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Supply Chain Management System of Fruits in Bangladesh

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ABSTRACT

Bangladesh is a country producing many fruits such mango, banana, litchi, papaya, guava, jackfruit, pine apple etc. But due to some reasons these types of fruits are not being exported in other countries of the world. However, the present study has conducted to identify the supply chain management system of fruits in Bangladesh, to find out the problems of supply chain management system of fruits in Bangladesh and to provide policy recommendations to overcome the problems of supply chain management system of fruits in Bangladesh. The study was conducted at 6 districts in Bangladesh. Rajshahi district, Dinajpur district, Tangail district, Jessore district, Narsingdi district and Dhaka district. Because Rajshaih is famous for mango and guava cultivation, Dinajpur is famous for litchi cultivation, Narsingdi is famous for banana cultivation, Jessore is famous for papaya cultivation and Tangail is famous for pineapple cultivation. Dhaka district has selected because most of the fruits come in different wholesale markets like Karwanbazar, Jatrabari, Sambazar, Babubazar etc. From the result it was found that certain problems may exist in this fruit supply chain management system such as numerous stakeholders like farmers, small and medium wholesalers, transporters, retailers and end customers. Poor packaging, poor handling methods and marketing system cause high post-harvest loss of the fruits. Transportation systems for fruits are not so scientific and for this reason post harvest loss occur. Transportation cost is also high due to manmade problems. Price hike is also a problem for the consumers' level. Farmers have very few knowledge on fruit supply chain management system, fruit marketing management. Due to lack of linkage with regional market, consequently reduces farmers' income. On the other hand, in Bangladesh it has been found that the intermediaries in the market are small in number but they are organized. So they dominate farmers and force them to sell fruits at a lower price as the farmer has no way to bring back the fruits from the market as it involves extra cost. One of the most important reasons for not getting the best price is the involvement of local broker and wholesaler organization's dominance. But there are selected financial difficulties and avoidable activities which increase the ultimate product price. Fruit supply chain management system studies provided valuable insights into the supply chain structure, market actors, intermediary's activities, their operations, value adding, price and profit margin movement of the existing supply chain management system. The fruit supply chain management has its particular structure and special demand. The study is mainly focused on the investigation of the product flow from the farmer through various marketing intermediaries to the consumers. This study primarily identifies the market intermediaries between the farmers and the consumers and their activities in the supply chain. From the result it was also found that latest technologies of post harvest are also unavailable in Bangladesh.

Key words: Supply Chain, Management, Fruits, Marketing, Agro products, Bangladesh

INTRODUCTION

Supply Chain Management (SCM) has been defined [1] as the design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally.[2] SCM practice draws heavily from the areas of industrial engineering, systems engineering, operations management, logistics, procurement, information technology, and marketing [3]and strives for an integrated approach. Marketing channels play an important role in supply chain management [4] the supply chain management system is a key structure for understanding how a product moves from producer to the customer. Supply chain analysis is a full range of activities which are required to bring a product to service from beginning through different phases of production involving a combination of physical transformation and the input of various producer services, delivery to final consumers and final disposal are used. It provides a way to understand the business policy, mechanism, and product and information movement for increasing

[1] "Supply Chain - School of Operations Research and Information Engineering - Cornell Engineering". www.orie.cornell.edu. Retrieved 26 July 2017.
[2] "Supply chain management (SCM)". APICS Dictionary. Retrieved 2016-07-19. supply chain management[:] The design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally.
[3] Kozlenkova, Irina V.; Hult, G. Tomas M.; Lund, Donald J.; Mena, Jeannette A.; Kekec, Pinar (2015-05-12). "The Role of Marketing Channels in Supply Chain Management". Journal of Retailing. 91 (4): 586–609.
[4] ibid

efficiency, productivity, customer service and a better business environment. It initiates better linkage among the producer, market actors, and consumer in the supply chain. In the year 2016-17 about 174208 hectare land were cultivated for mango, 76295 hectare land were cultivated for jackfruit, 28990 hectare land were cultivated for litchi, 89908 hectare land were cultivated for banana, 29700hectare land were cultivated for papaya in Bangladesh (Source: Department of Agriculture Extension, Ministry of Agriculture). In the year 2016-17 about 2143443 metric ton mangos were produced, 1751549 metric ton Jackfruits were produced, 184971 metric ton litchis were produced, 1766917 metric ton bananas were produced, 680179 metric ton papayas were produced in Bangladesh. (Source: Department of Agriculture Extension, Ministry of Agriculture)

In the supply chain management system of fruit trading, different intermediary stakeholders are involved between producer and consumer. They are the local wholesaler, divisional wholesaler, the regional wholesaler, and retailer. These intermediary stakeholders created a long supply chain management system. Intermediaries are an essential part of fruits supply chain in Bangladesh. They share profit with the producer without adding any value to the product. Their main function is to transport fruits and keeps business communication with other market players. At present, farmers have no influences in product pricing rather they are strongly managed and monopolized by giant traders, wholesalers, and retailer syndicates. The syndicates of traders, wholesalers, and retailers are taking the profitability and farmers are facing challenges to get the cost of production. But farmers in Bangladesh are not able to avoid intermediaries' for carrying their product to market [2]. As a result, the consumers are not getting the product at an affordable price. The consumers are pays two to three times more than the farmer's price. This paper tries to show and explain the fruit supply chain management system by conducting value stream analysis, cost and profit flow analysis and cause-effect analysis to identify non-value adding activities and the causes of the price hike. Nevertheless this research tried to recommend some appropriate policies as well as design a future supply chain management system to overcome the obstructions of the present supply chain. So, that the farmers and the consumers both are mutually benefited. Supply, chain and management are three key concepts of the study of supply chain management. Supply means to deliver any product from one place to another place. Chain is a system of a company or organization, people, activities, information, and resources involved in supplying a product from producer to consumer. In this research supply chain activities involve the transformation of fruit products that are delivered to the end customer.

OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

1. To identify the supply chain management system of fruits in Bangladesh.
2. To find out the problems of supply chain management system of fruits in Bangladesh.
3. To provide policy recommendations to overcome the problems of supply chain management system of fruits in Bangladesh.

METHODOLOGY OF THE STUDY

1. Research Design

The design of the study was descriptive as well as survey type.

2. Study Area

The study was conducted at 6 districts in Bangladesh. Rajshahi districts, Dinajpur district, Tangail district, Jessore district, Narsingdi district and Dhaka district. Because Rajshaih is famous for mango and guava cultivation, Dinajpur is famous for litchi cultivation, Narsingdi is famous for banana cultivation, Jessore is famous for papaya cultivation and Tangail is famous for pineapple cultivation. Dhaka district has selected because most of the fruits come in different wholesale markets like Karwanbazar, Jatrabari, Sambazar, Babubazar etc.

3. Sampling method

A purposive sampling technique was adopted for this study.

4. Sample size

From each district respondents were selected. So, total 300 respondents were selected for the study.

5. Source of Data

Data were collected from primary and secondary sources. In this study both qualitative and quantitative information and data were required. In order to generate database of the study, all necessary information were collected from different primary and secondary sources.

6. Source of Primary Data

Primary data were collected from the respondents of the study.

7. Source of Secondary Data

Secondary data were collected from reference books on the matter, reports of the Department of Agricultural Extension, Ministry of Agriculture, Bangladesh Bureau of statistics (BBS), NGOs Newspapers, periodicals, articles

from national and international level. Internet sources were also used for research. An attempt was made to include the latest information whenever available.

8. Methods of Data Collection

A questionnaire was developed in order to make an extensive study. Necessary data were collected from the respondents through face to face interview with the respondents, observation and review of concerned documents.

9. Tools of Data Collection

Questionnaire was used for primary data collection.

10. Review of Documents

Secondary information i.e. reference books, annual reports of the reports of the Department of Agricultural Extension, Ministry of Agriculture, journals, research report, newspaper, magazines etc were used in this study.

11. Data Processing and Analysis:

Collected data were checked for error and then data entry were completed and finally data were analyzed and presented through the use of necessary figures, tables and charts by using Computer Program Microsoft Excel.

RESULTS AND DISCUSSION

1. Present Supply Chain Management System Map

The value chain map shows the movement of the fruits product among the supply chain and identifies the actors and their activities. In present supply chain, illustrates in the figure 1 identify the major channel of the fruits supply chain in Bangladesh. The value chain starts from the producer and end at consumers. From producer to consumer, product follows a lengthy market channel. Different market actors known as market intermediaries or stakeholder involve in this value chain. Other market intermediaries are the local wholesaler, divisional wholesaler, the regional wholesaler, and retailer.

•**Farmer:** Farmers are the cultivator of the fruits. They cultivate different types of fruits and bring their product to sell in their local market. The amount and types of fruits differ from season to season. The farmer sells 90% of their product to the local wholesaler and the remaining 10% in the local retail market.

•**Local wholesaler:** Local wholesaler purchases their products from the farmer. Basically, they fixed the price paid to the farmer. They discuss with the divisional wholesaler. Local wholesaler sends their product lot to the different division, according to the market demand and market price. They also sell their product to the local market, but a little amount. They make a market margin of 15% to 25%.

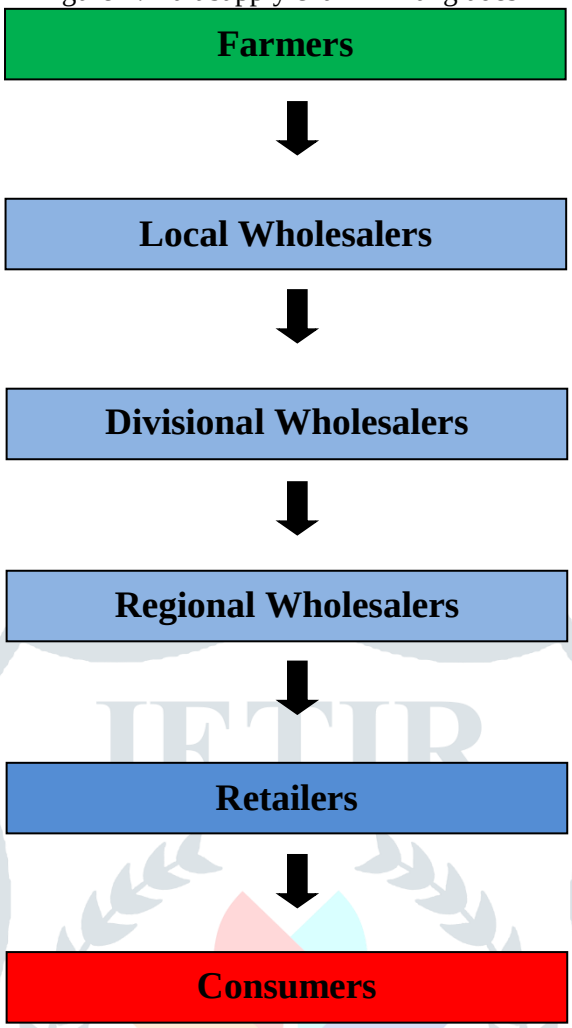
•**Divisional wholesaler:** Divisional wholesaler collects their product from local wholesalers. They deal with a large amount of fruits. Actually, they act like a divisional distributor. They sell their product to the regional wholesaler. They serve as a fixed commission agent. They also sell their product to the local retailer. They make a margin about 5% to 10%.

•**Regional wholesaler:** Regional wholesaler collect product from the divisional wholesaler. Sometimes they collect their product from local wholesalers. They make a market margin about 5% to 10%.

•**Retailer:** Retailer is an end connector to market. They are directly linked to the consumer. They purchase their product from the wholesaler and sell to the consumer and make a market margin about 5% to 15%.

•**Customer:** Customers are the ultimate users of fruits who consume the fruits. They buy the fruits from the retailer. There are also some customers who buy their product from the regional market like Kawran bazaar, Jatrabari etc. In this case the customers benefitted but customers have to buy large volume like 5 kg for each fruits.

Figure 1: fruit supply chain in Bangladesh



2 Market Channel of fruit From Source to Dhaka

In Bangladesh, Rajshahi is famous for its fruit production. Farmers bring their product to local wholesale market. The wholesaler from those markets purchases their product from the local farmer and sells these fruits to the other divisional wholesaler. They send their product to Dhaka about 60%, and they send the rest of the amount of the rest of the areas of Bangladesh. Sometimes they directly sell their product to other wholesalers, and sometimes they used other wholesalers to sell their product and give a market percentage after they sell. Regional wholesale market collects their product from the divisional wholesaler or sometimes local wholesaler. The divisional wholesaler also sells their product to other small wholesalers and retailer. The retailer in Dhaka city collects product from the regional wholesaler. The retailer sells their product to consumers.

3. Activities Involved In the Present Value Chain

Value stream analysis is used to examine fruit supply chain. In this analysis, activities are divided into three types. These are value added activities, non-value added activities and necessary non-value added activities. Value added activities are those activities; customers are willing to pay for it. The consumer only pays for value added activities like production, cleaning, processing, and packaging for maintaining good quality. These activities are important and essential for every value chain. Non-value added activities are intermediaries holding and stocking for a long time, unnecessary processing like using chemicals to keep fruit, fresh and green for a long time, intermediate loading and unloading etc. This nonvalue added activities are done by various intermediaries like the local wholesaler, divisional wholesaler, the regional wholesaler, retailer, etc. Holding fruit usually adds no value to the product but its increase handling cost, quality cost, etc. Only value added activities are directly involved with production activities. In fruit supply chain value added activities are limited.

In the supply chain, there is another type of activity which is not related to production or value added activities, but these types of non-value added activities are unavoidable. These types of work are known as necessary non-value added activities. Necessary non-value added activities are transportation, receiving, measuring weight by various intermediaries. The analysis takes place between every step in the value chain and the major activities like value added, non-value added and necessary non-value added activities are identified.

Activities between farmer and local wholesaler

Value adding process:
1. Collecting fruits
2. Cleaning the fruits
3. Sorting of fruits
4. Grading of fruits

Non value adding process:
1. Holding of fruits
2. Packaging of fruits
3. Loading of fruits
4. Unloading of fruits

Necessary non-value adding activities:
1. Transportation to local market

Activities between local wholesalers to divisional wholesaler

Non value adding process:
1. Loading Truck
2. Unloading
3. Intermediate holding

Necessary non-value adding activities:
1. Transportation

Activities between Divisional wholesalers to Regional wholesale market

Non value adding process:
1. Loading
2. Unloading
3. Intermediate Holding

Necessary non-value adding activities:
1. Transportation

Activities between Regional wholesaler to retailer/supper shop:

Non value adding process:
1. Loading
2. Unloading
3. Intermediate holding

Necessary non-value adding activities:
1. Transportation

Activities between Retailers to customer:

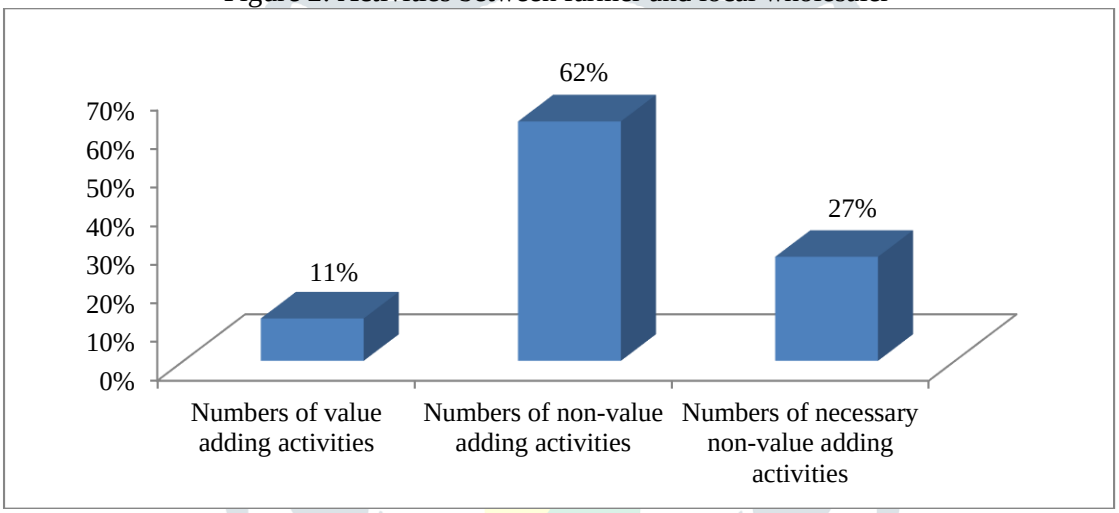
Non value adding process:
1. Holding at Retailer
2. Unloading

Necessary non-value adding activities:
1. Transportation
2. Cleaning

Total number of activities between farmers towards customers: 22
Numbers of value adding activities: 2
Numbers of non-value adding activities: 14
Numbers of necessary non-value adding activities: 6

Total 22 major activities found in this fruit supply chain, in which numbers of value adding activities are 2. These value adding activities are reaping fruit from the field and cleaning. These value adding activities are done by the farmer. Value adding activities consume about 9% of the whole activities (Figure 2). The number of non-value adding activities in this supply chain is 14. Mainly these non-value adding activities are intermediate holding, loading and unloading trucks in different stage state above by different intermediaries. This non-value adding activities consume a maximum percentage of total work and it is about 62% (Figure 2).These activities increase the cost of the product and create a high price for the ultimate consumer. The number of necessary non-value adding activities is 6. They are related to transportation at the different level and necessary nonvalue adding activities consume about 27% of the total amount (Figure 2).

Figure 2: Activities between farmer and local wholesaler



4. Cost and Price Movement in Supply Chain

At each and every step of a supply chain, the cost is added to the product. So the price is increased accordingly. As it is an inefficient and long chain of market intermediary cause's price increase dramatically from farmer to consumer. Sometimes price is two to three times of farmer's selling price. The study investigates the price at every level of this fruit value chain and the possible causes related to the increase of price. The existing fruit marketing system consists of a farmer, local wholesaler, divisional wholesaler, regional wholesaler, retailer and consumer. Price is negotiated between the farmer and the local wholesaler. Product and cost flow start from the farmer. The farmer is the main producer of fruit. He invests his capital, land, and labor to produce fruit. So farmers added value and price in the fruit. Cost involve in his activities. The farmer passes his fruit to a local wholesaler at a cost; negotiate between him and the local wholesaler. Local wholesaler passes it to divisional wholesalers at a price higher than his cost. He takes margin from his exchange. The divisional wholesaler sells it to the regional wholesaler. The regional wholesaler passes it to the retailer and retailer sells it to the consumer. Due to the variation of time, cost, amount and activities involve in the process, this price addition may be different. The study considers the buying price from the farmer of a group of fruit and the selling price of the same fruit at the retail market of Dhaka. From the study it was found that the selling price in the retail market is two times higher than that of the selling price of the farmer. For example, buying price of Mango in 2017 was 40 Taka per kg at Sibgonj at Chapai Nowabgonj. The selling price of Mango in the retail markets in Dhaka was 80 Taka per kg. Price for per kg Mango is about 40 Taka Table 1 represents the percentage of price increase of various fruits. The maximum price increase was about 100% for Mango, Banana and Pineapple, and the minimum price increase was about 66% for Litchi. The profit margin varies from product to product. These percentages of the margin of various fruits among different stakeholder are represented in Table 1.

Table 1: Average buying price, selling price and margin percentage of different fruits

Fruits	Average buying Price at production places	Average selling price in Dhaka among customers	Margin Percentage
Mango	40 Taka/Kg	80 Taka/Kg	100
Litchi	200 Taka/100 Pcs	300 Taka/100 Pcs	66
Banana	200Taka/Peduncle	400Taka/Peduncle	100
Papaya	50 Taka/Kg	85 Taka/Kg	70
Pineapple	25 Taka/piece	50 Taka/piece	100
Guava	60 Taka/Kg	115 Taka/Kg	92

Source: Field Survey, 2017

Table 2: Price of various fruits among the market intermediaries

Fruits	Farmers' sell price	Local wholesalers' sell price	Divisional wholesalers' sell price	Regional wholesalers' sell price	Retailers' sell price
Mango	40 Taka/Kg	45 Taka/Kg	50 Taka/Kg	60 Taka/Kg	80 Taka/Kg
Litchi	200 Taka/100 Pcs	210 Taka/100 Pcs	230 Taka/100 Pcs	250 Taka/100 Pcs	300 Taka/100 Pcs
Banana	200Taka/Peduncle	220Taka/Peduncle	240Taka/Peduncle	280Taka/Peduncle	400Taka/Peduncle
Papaya	50 Taka/Kg	55 Taka/Kg	60 Taka/Kg	67 Taka/Kg	85 Taka/Kg
Pineapple	25 Taka/piece	28 Taka/piece	34 Taka/piece	40 Taka/piece	50 Taka/piece
Guava	60 Taka/Kg	65 Taka/Kg	75 Taka/Kg	90 Taka/Kg	115 Taka/Kg

Source: Field Survey, 2017

Price of various fruits among the market intermediaries has shown in the table 2. From the result it was found that in case of banana, farmers' sell price was 200 taka per Peduncle, local wholesalers' sell price was 220 taka per Peduncle. Price gap between Local wholesalers and farmers was (220-200) taka per Peduncle = 20 taka per Peduncle. Divisional wholesalers' sell price was 240 taka per Peduncle. Price gap between Local wholesalers and Divisional wholesalers was (240-220) taka per Peduncle= 20 taka per Peduncle. Regional wholesalers' sell price was 280 taka per Peduncle. Price gap between Regional wholesalers and Divisional wholesalers was (280-240) taka per Peduncle=40 taka per Peduncle. Retailers' sell price was 400 taka per Kg. Price gap between Retailers and Regional wholesalers was (400-280) taka per Peduncle=120 taka per peduncle. Result shows that gap between producers (farmers) to consumers was (400-200) taka per Peduncle=200 taka per Peduncle. On the other hand Local wholesalers get 20 taka per Peduncle and the retailers get (400-280) taka per Peduncle =120 taka per Peduncle. It indicates that the farmers who are the main person for fruits production are getting the very less amount of profit or not profit in some case whereas the local wholesalers and retailer get profit near the price of farmers. It is very alarming for the farmers because they are getting the amount of money which is equal to the profit of the local wholesalers and retailers.

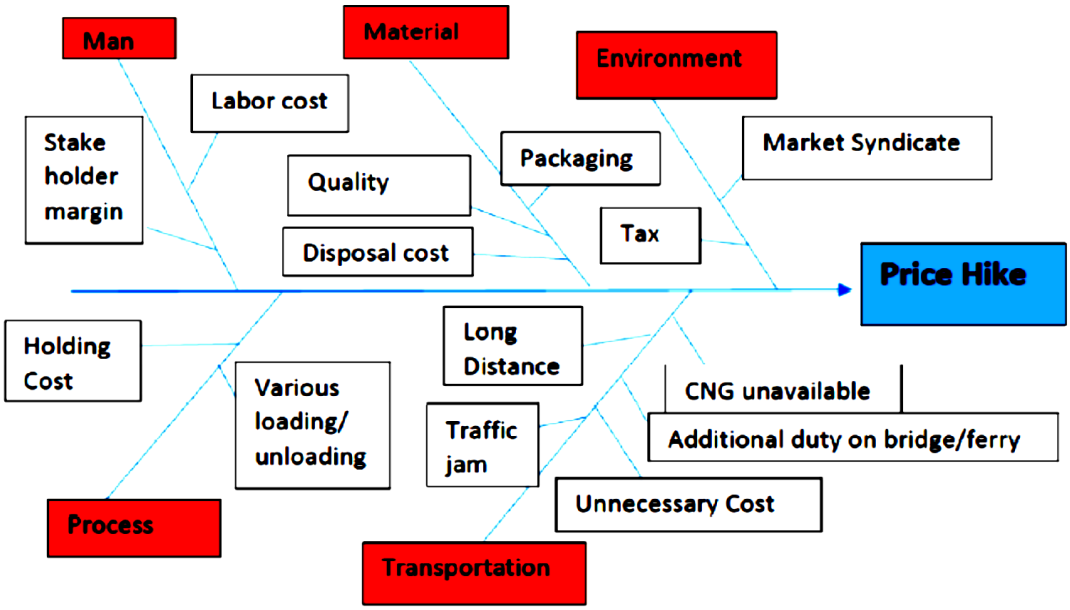
Table 3: Percentage of market margin of various fruits among the market intermediaries

Fruits	Farmer	Local wholesaler	Divisional wholesaler	Regional wholesaler	Retailer
Mango	40 Taka/Kg	11.25	10	16	31.67
Litchi	200 Taka/100 Pcs	4.5	8.57	7.40	20
Banana	200Taka/Peduncle	9	7.7	10.41	42.86
Papaya	50 Taka/Kg	9	7.27	8.33	23.88
Pineapple	25 Taka/piece	10	17.85	11.76	23
Guava	80 Taka/Kg	7.5	12.31	14.67	25.56

Source: Field Survey, 2017

Percentage of market margin of various fruits among the market intermediaries have shown in the above table 3. The farmers are getting a very few amount of profit margin in some cases they are not getting the profit margin. Because the cost of production for fruits are increasing day by day for the increasing price of fertilizers, pesticides, fuel price and labour cost. From the result it was found that the maximum margin is shared by local regional wholesaler and retailer. Regional wholesaler receives maximum margin percentage because they bear the cost of business cost and working capital cost. They have also their own cost, related to rent, labor fee, market fee, etc. As retailer sells only a small amount of fruit they added maximum margin after regional wholesaler. Other market actors share relatively same market margin and their cost was relatively more or less same. We have analyzed this value chain and tried to identify the major cause of price hike. The cause effect analysis is introduced to identify the price hike (Figure 3). The major causes are divided into man related cause, process related cause, material related causes, transportation- related causes, and environment related cause. On a man related price hike, the study found that fruit supply chain is a long supply chain, many stakeholders and labor involve in the channel.

Figure 3: Cause effect diagram for price hike



Every stakeholder shares margin for their involvement and activities. So the ultimate price is raised for so many market intermediaries. As the labor cost rises high, every labor needs to pay 300 to 400 Taka per day; this is also a cause of price hike of fruit. Numerous types of transportation are needed in the fruit supply chain. For the transportation between two markets actor, loading and unloading truck is needed. This unnecessary loading and unloading need extra labor and extra cost. Intermediate holding also considers extra cost as holding cost, processing costs, and labor cost. These processes related causes are responsible for the price hike of fruit.

Transportation is very important in the fruit value chain. Various types of transportation are required to bring the fruit from the farmer to the consumer. So it takes a huge amount of cost on the total product cost. Transportation related causes are the traffic jam, long distance needs extra payment, additional duty cost of the bridge and the ferry, unnecessary and unlawful money collection in transportation, etc. On the other hand, in Jessore, Rajshahi and Dinajpur gas station is not available; as a result, the vehicle need to use Diesel or Petrol as a fuel and this incurs higher costs than CNG. As a result, it's creating a huge amount of extra cost on the final product .Material related price hike causes are packaging cost, quality cost, and disposal cost. To ensure good quality fruit, market actor needs extra care on packaging, transportation, handling etc. which create the additional payment. Market syndicate and intermediate domination are one of the major causes of the price hike. In every market, there exist market syndicate and government have no control over them. So they create artificial demand over the market and raise the price every time without any causes. They take maximum margin as their profit from the market. They dominate the farmer and the customer. They don't share the actual market information to the farmer and the customer for their profit.

5. Problems Identified in Existing Fruit Supply Chain Management System

By analyzing the existing fruit supply chain, several problems have been identified. The problems are explained below:

a) Long supply chain

Supply chain always involved to improve the product flow and minimize the cost. The intermediaries play a vital role to make a proper connection between the producer and consumers, but too much involvement of intermediaries in the supply chain can cause the unequal price margin for both the producer and the consumers and also creates a long awaited supply chain which is not appropriate for the perishable product like fruits. Because the value or quality of fruit will decrease rapidly once they are harvested and will keep decaying when being delivered. The revenue of the supplier will depend on the condition of the product when they are received. Thus, the timely production and delivery of perishable foods significantly affect the supplier's revenue. So a simply understood and properly structured supply chain is much needed for a successful fruit production flow.

b) Many intermediaries from farmer to customer

Intermediaries make a connection between the producer and the consumer. They should be very honest and friendly for a better supply chain. But in Bangladesh there are many intermediaries involvements in one food supply chain and they are cutting off a major portion of the consumers' price as profit and also they throw different types of syndicate towards the poor farmers. Local wholesaler, divisional wholesaler, regional wholesaler, retailer are the different kinds of intermediaries in the fruit production flow.

c) Non-value added activities in the supply chain

The more there are a number of intermediaries the more there is a number of non-value added activities which are of no use rather increases the price of the product. The huge numbers of intermediaries added the extra cost. These are inventory cost, labor cost, packaging cost at the different stages of the stocking and loading- unloading options in the local market and thus increases the total cost of the produce.

d) Intermediaries syndicate

In Bangladesh, many intermediary wholesalers manage the fruit flow from producer to customer. Local wholesaler, divisional wholesaler, regional wholesaler, and retailer are the different types of intermediaries and they form the intermediary syndicate for the producer in different stages of the fruit supply flow. In which producer bound to pay otherwise he will not be able to sell his product to the market.

e) Seasonal climate problem and natural disaster

Bangladesh has a unique climate year for fruit production. The year is divided into two distinct seasons: Rabi (winter from October to November) and Kharif (hot humid season from April to October). Kharif season has a relatively high temperature, humidity, and rainfall so it is suitable for most of the fruit crops. But the irrigation problem with this season hinders production. At the peak harvest time, the farmers do not even recoup production costs by selling their product. During the Rabi season, only a few fruits can be successfully grown. The low temperatures and low rainfall of the Rabi season are not conducive for most other fruits. As a result, there is always scarcity of fruits during the Rabi season. The price of fruits at that time is very high; so much so that fruit prices often exceed the regular price. To improve fruit production and supply, we should develop varieties suitable for growing in the adverse weather condition of the Rabi season.

f) Unstable demand and supply

During the peak season, a market glut causes the producers to sell their product at a throw-away price. Under this situation, farmers lose their interest in growing fruits on their own. Inversely, in Rabi season there is always a scarcity of fruits and the price of fruit at that time is very high. To improve this fruit production, supply and demand, we should develop a variety of options suitable for growing in the adverse weather conditions of the Rabi season.

g) Lack of Government control over market

The fruit distribution in Bangladesh is mostly terminated by the local wholesaler and stakeholders. Government involvement in fruit marketing is minimal and it is almost zero. The price is determined by open bargaining of buyer attending the market, thus the poor farmers are bound to sell their produce at that insufficient price. But if the government established a proper price policy for the fruit producer then this price difference can be solved immediately from the market. The government should regularly check the market to control intermediary syndicate. The government should take action against hoarders and market manipulators to control country's marketing system.

h) Farmers are bound to sell to a local wholesaler syndicate

Due to market information are unavailable to producers and also a lack of accessibility to a high value market, producers are always in mess thinking about whom to sell their product in time and as a result, they are often bound to sell their product to local wholesaler syndicate at a very cheap price.

i) Creation of an artificial demand

Sometimes the cunning local wholesaler makes an artificial demand among the market only to cheat the producers. They make a fake sort of demand. As a result of that demand, producers then sell their whole bunch of product to the wholesaler at a very reasonable price thinking that this is their profit. But actually they are in a huge loss because the wholesaler then sells this product at a very much higher price in town and city market.

j) Unequal profit margin system

Fruit production, marketing depends on many intermediaries because of the lack of proper infrastructure and results huge delivery cost and wastage. The price of fruit increases with the number of intermediaries and price is less if there are fewer intermediaries. Thus, the price of fruits at a different market of Dhaka becomes almost multiple times higher than that in rural areas. This unequal profit margin brought clumsiness among the producers and deprived them.

k) A Poor transportation system causes extra cost

As a reason of socioeconomic conditions of Bangladesh, most of the fruit market is located mainly in the towns and cities. The transportation system in rural areas is very poor, so the marketing of growing fruits from the rural areas to urban towns is expensive. As a result, growers have to pay extra money for the transportation.

l) Inadequate knowledge and skills of producers in using modern techniques

A great cultivation of fruit production requires more care than the cultivation of field crops. But in Bangladesh most fruit growers are not aware of modern cultural practices. They follow traditional methods of cultivation and grow low fruit yields. Improving cultural methods of fruit production can increase the yields significantly.

m) Lack of knowledge in identifying appropriate inputs such as fertilizer, pesticides

Though Bangladesh is a nature farming agricultural country, more famous with the use of different organic materials such as cow dung, farmyard manure, and oil cakes but farmers started using Agrichemicals in fruit production for the quality of the fruit. Most of the farmers are unaware about how to apply fertilizers & pesticides, when to apply the fertilizers & pesticides and what will be the dozes and how frequently the fertilizers & pesticides to be applied.

n) Lack of access to high value market

The fruit producers of Bangladesh are not getting high food price due to deficient access to high-value market information and undeveloped infrastructure. They do not know anything about high -value market due to their lack of knowledge about the present and updated trend in business, thus the wholesalers took this advantage and buy their product at a low price.

o) Weak marketing system and lack of market information available to producers

A weak marketing system can hinder agriculture development which upsets to country development. Marketing system mainly depends on the efficiency of the transportation of the fruits from producers to consumers. In Bangladesh, the transportation system is so poor in rural areas. It leads to losses as fruit deteriorates quickly over time. The weak marketing system is also a result of lack of market information of the producers due to their lack of proper education and knowledge towards the new era.

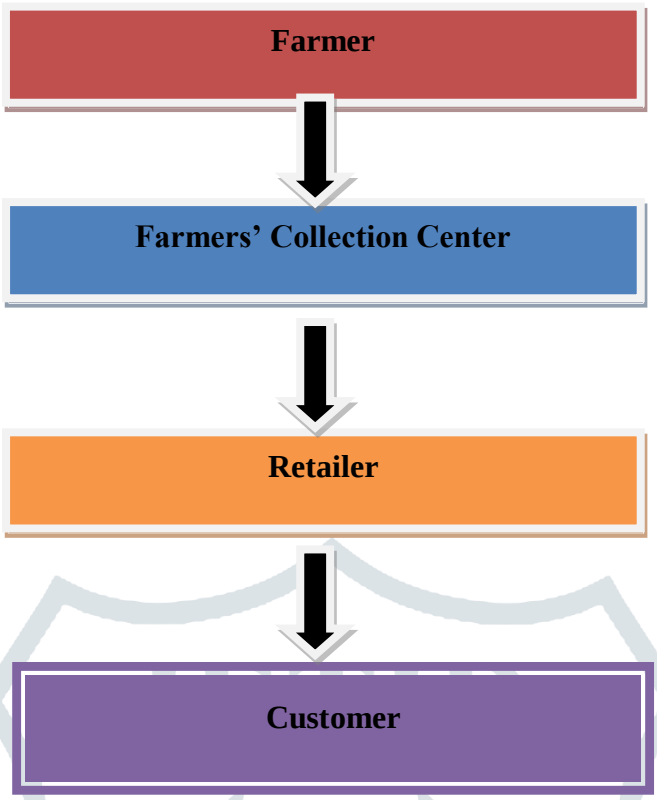
6. Proposed Supply Chain Management System

Agriculture Supply Chain Management System is a way to move the fruit product from producer to consumer. The analysis presents fruit supply chain and identified the various problems related to fruit production and marketing. Current Supply Chain Management System involves several intermediaries in the process. As a result, their involvement and activities raised the fruit cost at the end market. Consumers need to pay the excessive price and producer receive very low price from their production. Maximum margin goes to intermediaries, stock. Naturally, the producer and customer want to minimize the number of intermediaries, marketing step and their activities as much as possible. So that the farmer will earn more and consumer will pay less. By analyzing the present Supply Chain Management System, we proposed a future Supply Chain Management System which will help both the farmer and the customer. Our proposed Supply Chain Management System consists of 4 steps instead of 7 steps in the current Supply Chain Management System.

Our proposed future Supply Chain Management System consists of farmers and farmer's collection center, regional/divisional wholesaler, retailer and consumer. In our future Supply Chain Management System, we remove local, divisional and regional wholesaler and add farmer's collection center. Our main focus is to involve farmers in their fruit marketing. The proposed Supply Chain Management System is illustrated in figure 4. A farmer's cooperative can be established in each and every village. The organization will organize, and manage by the farmers. This farmers' cooperative will build a collection center in their production area. This collection center will also be managed by farmers themselves. The functions of these cooperative are the collection of member's fruits, contact with regional wholesaler and retailer, managing credit service, and managing information. The collection center will involve in activities like the collection of market information, the collection of products, price determination, proper distribution, transportation, storage and other marketing activities. As the collection center form by the farmers themselves, it will help the farmer to get the fair price. They can negotiate prices with wholesaler and retailer.

This Supply Chain Management System will be more efficient if they sell their product to the retailer directly. The cooperative must have some strategic planning and business policy to manage their business. The strategic planning must ensure their fundamental goal to achieve a fair price for their product. The collection center will receive a percentage about 3 to 6% on their total sell to bear their expenses of the cooperative. Regarding the implementation of their main task, i.e. organizing joint sales of the output produced by an individual member farmer. Farmer's collection center acts as an intermediate market organization that coordinates the exchange of fruit between the farmers and retailer. In our future model farmer's collection center passes their product to regional wholesaler or retailer. And retailer will sell the product to the consumer. Due to reduction of many intermediaries, product cost will be minimized. The most efficient Supply Chain Management System will be established if farmers' collection center confirms their business directly with the retailer instead of the wholesaler. As a result, it will reduce the supply chain and supply chain cost. So that the farmer will get the fair and attractive price and consumer will get the product at a lower cost.

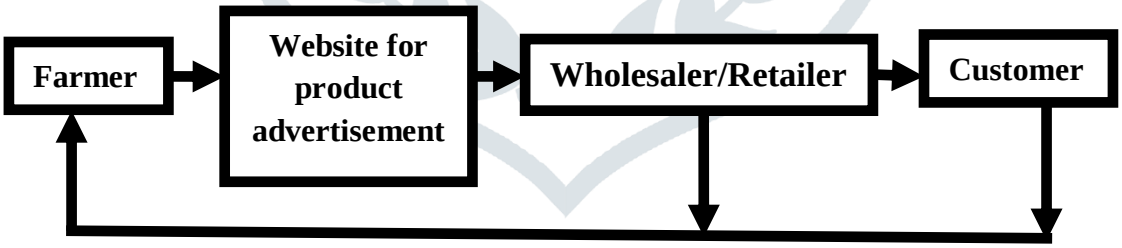
Figure 4: Proposed future value chain



7. E-Commerce Based Future Supply Chain Management System

For easier communication between the producer and the other market actor like a retailer, present research proposed an e-commerce based supply chain management system. A common online marketplace can be built where the producer and the other market actor easily access from their mobile or computer. A common website can be designed where the farmers can advertise their product. On the website, the farmer will add products photos, information and contact details. Wholesaler and retailer will browse that site and check the product and contact with the farmer. After negotiation, the farmer will send the products to the appropriate customer with the appropriate amount. This website of apps can be made by a third party. They only make a common place for communication between the farmer and the intermediary customer, but not involve in the business. The following figure 5 shows the whole process.

Figure 5: Flow diagram of e-commerce based supply chain management system



CONCLUSION

The fruits sector in agri-food supply chain constitutes a significant part of the world economy and is a source of raw material for many industries. Among the other agricultural produce, fruits sector have been explored the least. Agri-food Supply chain management involves all the activities in managing the relationships between the businesses and the chain partners involved in the efficient production and supply of products from the farm to the consumers with the objective to meet consumers' requirements reliably regarding quantity, quality, and price. The supply chain partners may include farmers, producers, growers, retailers, wholesalers, distributors and other intermediaries involved in supplying the agri-fresh produce from farm to fork. Rajshahi districts, Dinajpur district, Tangail district, Jessore district and Narsingdi district have a great opportunity to become one of the prevalent fruit producers in Bangladesh and abroad because a lot of fruits are cultivated by efficient farmers. The land of Rajshahi districts, Dinajpur district, Tangail district, Jessore district, Narsingdi district are fertile and weather is suitable for fruits cultivation. But certain problems may exist in this fruit supply chain management system such as numerous stakeholders like farmers, small and medium wholesalers, transporters, retailers and end customers. Poor packaging, poor handling methods and marketing system cause high post-harvest loss of the fruits.

Transportation systems for fruits are not so scientific and for this reason post harvest loss occur. Transportation cost is also high due to manmade problems. Price hike is also a problem for the consumers' level. Farmers have very few

knowledge on fruit supply chain management system, fruit marketing management. Due to lack of linkage with regional market, consequently reduces farmers' income. On the other hand, in Bangladesh it has been found that the intermediaries in the market are small in number but they are organized. So they dominate farmers and force them to sell fruits at a lower price as the farmer has no way to bring back the fruits from the market as it involves extra cost.
One of the most important reasons for not getting the best price is the involvement of local broker and wholesaler organization's dominance. But there are selected financial difficulties and avoidable activities which increase the ultimate product price. Fruit supply chain management system studies provided valuable insights into the supply chain structure, market actors, intermediary's activities, their operations, value adding, price and profit margin movement of the existing supply chain management system. The fruit supply chain management has its particular structure and special demand. The study is mainly focused on the investigation of the product flow from the farmer through various marketing intermediaries to the consumers. This study primarily identifies the market intermediaries between the farmers and the consumers and their activities in the supply chain.

From the result it was identified a huge portion about 62% of non-value added activities, which is surplus. This surplus activity raises the prices of the product. In this research focus made on the cost and price movement along the supply chain management system and found that consumer price of fruit is almost double of producer price margin. Different market intermediaries share profit margin with the farmers. Analyzing this fruit supply chain management system of the targeted area, the research identifies the major problem along the existing fruit supply chain management system. Producers and consumers are not getting the full benefit of fruits price due to deficient access to market information and undeveloped infrastructure. There are many intermediaries, inferior communication, and transport condition, inadequate financial and information service also contribute unequal profit margin distribution and a high price of the fruits. Government involvement, coordination and monitoring on price fluctuation in the existing supply chain management system are limited. Backward pricing system and market syndicate cause losses for the producers.

RECOMMENDATION

The recommendations of the study of the supply chain management system of fruits are as follows:

1. Vertical coordination among the farmers/growers through farmer cooperatives or associations, intermediaries and retail chains by contract farming facilitating pre-harvest practices resulting in quality produce, timely transportation of fresh produce from the farm to distribution centers and finally the retailers thus reducing the post-harvest losses and wastage. Through contract farming, farmers' may have access to quality inputs, information, and new technology for farming thus resulting in an increased income of the farmers.
2. Demand forecasting is an important measure for improving the effectiveness of the fruits chains resulting in a match between the supply and demand as sometimes the fruits are not harvested due to lack of demand and sometimes due to weather or other conditions fruits are not available, in both the cases either there is a post-harvest loss or the prices go up. The Collaborative Forecasting and Replenishment (CFAR) system enable the retail chains (supermarkets) to forecast demand and determine fruit production schedule.
3. Developing appropriate infrastructure and cold chain facilities and customized logistics reduces cost, maintains the quality of the produce and ensures timely delivery of the produce.
4. An effective inventory management must incorporate segmentation of the fresh fruits, customers, supply and distribution channels, optimized postponement of deliveries and stock levels to maintain the stability of price while keeping the quality consistent.
5. The information systems must be incorporated as a collaborative tool for supply chain planning in fruits supply chain to integrate farmers, cooperatives, retail chains (supermarkets) and target customers by facilitating information flow and exchange among them.
6. The agri-supply chain planning requires a holistic and integrated view of all the supply chain partners and systematic interactions between them recognizing their interdependencies thus promoting adoption and implementation of new technologies, increased revenues, better quality of produce and finally increased customer satisfaction.
7. There should have a new supply chain management system where farmers can play dominant role in setting the sell price of fruits. In every hat or bazaar of fruits there may have a price determining center. In price determining center there may have price determining committee. In the committee farmers and policy makers will be the member. Farmers can share their views about cost of production of any fruits and price determining committee will fix the selling price of any fruits. If it is do so, farmers will be benefitted. They will get profit from fruit production.
8. There should have supply chain management system to ensure farmers a fair price by direct marketing in a high value market as well as consumer lowest consuming price as much as possible.
9. There should have effective management and monitoring system of Government to reduce the gap between the farmer's price and consumer price and take necessary action against market syndicate.
10. Farmers should create a business link between the farmer's collection center and a high value market for direct selling.
11. The government should introduce the pricing policy for the different season for the different fruits.

12. Transportation system and facilities should be developed and the government should take necessary steps to reduce additional cost during transportation.
13. Information and communication system should be developed among the producers.
14. Interest -free agricultural loan should be provided for farmers.
15. In Bangladesh, crop insurance is absent; government should introduce crop insurance for farmers.

REFERENCES

1.Amorim P, Günther HO, Almada-Lobo B. Multi-objective integrated production and distribution planning of perishable products. International Journal of Production Economics, 2012; 138(1):89-101.
2.Anastasiadis F, Poole N. Emergent supply chains in the agrifood sector: insights from a whole chain approach. Supply Chain Management: An International Journal. 2015; 20(4):353-368.
3.Berdegué JA, Balsevich F, Flores L, Reardon T. Central American supermarkets' private standards of quality and safety in procurement of fresh fruits and vegetables. Food Policy. 2005; 30(3):254-269.
4.Kamath NB, Roy R. Capacity augmentation of a supply chain for a short lifecycle product: A system dynamics framework. European Journal of Operational Research, 2007; 179(2):334-351.
5.Lemeilleur S, Codron JM. Marketing Cooperative vs. commission agent: The Turkish dilemma on the modern fresh fruit and vegetable market. Food Policy, 2011; 36(2):272-279.
6.Mikkola M. Coordinative structures and development of food supply chains. British Food Journal, 2008; 110(2):189-205.
7.Negi S, Anand N. Issues and challenges in the supply chain of fruits & vegetables sector in India: A Review. International Journal of Managing Value and Supply Chains, 2015; 6(2).
8.Perdana T. The Triple Helix Model for Fruits and Vegetables Supply Chain Management Development Involving Small Farmers in Order to Fulfill the Global Market Demand: A Case Study in "Value Chain Center (VCC) Universitas Padjadjaran. Procedia-Social and Behavioral Sciences, 2012; 52:80-89.
9.Rong A, Akkerman R, Grunow M. An optimization approach for managing fresh food quality throughout the supply chain. International Journal of Production Economics. 2011; 131(1):421-429.
10. Sudarshan GM, Anand MB, Sudulaimuttu. Marketing & Post-harvest losses in fruits: Its implications on availability and economy-A study on pomegranate in Karnataka. International Journal of Management and Social Sciences Research (IJMSSR), 2013; 2(7):34-42.
11. Das, R., & Hanaoka, S. (2010). Perishable Food supply chain constraints in Bangladesh.
12. Sanogo, I. (2010).Market analysis tool-how to conduct a food commodity value chain analysis. World Food Program and VAM Food Security Analysis.
13. Sudarshan GM, Anand MB, Sudulaimuttu. Marketing & Post-harvest losses in fruits: Its implications on availability and economy-A study on pomegranate in Karnataka. International Journal of Management and Social Sciences Research (IJMSSR), 2013; 2(7):34-42.
14. Rong A, Akkerman R, Grunow M. An optimization approach for managing fresh food quality throughout the supply chain. International Journal of Production Economics. 2011; 131(1):421-429.
15. Das, R., & Hanaoka, S. (2010). Perishable Food supply chain constraints in Bangladesh
16. Sanogo, I. (2010).Market analysis tool-how to conduct a food commodity value chain analysis. World Food Program and VAM Food Security Analysis.
17. Lusine, H., Alfons, G.J.M., Jack, G.A.J., & Olafvan, K.(2007).Performance measurement in agrifood supply chains: a case study. *Supply Chain Management: An International Journal*, 12 (4); 304 –315.