

# Identifying The Potential Reasons Behind the Price-Increasing Issues in Vegetable Supply Chain in Bangladesh and Proposing Possible Solutions

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## Abstract

Agriculture is one of the largest employment sectors in Bangladesh, contributing 11.61% of GDP in the fiscal year 2021-22. This sector is contributing significantly even in the toughest situation of COVID-19. Farmers are the main actors behind this contribution. But we have seen farmers not getting a fair price for the vegetables they produce. On the contrary, when the same vegetables are coming to large cities, they are sold at higher prices. Our research tries to identify the potential causes behind the price-increasing issues of vegetables in the existing vegetable supply chain in Bangladesh. We also tried to recommend a solution to reduce the problem so that the farmers can get a better and fair price for the vegetables they produce. In this study, we tried to mention the reasons behind the price-increasing issues after conducting surveys. To conduct our research, we spoke with farmers and middlemen who are actively involved in the vegetable supply chain. Through our survey and after having conversations with them, we found out that both parties (farmers & middlemen) are dissatisfied with the current state. We came to know that the farmers feel the necessity of having a central supply chain system, and the middlemen are talking about the government's involvement in the whole process. When it comes to recommending a solution, we can't do a practical solution regarding the government's involvement. So, we proposed a central supply chain model that will help to minimize the price-increasing issues of vegetables in the vegetable supply chain in Bangladesh.

**Keywords:** Vegetable Supply Chain, GDP, Stakeholder, Middlemen, Distribution Network, Distributor, Retailer.

## Introduction

Vegetables are the major sources of nutrients, vitamins, phytochemical compounds, and dietary fiber for the human body. A study performed by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) recommends consuming at least 400 grams of vegetables and fruits in a day (not including potatoes and starchy vegetables like corn and beans) to prevent chronic diseases such as heart disease, cancer, diabetes. These are also needed for the prevention and mitigation of different

micronutrient shortages and suggest the gradual improvement of cost-effective interventions for these diseases.

Bangladesh is an agricultural country, with fertile soil suitable for producing any kind of vegetable. According to FAO statistics, the total volume of agricultural production in Bangladesh reached 93.3 million tons in the year 2021. Bangladesh is almost non-existent when it comes to fresh vegetable exports. Bangladesh secured good positions in the different sectors of agriculture all over the world. Besides, agriculture is contributing 11.61% of Gross Domestic Product (GDP) in the fiscal year 2021-22. Based on this data, Bangladesh is seen as a prospective vegetable producer, with the majority of vegetable production occurring in rural areas. We were able to see the state of our vegetable-growing farmers based on our observations. Farmers grow vegetables on their land before selling them to a market middleman. The vegetables are purchased at a low cost by the middleman, who then loads them into a truck, mini truck, or train and transports them to the city, where they are sold at a higher price in the market. Here, the first issue is that the farmers are not receiving a fair price for their produce, and as a result, they are losing money day by day.

Asian Productivity Organization (2007) on “Marketing System for Agricultural Products” stated that the vegetable based agricultural marketing system of Bangladesh is not so much efficient. The main reasons are the different types of territories, various types of scattered locations of production areas, issue of natural disasters and under developed infrastructure condition [9]. In the time of COVID-19 pandemic situation, the vegetable supply chain of Bangladesh had broken down creating big amount of loss to the vegetable growers. Several types of incentive packages for agriculture was announced, but those attempts failed to offer better incentives for smallholder vegetable farmers. These farmers faced a huge loss and several problems. That situation had increased the food unavailability and food insecurity of the vegetable’s growers [1].

The significant part of this thesis is to know the reasons, why the price is increasing in the city and what can be the best solution to reduce the cost. People can understand the reason behind the price increase issue and at the same time, they come to know the potential problems of the distribution network in the vegetable supply chain system in Bangladesh.

Another important part of this research is to find out the best possible recommendation for the above potential problems. All thing is going to be done by the dataset we developed from the survey observations. We go through a survey process where we put in some questionnaires to find out the most potential reasons. Based on this survey questionnaires we make a dataset, which helps us with further analysis. In the analysis part, we use Microsoft Excel to analyze the data. From this data analysis, we try to find out the best possible reasons that affect the cost-increasing issue in the distribution network in the vegetable supply chain in Bangladesh. Besides we develop the best possible recommendation to eradicate the most potential causes of problems in this distribution network.

The main objectives of this research are:

- To identify the potential causes for the cost-increasing issue of vegetables in the distribution network of the vegetable supply chain.
- To find out the best possible recommendations to eradicate the potential problems in this

distribution network of the vegetable supply chain.

**Literature Review**

There are different types of studies conducted on this topic of the vegetable supply chain in Bangladesh. These approaches mainly focused on different criteria-based problems. Almost all the reviews are focused on the relationship between the stakeholders that are used to gain the result. The following works were done in this track shown in

**Table 1.**

**Table 1: Related Works**

Reference	Target	Result
Alam, and Khatun (2021) [1]	To investigate the impact of COVID-19 on the vegetable supply chain network.	This research has conducted a survey of vegetable farmers using mobile phones to evaluate the impact of COVID-19 on the vegetable supply chain, cost aspect, and also the production plan for the future.
Azad (2021) [2]	To find out whether the contract farming process already in practice is capable to eradicate the obstacles in vegetable export and to make Bangladesh a better and more competitive performer in the international market of fresh vegetables.	This study may help the government and policymakers to understand the particular supply chain and to introduce more effective policies for the improvement of the industry.
Barua, Rahman, and Barua (2021) [3]	To explore the approaches of the sustainable value chain for developing the opportunities of marketing channels for agricultural-type products in Bangladesh.	The research showed that the difference in the organizational circumstances of the end markets of the agriculture-type products is closely connected to the several categories of compatibility throughout the supply chains.
Bhuiyan (2014) [4]	To investigate the marketing channel effectiveness of the vegetable supply chain. Also, identifying the factors for price variation, and stakeholders involved in the vegetable supply chain is another objective of this study.	This research tried to fill up the information gap between stakeholders. Also, tried to figure out efficient marketing options to develop the fragile marketing systems of vegetables in Bangladesh.
Bhuiyan and Raju	To investigate the condition of	Different types of analysis are

(2018) [5]	the existing vegetable supply chain management system and to identify the stakeholders with their activities. Also, to evaluate the costs and prices of different phases of the supply chain.	shown to make the related problems of the present supply chain management system more understandable and a new network was proposed.
Gazi (2020) [6]	To investigate the logistics support for agro products in the supply chain network in Bangladesh.	We found loopholes in the logistic system in the overall supply chain system from this journal. Also, we learned to create a better logistic process in the vegetable supply chain and ensure customer satisfaction.
Hasan, and Naim (2017) [7]	To evaluate the potentiality of regular supply chains by comparing the opinions of local traders and exporters.	The comparison explains that the local vegetable supply chain cannot meet the requirements of international trade because of some reasons such as food safety and hygiene standards issues, storage facilities problems, unprofitable transport systems, inadequate quantity of supply, and costly operational processes of the supply chain.
Haque, and Hoque (2021) [8]	To organize and improve the condition of the vegetable supply chain network by summarizing various types of vegetable marketing networks, intermediaries, vegetable production level and consumption rate, and constraints of vegetable production for the benefit of the general public.	As a result of being a review paper, a better understanding of the different types of vegetable marketing networks, market intermediaries, consumption rates, and constraints of vegetable production was achieved.
Hossain, and Hossain (2013) [9]	To identify the existing constraints of the vegetable supply chain system in Bangladesh.	This paper describes the existing vegetable supply chain system that includes several markets, middlemen, and several financing institutions. The negative impacts of the lack of an effective supply chain are discussed.

<p>Hossain, Sarker, Alam, Chowdhury, and Kamal (2020) [10]</p>	<p>To investigate the distribution network of vegetable supply chain systems and to find out any causes of failure of the system.</p>	<p>The authors have discussed the fact behind the failure of an appropriate supply chain distribution network. Insufficient infrastructure, lack of training among growers and traders, and an uncontrolled market are the main reasons behind the failure.</p>
<p>Islam (2020) [11]</p>	<p>To examine the price variation of vegetables from farmers to different stakeholders through several marketing channels, and also to identify some factors that vary the vegetable price.</p>	<p>This research discussed that the variation in price has a relationship with the increase in the number of stakeholders and also discussed the multiple times' price variations executed at the retailers' level.</p>
<p>Karim, and Biswas (2016) [12]</p>	<p>To evaluate the existing vegetable supply chain network through value stream analysis, identify stakeholders and their activities, and also evaluate various cost and price aspects.</p>	<p>Based on the questionnaire different data are collected from farmers and consumers, then the problems of the value chain were identified. Several analyses are conducted to make the problems of the existing supply chain more understandable.</p>
<p>Khatun, Jahan, and Hossain (2022) [13]</p>	<p>To evaluate the production processes and also the marketing of the vegetable supply chain. Also, to highlight the vegetable-based value chains and vegetable marketing channels problems.</p>	<p>This research showed some policies based on the identified problems to develop production and marketing-related opportunities for the farmers.</p>
<p>Rahman, Maruf, Walid, and Tahmid (2020) [14]</p>	<p>To reduce the number of distribution channels in the vegetable supply chain network to make an effective supply chain.</p>	<p>Several potential causes behind the increasing amount of price agricultural products were identified. Moreover, lack of quality of products, and long delivery time were also identified as the major problems. Several potential solutions regarding the supply chain have also been portrayed.</p>
<p>Rahman, Barua, Zhou, Li, and Farid (2022) [15]</p>	<p>To evaluate the vegetable value chain with the performance of actors in the chain and to</p>	<p>Using simple random and purposive sampling techniques, data were gathered from different</p>

	identify the factors of the vegetable supply chain in the market.	value chain actors. And, the outcomes were evaluated to identify the main reasons behind the problems that occurred in the supply chain.
Sultana (2019) [16]	To analyze the variation of supply chain surplus among the different traders of the vegetable supply chain.	In this study, SPSS Software was used to analyze data. Several reasons for price variation were also identified such as several intermediaries from Foria to retailers sharing the supply chain surplus, and illegally raising the prices of vegetables that increase the market price to the end customer.

Our main focus was to identify the potential reasons behind the price-increasing issues in vegetables supply chain. These previous studies motivated us to find out the actual reasons working behind it.

### Methodology

The total research methodology will be discussed step by step. This can be illustrated in

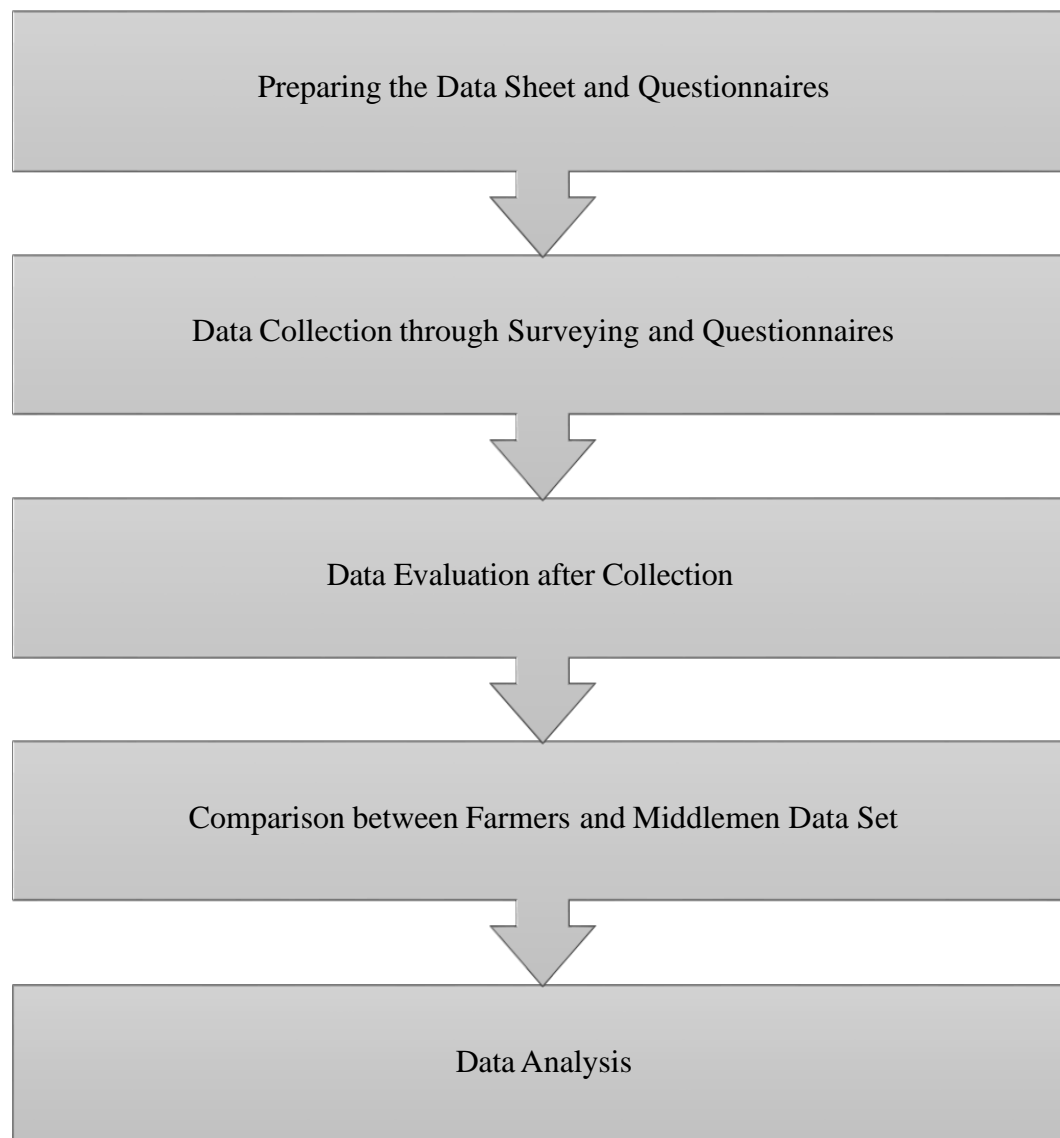


Figure 1.

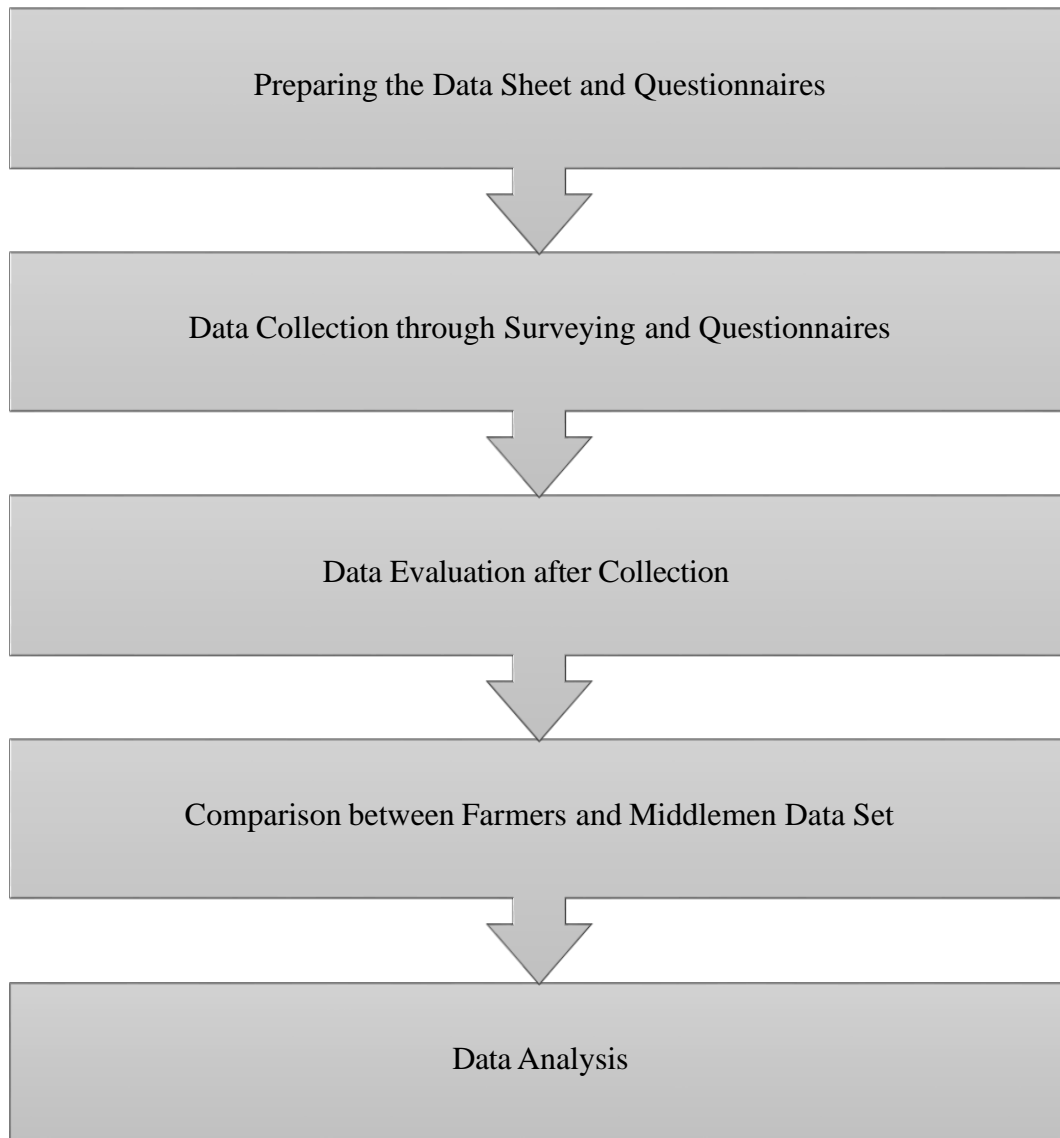


Figure 1: Steps included in research work

**Preparing Data Sheets and Questionnaires:** With the knowledge gathered by the literature review, the data sheet and questionnaires were prepared first. The main focal point of this research was performing data analysis and developing a comparison between the data set of the farmer and the middleman for better visualizing the causes and probable recommendations for increasing the cost issue of vegetables in the distribution network. For that reason, most of the questions were prepared related to that practice area based on practical aspects of this research.

In preparing the data sheet and questionnaire's part, we develop the questions which helped us for finding out the potential causes, related questions, and recommendations related questions. From this, we tried to find out what will be the probable solutions for solving the problem. The survey questionnaires are attached below:



**Survey Questionnaires:**

1. Name of the Participant:  
.....
2. Designation of the Participant:  
.....
3. What type of potential causes for the cost-increasing issue of vegetable supply chain faced?
  - Middlemen issue
  - Political Problem
  - No Centralized System
  - No Monitoring system
4. If you rate the potential causes between 1 to 10, what should be the score?
 

1      2      3      4      5      6      7      8      9      10
5. What are your recommendations to eradicate the potential problem of the vegetable supply chain?
  - Establish a centralized system
  - Establish a proper monitoring system
  - Taking care of political issues by Government
6. If you rate the potential causes between 1 to 10, what should be the score?
 

1      2      3      4      5      6      7      8      9      10

The 3 and 4 No. survey questions are used for identifying the protentional causes for the cost-increasing issue of the distribution network of the vegetable supply chain. The next 5 and 6 No. survey questions are used for finding the possible best recommendation for the cost-increasing issue of the distribution network of the vegetable supply chain.

**Data Collection through Survey and Questionnaires:** Data was collected thoroughly from the farmers and middle man of different areas of North Bengal (Panchbibi, Bogra). The purpose of the questionnaires is to find the potential causes and identify the perspective of opinions from both groups of farmers and the middlemen of the vegetable supply chain.

From the data which are generated from the survey, we have got the following dataset which is attached below. Here we are showing a glimpse of that dataset in **Table 2**.

**Table 2: Sample Dataset of the Survey**

Name of the Participant	Designation of the Participant	What type of potential causes for the cost-increasing issue of vegetable supply chain faced?	If you rate the potential causes between 1 to 10, what should be the score?	What are your recommendations to eradicate the potential problem of the vegetable supply chain?	If you rate the recommend ations between 1 to 10, what should be the score?

Abdul Majid	Farmer	Middleman issue	8	Establish a proper monitoring system	9
Karim Molla	Farmer	No Centralized System	7	Establish a centralized system	7
Aman	Farmer	No Centralized System	8	Establish a centralized system	9
Javed	Farmer	No Centralized System	7	Establish a centralized system	7
Saiful	Farmer	No Centralized System	7	Establish a centralized system	10
Abdul	Farmer	No Centralized System	9	Establish a centralized system	8

**Data Evaluation after Collection:** We divided the dataset into two groups. One group we named as ‘Farmers Dataset’ and another group we named as ‘Middleman Dataset’. We will consider both datasets of farmers and middlemen to identify the causes and the probable recommendation which will eventually help us to remove the biased decision from the data analysis.

**Comparison between the data sets of Farmers and Middlemen:** We started the conclusion step of identifying the causes and probable recommendations. We tried to find out an effective decision about what are the best possible causes and recommendations for this issue. The comparison between each dataset helps us to visualize the underneath actual picture of the cost-increasing issue of the vegetable supply chain.

We mainly find out four potential causes which are making a significant impact on the cost-increasing issue of the distribution network of the vegetable supply chain. The potential causes are:

- Middleman issue
- Political Problem
- No Centralized System
- No Monitoring system

From these four potential causes, we differentiated what are the potential causes farmers and middlemen are facing for the cost-increasing issue of the distribution network of the vegetable supply chain.

Again, we mainly find out three recommendations that are making a significant impact on the cost-increasing issue of the distribution network of the vegetable supply chain.

The recommendations are:

- Establish a centralized system
- Establish a proper monitoring system
- Taking care of political issues by Government

From these three recommendations, we find out the best possible way which can solve the cost-increasing issue of the distribution network of the vegetable supply chain.

We have collected a total of 111 responses from both groups of farmers and middlemen. Responses from the farmers were 89 and the responses from the middleman were 22. This data is shown below in **Figure 2**.

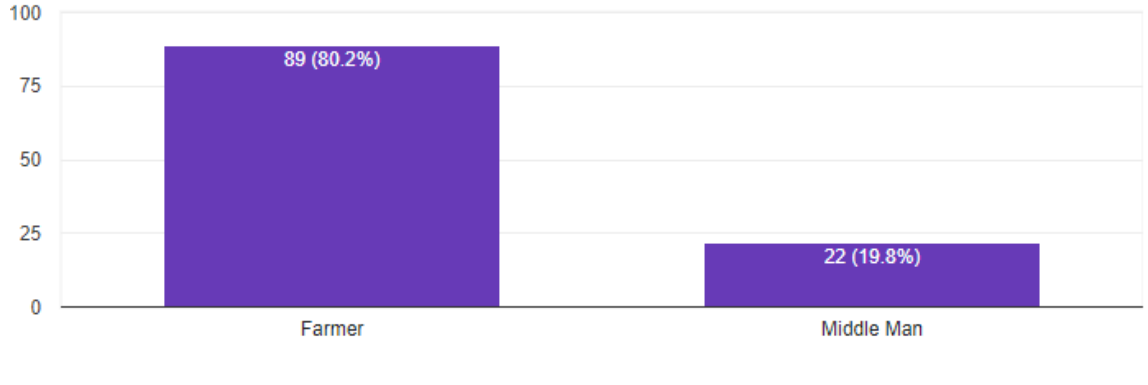


Figure 2: Response numbers from Farmers and Middlemen

Finally, we analyze the result from the alternatives and we proposed an effective distribution network for the cost-increasing issue of the distribution network of the vegetable supply chain. Finally, we will suggest a value chain map that will help us with the implementation of the distribution network of the vegetable supply chain.

In the survey process of this research, we collect the data from farmers and middlemen and we put the data into the generated Google form our team. Because the farmers and middlemen are not that educated to use Google Forms, we asked the questions and options and collect the answer from them, and put them into the form. From the survey, we can see that because of not having a centralized system is the potential cause for the cost-increasing issue of the distribution network of the vegetable supply chain. So, from these potential causes, we get that if there is a centralized supply chain system then it will solve the cost-increasing issue of the distribution network of the vegetable supply chain.

### Result Analysis

First of all, we differentiated the designation of the participants. Here are two groups of participants. One of the groups of participants is farmers and another group of participants are middlemen. We collected 80.2% of farmers' data and 19.8% of middleman data, that are shown in **Figure 3**.

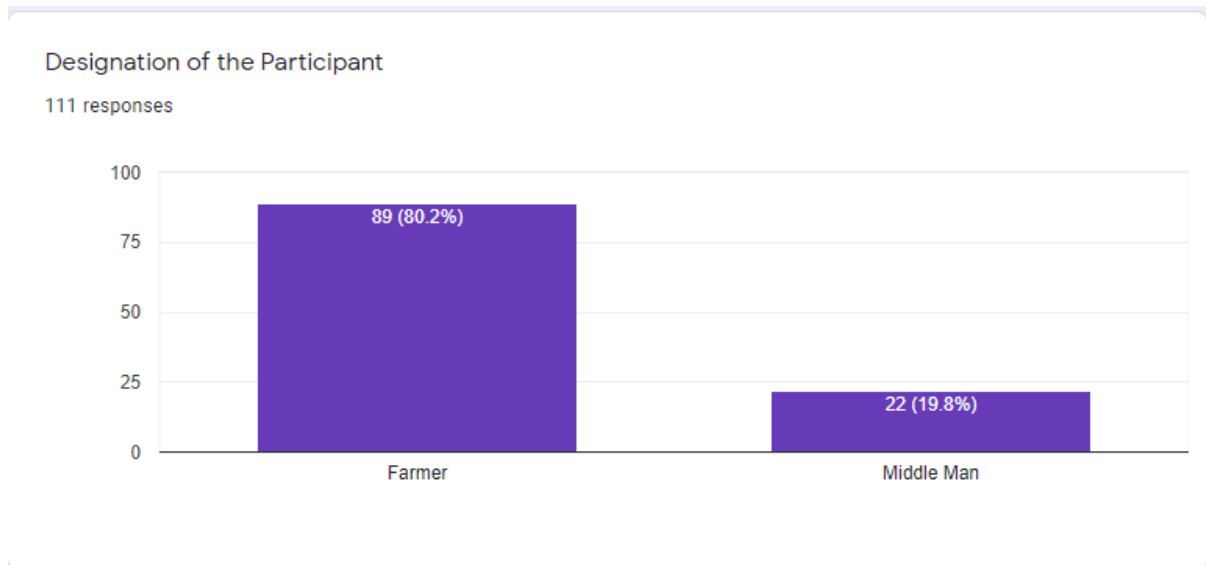


Figure 3: Designation of Participant

Here we get the responses from both groups of farmers and middlemen. From this data, we get that 64.9% of the participants dictate the potential cause is No Centralized System. The other potential causes are No monitoring system, Middleman issues, and political problems whose values are 14.4%, 15.3%, and 5.4% respectively. These are also illustrated in Figure 4.

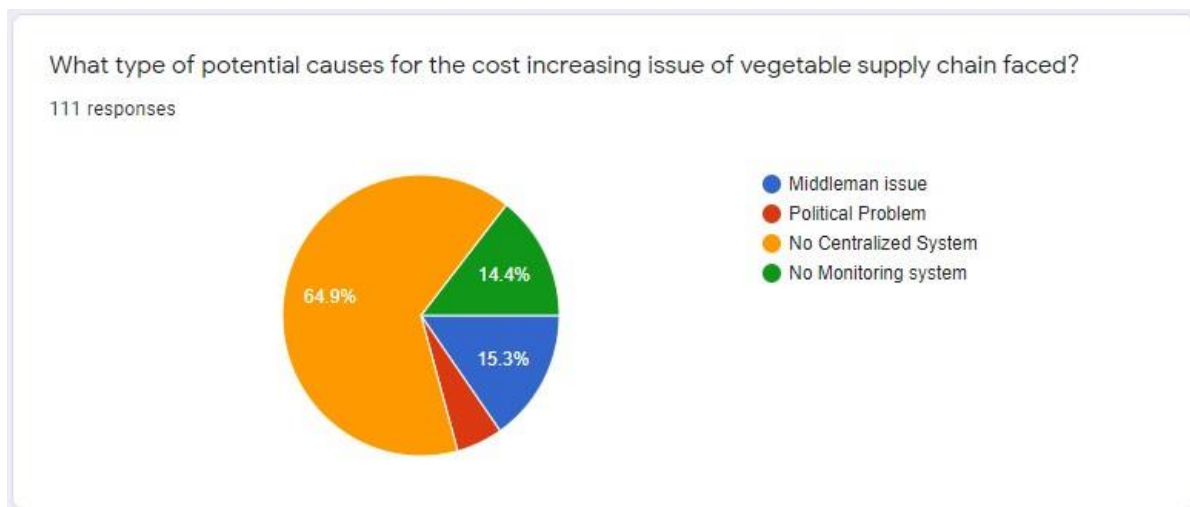


Figure 4: Potential Causes for the Cost-increasing Issue of the Distribution Network

Here we take the rating for the potential causes and we set the rating range from 1 to 10. The significant rate was 38.7% which a rating number was 9. And the second rating was 10.8% and the rating number is 7. The rest of the rating is given below in **Figure 5**.

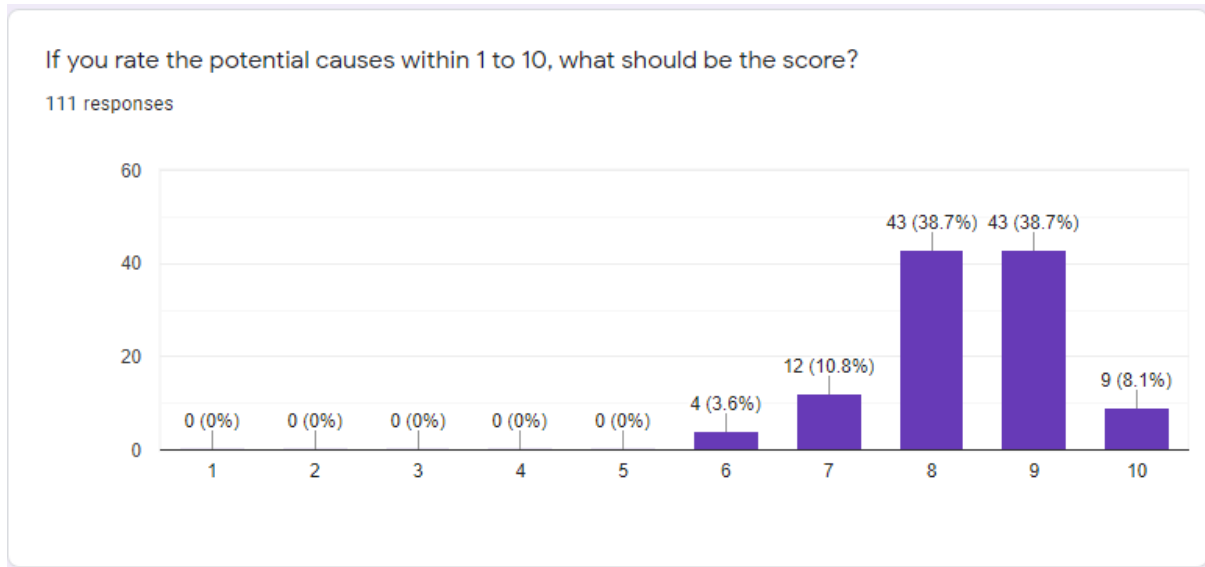


Figure 5: Potential Cause Rating

Here we get the responses from both groups of farmers and middlemen. From this data, we get that 64.9% of the participants recommended establishing a centralized system. The other recommendations are establishing a proper monitoring system, and taking care of political issues by Government 29.7% and 5.4% respectively which are shown in

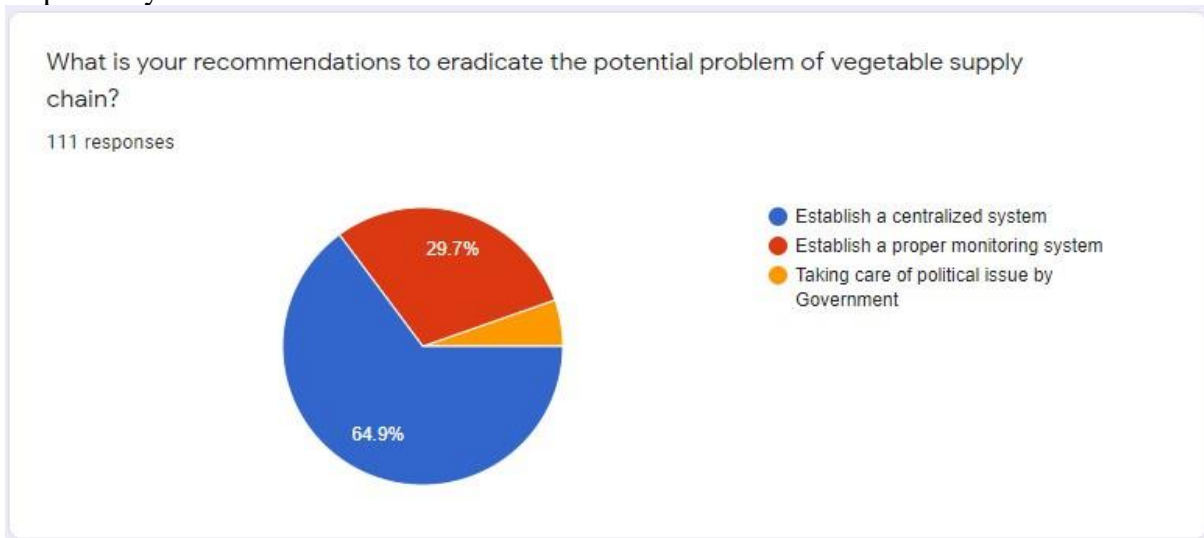


Figure 6.

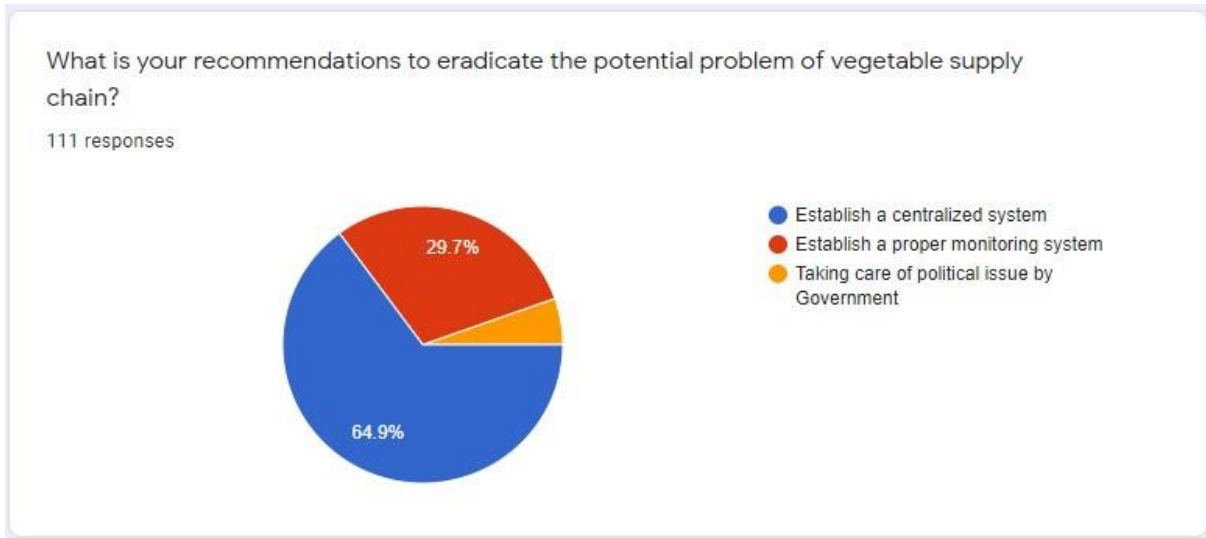


Figure 6: Recommendations for the Cost-increasing Issue of the Distribution Network

Here we take the rating for the recommendation and we set the rating range from 1 to 10. The significant rate was 39.6% which a rating number was 9. And the second rating is 28.8% and the rating number is 8. The rest of the rating is given below in **Figure 7**.

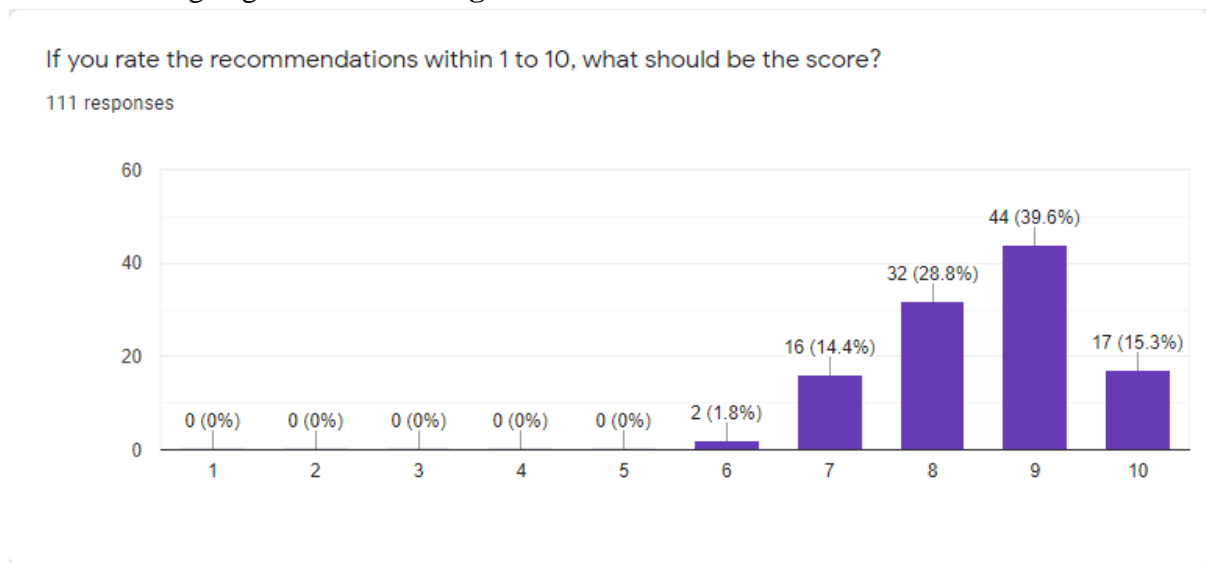


Figure 7: Recommendation Rating

From the data analysis part, we concluded that we need a centralized system for solving the cost-increasing issue of the distribution network of the vegetable supply chain. That's why we are proposing a newly developed supply chain system that can solve the potential causes of the distribution network of the vegetable supply chain. The centralized system is attached below in **Figure 8**.

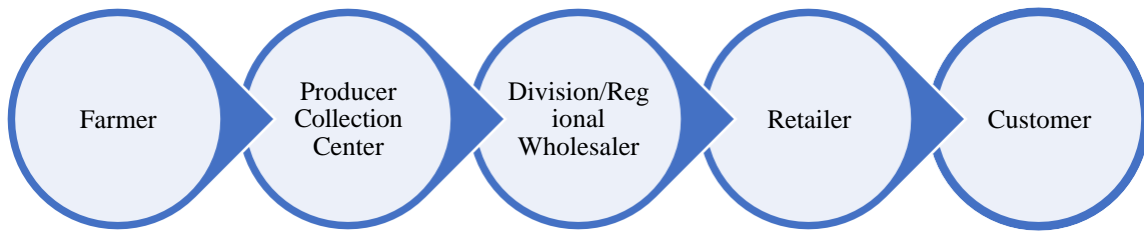


Figure 8: The Proposed Centralized System of the Vegetable Supply Chain

The proposed centralized system consists of five elements. They are:

- Farmer
- Producer Collection Center
- Division/Regional Wholesaler
- Retailer
- Customer

**Farmer:** In this system, farmers will be producing crops and vegetables and store them locally in their farming houses.

**Producer Collection Center:** After farming the farmers will bring their crops and vegetables to the nearest producer collection center to sell those crops and vegetables. In the producer collection center, there will be agents for monitoring the process so that farmers can get a fair price for their goods and the vegetable supply chain will be smooth through this process.

**Regional or Divisional Wholesaler:** Once the producer collection process gets finished, the collected vegetables will be sent to the Divisional/Regional Wholesaler.

**Retailer:** Here retailer will collect the vegetables for the Division or Regional wholesaler.

**Customer:** Finally, the customer will buy their desired fresh vegetables from the retailer at a reasonable price.

To maintain the total process, a special team of supply chain management is needed to control the whole process. The supply chain management team will assign the agents for the producer collection center and they maintain the flow of vegetables to the Divisional/Regional Wholesaler and also, they maintain the pricing.

**Cost Analysis**

We consider Tomato (Vegetable) as an example for this calculation. From this calculation, we optimized the cost of 1.309 BDT per KG. The optimized cost for a truck of 5 tons is 65450 BDT. The total costing is shown in **Table 3**.

**Table 3: Cost Analysis of Traditional Vegetable Supply Chain**

Cost of Traditional Vegetable Supply Chain System (For average 100 kg quantity)				
Cost	Costing Detail	Total Cost	Per Unit	Unit

			Cost	
C1	Farmer's Producing Cost	1802	18.02	tk/kg
C2	Truck Rent Cost	334.6	3.346	tk/kg
C3	Others Unlawful & Uncontrollable cost	608.9	6.089	tk/kg
C4	Holding Cost for Wholesaler	129.7	1.297	tk/kg
C5	Holding Cost for Retailer	100	1	tk/kg
		Sum	29.752	tk/kg

Cost of Centralized Vegetable Supply Chain System (For average 100 kg quantity)				
Cost	Costing Detail	Total Cost	Per Unit Cost	Unit
C1	Farmer's Producing Cost	1802	18.02	tk/kg
C2	Truck Rent Cost for Producer Collection Center (For 5 Tons and 10 Centers)	7000	0.14	tk/kg
C3	Holding Cost for Producer Collection Center	129.7	1.297	tk/kg
C4	Truck Rent Cost for Distribution/Regional Wholesaler (For 5 Tons and 10 Centers)	15000	0.3	tk/kg
C5	Holding Cost for Distribution/Regional Wholesaler	129.7	1.297	tk/kg
C6	Truck Rent Cost for Retailer (For 5 Tons and 10 Centers)	15000	0.3	tk/kg
C7	Holding Cost for Retailer	100	1	tk/kg
C8	Others Unlawful & Uncontrollable Cost	608.9	6.089	tk/kg
		Sum	28.443	tk/kg

<b>Optimized Cost</b>	<b>1.309</b>	<b>tk/kg</b>
<b>Optimized Cost Per Truck with our proposed Model (For 5 Tons)</b>	<b>65450</b>	<b>BDT</b>

### Conclusion and Recommendation

The main objective which drives us to complete this research is to find potential causes and find out a recommendation. From this, we got that we need a centralized vegetable supply chain system which will eventually help us to solve the cost-increasing issue of the distribution network of the vegetable supply chain. The objectives of this research are achieved perfectly. In this study, our first objective is to find out the potential causes for the cost-increasing issues of the distribution network of the vegetable supply chain. From this, we get that 64.9% of the total responded that no centralized system is one of the core causes for the cost-increasing issue of the distribution network of the vegetable supply chain.

Finally, this paper reveals our last objective of finding the best possible recommendation and proposing a solution to it. We find out that 64.9% responded that a perfect centralized system will be the best possible solution for reducing the cost-increasing issue of the distribution network of the vegetable supply chain.

### Limitations and Future Scopes of the Research



Though all of our research goals have been achieved, there were some limitations in this study. Further research can be done based on these limitations. This work is properly developed through a theoretical survey-based process in real life experiences. In this process, it can be different in the practical field. We cannot relate this mechanism to the political issue. The proposed vegetable supply chain system can be more detailed and upgraded. Overall, further research can be done on the basis of our research.

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