



# Supply Chain Management System of Vegetables in Bangladesh

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## ABSTRACT

Bangladesh is mainly an agricultural country. Agriculture has pivotal role in the economy of Bangladesh. For food safety, value addition, export earnings and employment agriculture plays a vital role. The weather and soils are suitable for a variety of vegetable cultivation. More than 100 vegetables are cultivated in this country. Different types of vegetables are produced in rural areas of Bangladesh in small homesteads and large agricultural land. Vegetables are cultivated both for the own consumption and commercial purposes. Commercial vegetable trading has an integrated supply chain management system. Supply Chain Management System depends on some intermediaries and their activities to supply the vegetables from producers to consumers. The major problem is consumer pays three to four times more than the producers' margin. The main objectives of this research are to evaluate the existing vegetable supply chain management system and to identify different stakeholders and their activities, and also to demonstrate various cost and price movement towards different stages of the supply chain management system. The study was survey type. Data were collected by using questionnaire. Based on the questionnaire different data were collected from farmers, different market actors, and consumer and finally problems regarding vegetable supply chain management system are identified. In the existing situation, producers have no control over the vegetable supply chain management system. In case of product pricing, producers are strongly influenced by market syndicates. In order to make the problems of the existing supply chain management system more understandable different analysis is conducted in this research. Finally a new network is proposed to the vegetable supply chain.

**KEYWORDS:** *Vegetables, Supply chain management, System; Future Value Chain; Cost and Price Movement, Margin*

## INTRODUCTION

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 efficiency, productivity, customer service and a better business environment. It initiates better linkage among the producer, market actors, and consumer in the supply chain. This research mainly focuses a vegetable supply chain management system from Jessore to Dhaka and the other divisional market of Bangladesh. Jessore, Kustia, Jhinaidah, Magura, Satkhira, Cuyadanga, Comilla, Bogra, Rajshahi all are famous for their fresh quality green vegetables. In the year 2015, about 14105 hector land were cultivated only for vegetable in Jessore area. (Source: Department of Agriculture Extension, Jessore). In the Jessore vast amount of vegetables are Cultivated. For this reason farmers can provide vegetable for another district. In the supply chain management system of vegetable 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 a vegetable supply chain in Bangladesh. They share profit with the producer without adding any value to the product. Their main function is to transport vegetables 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 vegetable 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 vegetable products that are delivered to the end customer.

Supply-Chain Management (SCM) is the plan, preparation, carrying out, manage, and monitor of supply chain activities with the objective of creating net value, creating a competitive, synchronizing supply with demand infrastructure of a product. Sanogo [5] explains the movement of a product from one stage to another and identification of the indicator, firms and their services. He also adds an analysis of the institutional support to production at various stages to SCM. Hence, food SCM analysis stands on the pillars of production, processing and marketing of food products. Lusine et al. [6] explained performance measures to assess the success of supply chains. The authors used four criteria, including efficiency, flexibility, responsiveness, and food quality to assess the performance of value chains. Efficiency points to the utilization of resources in the supply chain and its measures include production costs, profit, return on investment and inventory. Flexibility indicates the degree of responsiveness of the supply chain to a changing environment and is measured through customer satisfaction, volume flexibility, delivery flexibility, and lost sales. Responsiveness shows the time spent in the fulfillment of a request and is measured through fill rate, product lateness, customer response time, lead-time, shipping errors, and customer complaints. Food qualities are criteria of supply chain management of vegetables in Bangladesh. In this research food quality means the quality of vegetables. Food quality is divided into product and process quality. Product quality consists of product safety and health, sensory properties, shelf-life, and product reliability and convenience. On the other hand process quality consists of the characteristics of production, sorting, grading, packaging and marketing systems. Taylor [7] proposed the following five principles to be considered during conducting value in supply chain management studies:

- i. Identify what creates value from the end-user perspective and not from the individual firm's perspective.
- ii. Find out the steps across the value stream. In addition, highlight waste created at each step.
- iii. Implement the actions that create value and flow of the product without interruption, diversions or waiting.
- iv. Based the output produced on customer demand.
- v. Continuously remove successive layers of waste in both the product and the processes.

Sanogo [5] added to Taylor's [7] list of best practices. In Sanogo's [5] explanation, SCM should consider:

- vi. Systematically mapping the actors taking part in the production, distribution, marketing, and sales of a product.
- vii. Identifying and estimating the share of the costs and benefits of each actor in the chain
- viii. Determining the scope for quality enhancement within the chain. Quality enhancement may involve improvements in the production, delivery, and processing of the product, its packaging and design.
- ix. Highlighting the role of governance in the chain

## OBJECTIVES OF THE RESEARCH

The objectives of the study are as follows:

1. To identify the supply chain management systems of vegetables in Bangladesh.
2. To assess the market problem, the causes of cost increases,
3. To provide policy recommendations to overcome the problems.

## METHODOLOGY OF THE STUDY

**Research Design:** The design of the study was descriptive as well as survey type.

**Study Area:** The study was conducted at three divisions in Bangladesh. The three divisions were Dhaka, Khulna and Rajshahi division. Dhaka Division was selected because the capital of Bangladesh is situated in this division; about 20 million people live in the city. Most of the vegetables wholesalers sell the vegetables at different markets at Dhaka. Jessore district of Khulna division is famous for vegetables cultivation. Rajshahi division is selected because vegetables are also cultivated in different regions of Rajshahi divisions.

**Sampling method:** A purposive sampling technique was adopted for this study.

**Sample size:** From each division 100 respondents were selected. Total 300 respondents were selected for the study.

**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.

**Source of Primary Data:** Primary data were collected from the respondents of the study.

**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.

**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.

**Tools of Data Collection:** Questionnaire was used for primary data collection.

**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.

**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 Statistical Package for Social Sciences (SPSS Version 16) soft ware.

## RESULTS AND DISCUSSION

### Vegetable Production Situation in Bangladesh

Vegetable contributes a significant proportion among the agricultural products in Bangladesh. In case of vegetable production a revolution is occurring in over the last decade. According to FAO report, Bangladesh has ranked third in the list of vegetables producing countries in the world. Vegetable cultivation is increasing day by day. The ministry of agricultural statistics show that the country produced a total of 13.8 million tons of vegetables in 2013-14 while the growth rate marked a steady six percent yield in each of the last three years. At present, farmers cultivate 200 vegetable varieties. Moreover, Bangladesh now boasts of producing 90% seeds leading to that surprising high yield. In last year, the country's overall export revenue marked an 11.65 percent increase. Exports of vegetables and fruits jumped to 60 percent, while earnings raised by 34%. Bangladesh had to import potato from 20 countries in the past. In the year 2013 Bangladesh exported 25 thousand tons of potato only to Russia. The increase of vegetable production since independence has given birth to the hope of achieving nutrition security. Government efforts like providing high quality seeds, disseminating the knowledge of latest cultivation methods, allocating fertilizers have largely contributed to the success.

### Present Supply Chain Management System Map

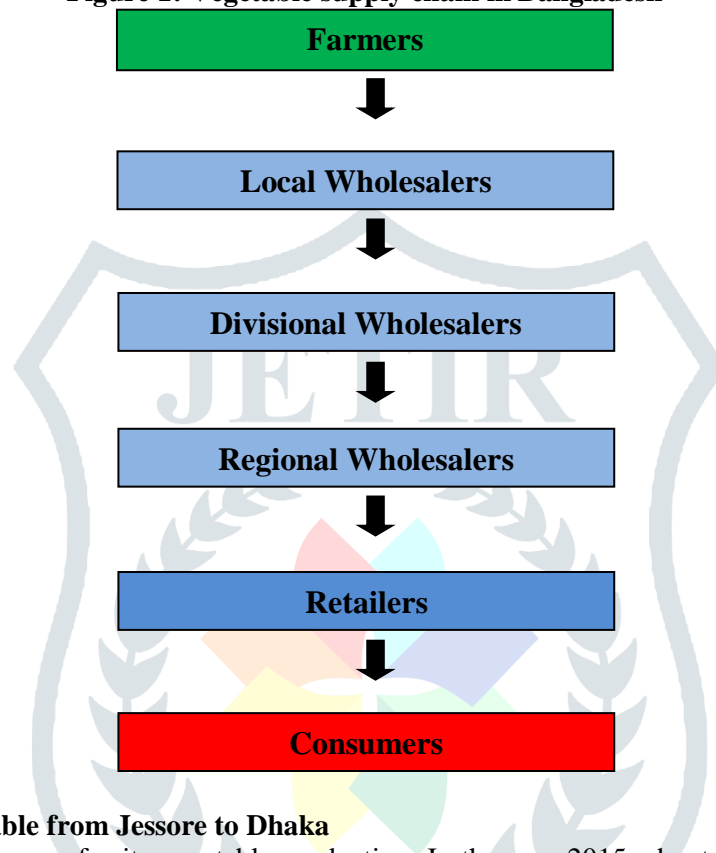
The value chain map shows the movement of the vegetable product among the supply chain and identifies the actors and their activities. In present supply chain, illustrates in the figure 1 identify the major channel of the vegetable supply chain in Bangladesh. The value chain starts from the producer 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 vegetable. They cultivate different types of vegetable and bring their product to sell in their local market. The amount and types of vegetables 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 vegetable. 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 vegetables who consume the vegetables. They buy the vegetables 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 vegetable.

**Figure 1: Vegetable supply chain in Bangladesh**



#### **Market Channel of Vegetable from Jessore to Dhaka**

In Bangladesh, Jessore is famous for its vegetable production. In the year 2015, about 14105 hector land cultivates only for vegetable in Jessore area. (Source: Agriculture Extend Division, Jessore). Farmers bring their product to local wholesale market. The major vegetable wholesale market in Jessore area is, Curamon Kathi Bazar, Baro Bazar, Satmail, Cougacha Bazar, Jhikorghacha, Kajurabazaar etc. The wholesaler from those markets purchases their product from the local farmer and sells these vegetables to the other divisional wholesaler. They send their product to Dhaka about 60%, Khulna about 20%, Barisal about 10%, Pirojpur about 3%, Gopalganj about 3%, Bagerhat about 2% and other regions about 2%. 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 like Karwan Bazar, Mirpur, Jatrabari 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.

#### **Activities Involved In the Present Value Chain**

Value stream analysis is used to examine vegetable 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 vegetable, 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 vegetable 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 vegetable 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 vegetable
2. Cleaning the vegetables
3. Sorting of vegetables
4. Grading of vegetables

##### Non value adding process:

1. Holding of vegetables
2. Packaging of vegetables
3. Loading of vegetables
4. Unloading of vegetables

##### 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

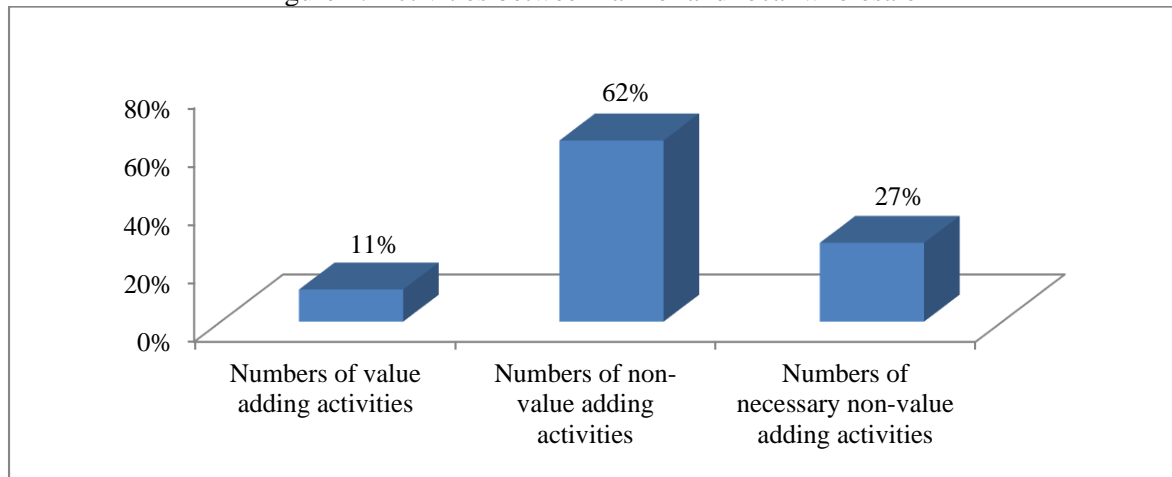
Numbers of non-value adding activities: 14

Numbers of necessary non-value adding activities: 6

Total 22 major activities found in this vegetable supply chain, in which numbers of value adding activities are 2. These value adding activities are reaping vegetable 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 non-value adding activities consume about 27% of the total amount (Figure 2).

Figure 2: Activities between farmer and local wholesaler



Source: Field survey, 2017

**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 vegetable value chain and the possible causes related to the increase of price. The existing vegetable 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 vegetable. He invests his capital, land, and labor to produce vegetable. So farmers added value and price in the vegetable. Cost involve in his activities. The farmer passes his vegetable 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 vegetable and the selling price of the same vegetable at the retail market of Dhaka. From the study it was found that the selling price in the retail market is four times higher than that of the selling price of the farmer. For example, buying price of Brinjal in 2016 was 20 Taka per kg at Curamonkathi Bazar, Jessore. The selling price of Brinjal in the retail markets in Dhaka was 80 Taka per kg. Price spread for per kg brinjal is about 20 Taka Table 1 represents the percentage of price increase of various vegetables. The maximum price increase was about 309% for Yard Long bean, and the minimum price increase was about 200% for Cauliflower. The profit margin varies from product to product. These percentages of the margin of various vegetables among different stakeholder are represented in Table 1.

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

Vegetables	Average buying Price at Jessore (in Taka per Kg)	Average selling price in Dhaka among customers (in Taka per Kg)	Margin Percentage
Bitter gourd	20	80	300%
Brinjal	25	84	276%
Ladies finger	25	85	240%
Yard long bean	22	90	309%
Pointed gourd	22	80	264%
Bean	30	105	250%

Source: Field Survey, 2017

**Table 2: Price of various vegetables among the market intermediaries**

Vegetables	Farmers' sell price (Taka per Kg)	Local wholesalers' sell price (Taka per Kg)	Divisional wholesalers' sell price (Taka per Kg)	Regional wholesalers' sell price (Taka per Kg)	Retailers' sell price (Taka per Kg)
Bitter gourd	20	45	55	62	80
Brinjal	25	46	54	64	84
Ladies finger	25	47	56	66	85
Yard long bean	22	48	58	69	90
Pointed gourd	22	42	52	61	80
Bean	30	60	72	83	105

Source: Field Survey, 2017

Price of various vegetables among the market intermediaries has shown in the table 2. From the result it was found that in case of Yard long bean farmers' sell price was 22 taka per Kg, local wholesalers' sell price was 48 taka per Kg. Price gap between Local wholesalers and farmers was (48-22) taka per Kg = 26 taka per Kg. Divisional wholesalers' sell price was 58 taka per Kg. Price gap between Local wholesalers and Divisional wholesalers was (58-48) taka per Kg= 10 taka per Kg. Regional wholesalers' sell price was 69 taka per Kg. Price gap between Regional wholesalers and Divisional wholesalers was (69-58) taka per Kg=11 taka per kg. Retailers' sell price was 90 taka per Kg. Price gap between Retailers and Regional wholesalers was (90-69) taka per Kg=21taka per Kg. Result shows that gap between producers (farmers) to consumers was (90-22) taka per Kg=68 taka per Kg. On the other hand Local wholesalers get 26 taka per Kg and the retailers get (90-69) taka per Kg=21taka per Kg. It indicates that the farmers who are the main person for vegetables 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.

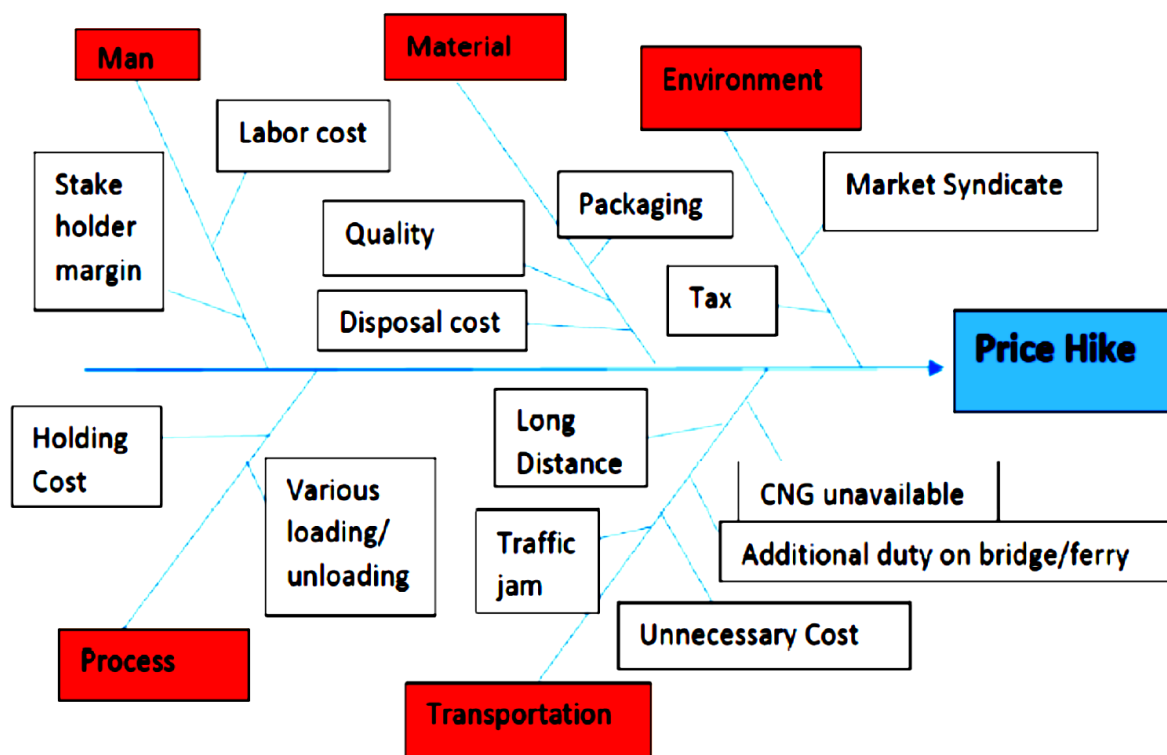
**Table 3: Percentage of market margin of various vegetables among the market intermediaries**

Vegetables	Farmer	Local wholesaler	Divisional wholesaler	Regional wholesaler	Retailer
Bitter gourd	25%	31.25%	12.50%	8.75%	22.50%
Brinjal	30%	25%	9.52%	11.90%	23.8
Ladies finger	29.41%	25.88%	10.59%	11.76%	22.36%
Yard long bean	24.45%	28.89%	11.11%	12.22%	23.33%
Pointed gourd	27.50%	25%	12.50%	11.25%	23.75%
Bean	29%	28.57%	7.61%	10.47%	20.95%

Source: Field Survey, 2017

Percentage of market margin of various vegetables 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 vegetables 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 wholesaler and retailer. Local wholesaler receives maximum margin percentage because they bear the cost of transportation and packaging. They have also their own cost, related to rent, labor fee, market fee, Transportation cost, etc. As retailer sells only a small amount of vegetable they added maximum margin after local wholesaler. Other market actors share relatively same market margin and their cost was relatively 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 vegetable supply chain is a long supply chain, many stakeholders and labor involve in the channel.

Figure 3: Cause effect diagram for price hike



Source: Field Survey, 2017

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 vegetable. Numerous types of transportation are needed in the vegetable 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 vegetable. Transportation is very important in the vegetable value chain. Various types of transportation are required to bring the vegetable 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, CNG 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 vegetable, 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.

### Problems Identified in Existing Vegetable Supply Chain Management System

By analyzing the existing vegetable 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 vegetables. Because the value or quality of vegetable 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 vegetable 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 vegetable 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 vegetable 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 vegetable 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 vegetable production. The year is divided into two distinct seasons: Rabi (winter from October to November) and Kharif (hot humid season from April to October). Rabi season has a relatively low temperature, humidity, and rainfall so it is suitable for most of the vegetable 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 Kharif season, only a few vegetables can be successfully grown. The high temperatures and high rainfall of the Kharif season are not conducive for most other vegetables. As a result, there is always a serious scarcity of vegetables during the Kharif season. The price of vegetables at that time is very high; so much so that vegetable prices often exceed the regular price. To improve vegetable production and supply, we should develop varieties suitable for growing in the adverse weather condition of the Kharif season and drought resistant varieties 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 vegetables on their own. Inversely, in Kharif season there is always a scarcity of vegetables and the price of vegetable at that time is very high. To improve this vegetable production, supply and demand, we should develop a variety of options suitable for growing in the adverse weather conditions of the Kharif season and drought resistant varieties of the peak Rabi season.

**g) Lack of Government control over market:** The vegetable distribution in Bangladesh is mostly terminated by the local wholesaler and stakeholders. Government involvement in vegetable 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 vegetable 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 available 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:** Vegetable production, marketing depends on many intermediaries because of the lack of proper infrastructure and results huge delivery cost and wastage. The price of vegetable increases with the number of intermediaries and price is less if there are fewer intermediaries. Thus, the price of vegetables 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 vegetable market is located mainly in the towns and cities. The transportation system in rural areas is very poor, so the marketing of growing vegetables 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 vegetable production requires more care than the cultivation of field crops. But in Bangladesh most vegetable growers are women and unfortunately, they are not aware of modern cultural practices. They follow traditional methods of

cultivation and grow low crop yields. Improving cultural methods of vegetable production can increase the yields significantly.

**m) Lack of knowledge in identifying appropriate inputs such as seeds and fertilizer:** Bangladesh imports many exotic vegetable seeds almost all of which are hybrids and therefore, the import of this seed is recurrent processed. Our farmer's lack of education and without any suitability study, they raised crops from that seed which results in partial or total failure. 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 crop production for the quality of the crop.

**n) Lack of access to high value market:** The vegetable 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.

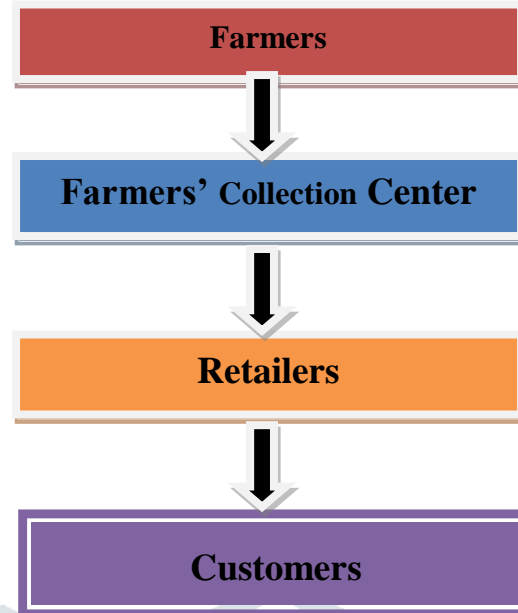
**o) Weak marketing system and lack of market information available to producers:** A weak marketing system can hinder agriculture development which upsets to country development. Marketing system mainly depends on the efficiency of the transportation of the vegetables from producers to consumers. In Bangladesh, the transportation system is so poor in rural areas. It leads to losses as vegetable 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.

### Proposed Supply Chain Management System

Agriculture Supply Chain Management System is a way to move the vegetable product from producer to consumer. The analysis presents vegetable value chain and identified the various problem related to vegetable production and marketing. Current Supply Chain Management System involves several intermediaries in the process. As a result, their involvement and activities raised the vegetable 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, 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 vegetable 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 vegetables, 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 vegetable between the farmers and retailer. In our future model farmer's collection center passes their product to the 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.

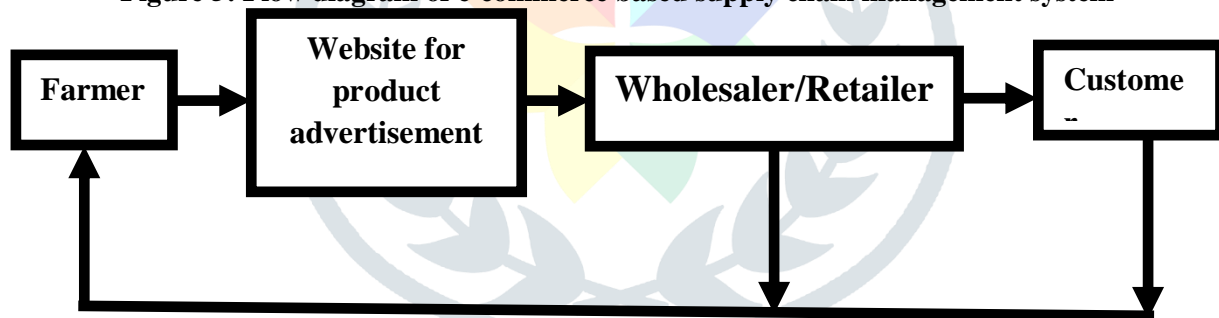
Figure 4: Proposed future value chain



### 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

Khulna division specially Jessore districts and Rajshahi division have a great opportunity to become one of the prevalent green vegetable producers in Bangladesh and abroad because a lot of green vegetables are cultivated by efficient farmers. The land of Jessore and Rajshahi division are fertile and weather is suitable for vegetables cultivation. But certain problems may exist in this vegetable 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 vegetables. Transportation systems for vegetables 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 vegetable supply chain management system, vegetable 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 vegetables at a lower price as the farmer has no way to bring back the vegetables 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. Vegetable 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 vegetable 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 vegetable is almost double of producer price margin. Different market intermediaries share profit margin with the farmers. Analyzing this vegetable supply chain management system of the targeted area, the research identifies the major problem along the existing vegetable supply chain management system. Producers and consumers are not getting the full benefit of vegetables 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 vegetables. 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.

## RECOMMENDATIONS

The recommendations of the study are as follows:

1. There should have a new supply chain management system where farmers can play dominant role in setting the sell price of vegetables. In every hat or bazaar of vegetables 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 vegetables and price determining committee will fix the selling price of any vegetables. If it is do so, farmers will be benefitted. They will get profit from vegetable production.
2. 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.
3. There should have effective management and monitoring system of Government to reduce the gap between the farmer's price and consumer price.
4. Farmers should create a business link between the farmer's collection center and a high value market for direct selling.
5. The government should monitor market regularly and take action against market syndicate.
6. The government should introduce the pricing policy for the different season for the different vegetables.
7. Transportation system and facilities should be developed and the government should take necessary steps to reduce additional cost during transportation.
8. Information and communication system should be developed among the producers.
9. Interest-free agricultural loan should be provided for farmers.
10. In Bangladesh, crop insurance is absent; government should introduce crop insurance for farmers.

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