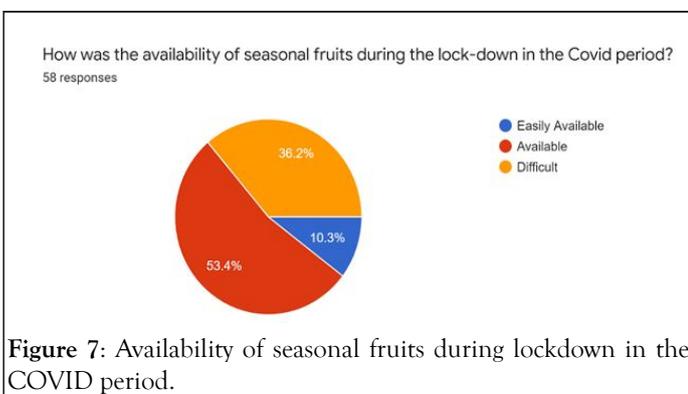


Figure 7: Availability of seasonal fruits during lockdown in the COVID period.

During lockdown we can see that fruits were not easily available. Consumers found it difficult to buy fruits as they were not easily available they bought fruits which were available. All fruits were not available and some of them were not supplied as well. Here we can see that no How COVID-19 has impacted your sales?

Also during COVID-19 the local vendors made heavy losses as they either went to their home town or people were not able to come and buy from them and the consumers also reduced as most people started ordering fruits online due to fear of COVID and also lead to closure of man dies and local markets. Sellers were not able to reach consumers and hence incurred heavy losses.

Also if we see the view point of retailers the sales were up for those retailers who were able to deliver at every door step as the consumers preferred those only and also their sales were only down when the family had either COVID patient with them. So, for some retailer the sales increase and also the profit as the consumers did not have any other option in such a crisis but some retailers also faced heavy losses due to less supply of fruits

How do you manage stiff competition in the marketplace?

As per the responses received the local vendors and retailers both maintain good quality and keep their prices at par or less to maintain the competition in the market. Mainly they charge less than their competitors to attract the customers to buy fruits from their stall. They also use different pricing strategies to

maintain competition and also to reduce competition in the market.

How do you adjust the quantity demanded and supplied so as to ensure minimum wastage of fruits?

The retailers try to adopt effective sales and sell fruits the very same day due to perishability menace. The fruits they order or buy are usually on the basis of the demand of the previous day or they stock less fruits in week days and more in weekends as people usually tends to go out in weekends to buy fruits as everyone is busy in week days. This is how they maintain their demand and supply to ensure minimum wastage.

CONCLUSION

Our nation in spite being the second largest producer of fruits after China (as stated by the National Horticulture Board in India) with 99.07 million metric tons of fruits production and about 6.66 million hectares of area under cultivation, still faces the problems of procurement, stocking, transportation and perishability of seasonal fruits which makes incomes of traders and farmers stagnant and without much of government support they still struggle to sell their stock. While the consumers remain cautious of quality, variety of seasonal fruit and prices they pay.

This status quo was further blighted by the pandemic lockdowns that affected both customers and sellers. Customers were skeptical and afraid of stepping out and buying fruits while for vendors the man dies and local markets remained closed. However it turned out as great opportunity for retail companies as they had their systems intact to assure safe quality fruits and customers who used to buy from local vendors switched to them because of safety guarantee and home delivery.

Hence we observed a definite scope of improvement in Indian practices of SCM of fresh seasonal fruit In India; infrastructure facilities such as roads are not developed in all regions of the country. Hence the transportation industry is not very efficient. Our country has diverse climatic conditions and hence during transportation, majority of fruits and vegetables gets deteriorated due to difference in temperatures. Hence there is

utmost need of cold transport system which will maintain the temperature of fruits. Small scale farmers are still exploited by middlemen and farmers do not get correct picture of the market and consumer demand. Farmers can come together and form co-operative societies/associations so that even a small farmer will be able to sell his produce and get protection from exploitation by middlemen. These associations can tie up with big retailers ensuring good margins. Contractual agreement will help both the parties; farmers will get correct market information, retailers can train the farmers in their farming techniques in order to increase productivity, retailers will get consistent supply of good quality fruits and they don't have to go in for hunting in mandies. The retailers can afford to have good cold storage facilities thus reducing the wastage which is the biggest concern in this sector.

Also our national fruit mango remains unbeatable seasonal fruit because of high liking and demand from customer's side and also the highest source of revenue for vendors during its season. Followed by mangoes are strawberries and pineapples.

RECOMMENDATIONS

More government initiatives are needed in order to improve conditions of local traders and farmers selling fruits as they do not get any direct benefits from its schemes and seem to be disappointed.

Reach of cold storage facility has to be widened as perishability remains an issue in case of seasonal fruits. Focus should be on better transport and cold-chain systems to make movement of seasonal fruits across distribution centers located in different states possible. It would thus reduce dependency on wholesale markets.

Management of quantity ordered for sale purpose as unsold stock remains to be main reason for the losses. Concepts of stock levels, EOQ can be designed suiting the suppliers need.

Enhance knowledge of local vendors and traders so that they can understand the market and consumers well and sell more and earn more. Training or workshops can be planned by local governments or Co-operatives.

LIMITATIONS

- Reluctance of respondents to contribute in research work.
- Lack of understanding of certain terms and definitions in local vendors.
- Norms and privacy concerns from the part of the retail companies in giving information.

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