

**MARKETING MARGIN ANALYSIS OF POTATO
VALUE CHAIN ACTORS IN SOME SELECTED
AREAS OF JAMALPUR DISTRICT**

SUMAIA YEASMIN NISHI



**DEPARTMENT OF AGRIBUSINESS AND MARKETING
SHER-E-BANGLA AGRICULTURAL UNIVERSITY**

DHAKA-1207

DECEMBER, 2022

**MARKETING MARGIN ANALYSIS OF POTATO
VALUE CHAIN ACTORS IN SOME SELECTED
AREAS OF JAMALPUR DISTRICT**

BY

SUMAIA YEASMIN NISHI

REGISTRATION NO: 15-06776

A Thesis

Submitted to the Department of Agribusiness and Marketing

Sher-e-Bangla Agricultural University, Dhaka-1207

In Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE (MS)

IN

AGRIBUSINESS AND MARKETING

SEMESTER: JANUARY-JUNE, 2022

Approved by:



Supervisor

Dr. Airin Rahman

Associate Professor

Department of Agribusiness and
Marketing

Sher-e-Bangla Agricultural University

Co-Supervisor

Md. Rasidul Hasan

Professor

Department of Agribusiness and
Marketing

Sher-e-Bangla Agricultural University

Dr. Sharmin Afrin

Chairman

Examination Committee

Department of Agribusiness and Marketing
Sher-e-Bangla Agricultural University

DECEMBER, 2022



DEPARTMENT OF AGRIBUSINESS AND MARKETING

Sher-e-Bangla Agricultural University

Sher-e-Bangla Nagar, Dhaka -1207

CERTIFICATE

This is to certify that the thesis entitled“ **Marketing margin analysis of potato value chain actors in some selected areas of jamalpur district**” submitted to the Faculty of Agribusiness and Management, Sher-e Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree **of Master of Science in Agribusiness and Marketing**, embodies the result of a piece of bona fide research work carried out by **Sumaia yeasmin Nishi**, Registration No: **15-06776** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Date: _____

Place: Dhaka, Bangladesh

Supervisor

Dr. Airin Rahman

Associate Professor

Department of Agribusiness and Marketing

Sher-e-Bangla Agricultural University

Dhaka-1207

DEDICATION

I humbly dedicate this dissertation to my beloved parents
for their endless love and support.

ACKNOWLEDGEMENT

All admiration are due to almighty the merciful Allah, whose blessing have enabled me to complete the study successfully. Guidance, help and co-operation have been received from several persons during the tenure of the study; the author is immensely grateful to all of them.

I would like to express my heartfelt gratitude to my respected supervisor Airin Rahman, Associate Professor, Department of Agribusiness and Marketing, Sher-e-Bangla Agricultural University, for her untiring and painstaking guidance, innovative suggestions, continuous supervision, timely instructions and inspirations throughout the tenure of research work.

Heartfelt gratitude and profound respect to his Co-supervisor, Md. Rashidul Hasan, Professor, Department of Agribusiness and Marketing, Sher-e-Bangla Agricultural University, for her constructive criticism, valuable suggestions and co-operation throughout the study period.

The author also expresses his profound respect and sincere gratitude to all other teachers, Departments of Agribusiness and Marketing, for providing suggestions and inspirations through the whole period of my research work.

I am also very much thankful to the farmer, wholesaler, and retailer in Bakshiganj and Dewanganj Upazila of Jamalpur district.

I would like to express thanks to Maruf Khan my younger brother who helped me to collect all the data.

The Author

ABSTRACT

Potato contributes significantly to the food security and income of Bangladeshi farmers. It is a valuable vegetable both commercially and nutritionally in the world, as well as in Bangladesh. In Bangladesh, the potato value chain is not well organized. The study was carried out to Assess marketing margin of value chain actors in a selected area of Bangladesh's Jamalpur district. It's an attempt to assess the existing potato value chain with the help of primary and secondary data. Primary data were collected from the potato growing area of Dewanganj and Bakhshiganj upazila of Jamalpur district. Potato value chain actors were selected from both the upazilas. Fifty farmers, twenty traders, twenty consumers, and one cold storage owner were selected through simple random sampling, purposive sampling, and simple random sampling procedures, respectively. Simple descriptive methods were used to analyze the data. The primary data were collected through the direct interview method with the help of pretested questionnaires during the month of July 2022 to January 2023. In the production and marketing system of potatoes, many value chain actors were involved such as farmers, wholesalers, retailers, and cold storage owners. Marketing of potato produced in both Upazila was moved from the hands of producers to the hands of consumers through four separate chains. This study shows that highest sales price per 100kg of potato received by retailer of dewanganj and Bakhshiganj was Tk.2100.00 and Tk. 2050 respectively and the lowest sales price was received by farmer dewanganj and Bakhshiganj Tk.1400.00 and Tk. 1350.00. Additionally, value addition in Dewanganj Upazila by the farmer, retailer and wholesaler was 32.64%, 20.00% and 25.00% respectively and value addition in Bakhshiganj Upazila by the farmer, retailer and wholesaler was 31.32%, 17.14% and 29.63% respectively. The current study discovered some weaknesses in the existing potato production and marketing system. Potato growers did not receive a fair price due to a lack of economic storage facilities, the presence of stronger middlemen, inefficient transportation facilities, a lack of proper marketing information, and the farmers' urgent need for money immediately following the potato harvesting period. Based on the findings of the current study, it was recommended that institutional credit, timely input supply, the use of modern production and postharvest technologies, and price stability be ensured, in addition to the provision of storage, transport, and market facilities.

Table of Content

Description	Page
Dedication sheet	i
Acknowledgement	ii
Abstract	iii
Table of content	iv-vii
CHAPTER I: INTRODUCTION	1-3
1.1 Background of the study	1
1.2 Objective of the study	2
1.3 Justification of the study	2
CHAPTER II: REVIEW OF LITERATURE	4-17
2.1 Marketing margin analysis of potato value chain actors	4
2.1.1 Value chain	4
2.1.2 Conceptual framework of value Chain	4
2.1.3 Value chain actors and support framework	6
2.1.4 Market chains versus value chains	7
2.1.5 Major concepts guiding agricultural value chain analysis	7
2.1.5.1 Effective demand	7
2.1.5.2 Production	8
2.1.5.3 Value chain governance	8
2.1.5.4 Market and marketing	9
2.1.5.4.1 Marketing efficiency	9
2.1.5.4.2 Marketing channel	9
2.1.5.4.3 Marketing Performance	9
2.1.5.4.4 Marketing Costs	10
2.1.5.4.5 Marketing Margin	10
2.1.5.4.6 Measuring value chain	11
2.2 Benefit of value chain in Agricultural sector	11
2.2.1. Developing value chain systems towards the benefits of the poor	11
2.3 Review of empirical studies	12
2.3.1 Value chain approach	12
2.3.2 Determinants of marketable surplus	13
2.3.3 Determinants of market channel choices	14

CHAPTER III: METHODOLOGY	18-23
3.1 Introduction	18
3.2 Selection of Study Area	18
3.3 Selection of Period of Study	18
3.4 Selection of Samples and Sample Technique	19
3.4.1 Selection of Potato Growers	19
3.4.2 Value Chain Actors of Potato	19
3.5 Preparation of the Survey Schedule	19
3.6 Data Collection	20
3.7 Tabulation and Analysis of Data	20
3.8 Analytical Technique	21
3.8.1 Gross return and net return of the farmer	21
3.8.2 Marketing margin and net margin of value chain actors	22
3.8.3 Problems Encountered in Collecting Data	22
3.9 Report Writing	23
CHAPTER IV: RESULTS AND DISCUSSION	24-42
4. 1. Present Status of Potato Cultivation in Bangladesh	24
4. 2. Export of potato	25
4.2.1. Export trend of potatoes in Bangladesh	25
4.2.2. Export of potato based processed products during 2015-2017	26
4.3. Potato Production in the Study area	26
4.4. Stakeholders' profile	27
4.4.1. Land details and characteristics of stakeholders:	27
4.4.2. Educational Background and Characteristics of Actors in Value chain	28
4.4.3. Agronomic practices in the study area	29
4.4.3.1. Land and soil	29
4.4.3.2. Seed rate	29
4.4.3.3. Time of sowing	29
4.4.3.4. Sowing method	29
4.4.3.5. Fertilizer application	29
4.4.3.6. Irrigation	29
4.4.3.7. Major diseases and insect pest	30
4.5. Post-harvest loss at farm level	30
4.6. Marketing Margin Analysis of Potato	31

4.6.1. Potato value Chain Map and Actors	31
4.6.2. Supply Chain of Stored potatoes:	33
4.6.3. Average disposal pattern of potato at farm level in the study areas	34
4.7. Consumer Family Size and Average Consumption	35
4.8. Marketing Margin Analysis	36
4.8.1. Cost and return analysis of Dewanganj farmer	36
4.8.2. Profitability of Dewanganj potato farmer	37
4.8.3. Cost and return analysis of Dewanganj farmer	37
4.8.4. Profitability of Bakshiganj potato farmer	38
4.8.5. Value addition of potato by farmers	39
4.8.6. Cost and margin analysis of Dewanganj wholesaler	40
4.8.7. Cost and margin analysis of Bakshiganj wholesaler	41
4.8.8. Cost and margin analysis of Dewanganj retailer	42
4.8.9. Cost and margin analysis of Bakshiganj retailer	43
4.9. Storage of Potato	44-45
4.9.1. Cost and margin analysis of cold storage owner	44
4.9.2. Cold storage Information	45
CHAPTER V: CONSTRAINTS FACED BY POTATO VALUE CHAIN ACTORS	46-49
5.1. Constraints faced by farmers	46
5.2 Constraints faced by middlemen	46
5.3. Strategic intervention for increasing the competitiveness of potato value chain in the two regions.	47
CHAPTER VII: SUMMARY, CONCLUSION AND RECOMMENDATION	50-53
6.1 Summary	50
6.2. Conclusion	52
6.3. Recommendation	52
REFERENCE	54-58
List of Table	Page
Table 2.1 Enterprise relations: production chain versus value chain	7
Table 3.1. Different Actors and Size of Sample	19
Table 4.1: Area, yield and production of potato in Bangladesh 2015-2016 to 2021- 2022	24
Table 4.2: Export of potato based processed products during 2015- 2017	26

Table 4.3: Potato Production in the Study area	27
Table 4.4: Land details and characteristics of stakeholders	28
Table 4.5: Educational background of potato value chain actors at Dewanganj and Bakshiganj Upazilas	29
Table 4.6: Post Harvest loss at farm level	31
Table-4.7: Quantity of potato stored and sold at farm level in the study areas	34
Table 4.8: Average disposal pattern of potato at farm level in the study areas	35
Table 4.9: Average production cost of Dewanganj	36
Table 4.10: Profitability of Dewanganj potato farmer	37
Table 4.11: Average production cost of Bakshiganj	38
Table 4.12: Profitability of Bakshiganj potato farmer	39
Table 4.13. Value addition of potato by farmers	39
Table 4.14 Daily transactions and value addition incurred by wholesaler	40
Table 4.15 Value addition and marketing margin of potato incurred by	41
Table 4.16 Daily transactions and value addition incurred by wholesaler	41
Table 4.17 Value addition and marketing margin of potato incurred by	42
Table 4.18 Daily transactions and value addition incurred by retailer	42
Table 4.19 Value addition and marketing margin of potato incurred by retailer	43
Table 4.20 Daily transactions and value addition incurred by retailer	44
Table 4.21 Value addition and marketing margin of potato incurred by retailer	45
Table 4.22: Cold storage Information	46
Table 5.1. Constraints faced by farmers	46
Table 5.2. Constraint faced by middlemen	47
Table 5.3. Strategic intervention for increasing the competitiveness of potato value chain in the two regions	48

List of Figure	Page
Figure 2.1. Value chain functions	5
Figure 2.2. Value chain actors and support framework	6
Figure 4.1: Export trend of potatoes in Bangladesh	25
Figure 4.2: Potato Supply Chain Map	33
Figure 4.3: Family Size and Average Consumption	35
Figure 4.4: Cost and margin analysis of cold storage owner	45

CHAPTER I

INTRODUCTION

1.1 Background of the study

The main agricultural crops of Bangladesh are considered to be rice, wheat, potatoes, jute, and sugarcane, and these crops have a big impact on the agricultural industry. The most densely populated nation in the world and a developing nation with an agriculture-based economy is Bangladesh. The overall population of Bangladesh is estimated to be 165.16 million (BBS, 2022). Almost 68.46 percent of Bangladeshis live in rural areas (BBS, 2022), and agriculture is their primary source of income. According to Finance Division (2018) and Murshid and Yunus (2016), the agriculture sector accounts for 14.23 percent of Bangladesh's GDP and nearly 70 percent of its agricultural gross domestic product (AGDP). Nonetheless, as a result of industrialization, the amount of agricultural land is decreasing year by year. Agricultural land accounted for 70.6 percent of Bangladesh's total land area (World Bank, 2018). Because of the large population, food security is the most pressing issue. Rice, potato, wheat, maize, and sugarcane are important crops in Bangladesh to meet rising food demand. Bangladesh is known as a rice-eating country, with massive amounts of potato produced and consumed each year. In Bangladesh, the potato is gradually gaining popularity. For a long time, most people needed potato (Alu) as a vegetable. It is, however, becoming more popular in other shapes like, Alu puree and Alu chop. Smashed potatoes and potato chips were once well-known luxuries in this country. This has paved the way for small-scale residential kitchen potato handling. Potato with added benefits fresh potatoes can be used to make French Fries for both domestic and international markets. Bangladesh potatoes are in high demand around the world, and other varieties can be grown here as well. With the introduction of modern technologies, a relatively high yield and low cost of production of the crop may have provided an incentive to farmers to increase the area as well as production of potato, thereby increasing the marketable surplus of potato in Bangladesh.

However, due to lack of proper storage and marketing facilities, farmers do not receive a fair price and, in some cases, cannot afford to recover their production costs. Due to a lack of storage facilities and the farmers' need for cash, the growers are forced to sell a large portion of their harvest immediately after harvesting at a very low price. Farmers are compelled to sell potato in a very low price at peak harvesting time in most potato growing areas of Bangladesh. Side by side, it has been observed that in some areas potato price is very high during off season and even in the peak season. If farmers fail to sell their produce at an incentive price they are likely to discontinue its production, which may adversely affect the economy of the country. So, it is very important to make the market efficient for the sake of both farmers and consumers. Marketing margin of potato marketing can be used for identifying the various issues related to production and marketing problems of potato and help to identify probable solutions. It is widely assumed that potato growers do not receive a fair price due to a lack of storage facilities, the presence of middlemen, transportation facilities, a lack of proper marketing information, and the farmers' immediate need for money following potato harvesting. The seasonal character of potato arrivals is greatly influenced by farmers' failure to rely on them due to their semi-perishable nature, resulting in a post-harvest market glut. As a result, an efficient marketing system is critical in order to accelerate and sustain potato production and thus promote agricultural growth in the country. The current study aims to identify the major shortcomings of existing potato production and marketing systems in order to identify interventions for long-term increases in production and value-added activities.

1. 1. 1. Present Status of Potato Cultivation in Bangladesh

Within the later a long time, potatoes have been involved in an imperative position in Bangladesh. The generation of potato has expanded significantly within the nation shape 2015-16 to 2021-2022. The zone beneath potatoes has expanded to 464.01 thousand ha in 2021- 22 from 475.48 thousand hectares in 2015-16. The normal surrender per hectare for the nation moreover expanded from 19.47 tons to 21.86 tons during this period.

Table 1.1: Area, yield and production of potato in Bangladesh 2015-2016 to 2021-2022

Year	Area (ha)	Yield(ton/ha)	Production (ton)
2015-16	475488	19.476	9474098
2016-17	499725	20.443	10215957
2017-18	477400	20.411	9744412
2018-19	468375	20.614	9655082
2019-20	461317	20.822	9605624
2020-21	468680	21.096	9887242
2021-22	464011	21.863	10144835

Source: BBS, 2022

1.2 Export of potato

1.2.1. Export trend of potatoes in Bangladesh

Figure 1.1 shows the export trends of potato are also fluctuating. In 2008-09, 407 MT potatoes were exported from Bangladesh and since then it started to increase gradually and had gone peak in 2013- 14 (103000MT). After that it again started to decline gradually and fall down to 34794 MT of potato export in 2018-19 but in the following year it started to increase with export of 46002 MT export potatoes. As evident from the data presented in this section, exports of fresh produce have demonstrated fluctuations across the years. According to the insiders of export business, these erratic trends of export of fresh produce were due to non-compliances of requirements of imported countries. The main reason for the fluctuation was the ban/embargo on some products due to Bangladesh's non-compliance with quality standards. BFTI (2016) in a study reported that importing

countries, particularly the EU put embargo to export betel leaf, lemons/citrus and cucurbits (pointed gourds, teasel gourd) to the EU markets. Russia, the major uplifting country of potatoes-imposed ban to import potatoes from Bangladesh due to presence of brown rot disease caused by *Rastonia solanacearum* a bacterial rot agent.

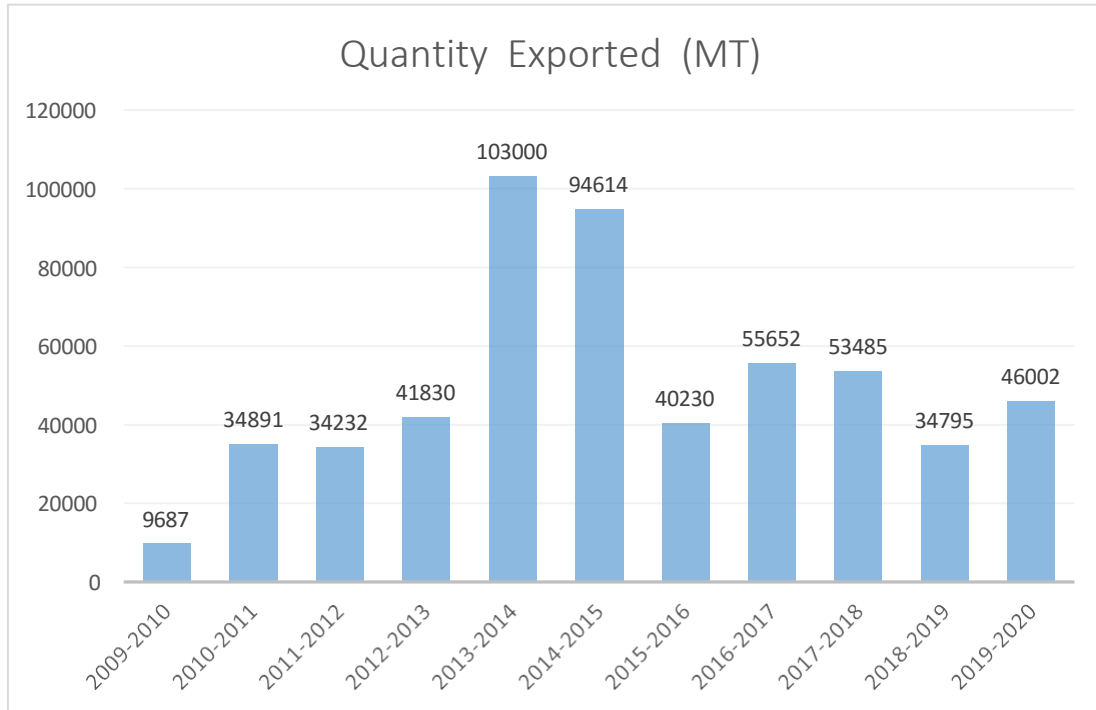


Figure 1.1: Export trend of potatoes in Bangladesh

1.2.2. Export of potato based processed products during 2015-2017

It has been found that the export earning of dry food products increased significantly during the period from 2015 to 2017. Table 4.2 shows that in 2015-16 export earnings from Potato crackers/ chips was only 2.41 million US \$ and in 2016-2017 it raised to 2.68 million US \$. But Potato Flakes export decreased in 2016-2017 than 2015-2016.

Table 1.2: Export of potato based processed products during 2015-2017

Year	Potato Based Processed Products		
	Potato crackers/ chips	Potato Flakes	Potato pellet
2015-2016	2.41 million US \$	2.11 million US \$	-
	917.851 MT	1782.015 MT	-
2016-2017	2.68 million US \$	0.72 million US \$	1.05 million US \$
	899.94 MT	613.27 MT	952.70 MT

Source: BAPA, data analysed by Hortex Foundation 2020

1.3 Potato Production in the Study area

Among those, Table 1.3. shows that farmers got 36317 tons of diamond variety from 1602 hectares of land, 34146 tons of cardinal from 1411 hectares, 18841 tons of Asterix from 776 hectares, 2692 tons of granula from 124 hectares, 2880 tons of BARI-5 from 120 hectares, 2244 tons of Binela from 102 hectares, 6809 tons Lalpakri from 390 hectares, 3000 tons of champok from 100 hectares, 3200 tons Munta from 110 hectares and 1508 tons local variety from 95 hectares. From all the varieties it is seen that farmers mostly cultivated diamond variety and production of diamond variety is higher than others variety. Farmers are avoiding cultivating local variety day by day.

Table 1.3: Potato Production in the Study area

Name of Variety	Area (ha)	Production (Tons)
Diamond	1602	36317
Cardinal	1411	34146
Estarix	776	18841
Granula	124	2692
BARI-5 from	120	2880
Binela	102	2244
Lalpakri	390	6809
Champok	100	3000
Munta	110	3200
Local variety	95	1508

Source: Plant Protection Wing, DAE and EPB,2022

1.4 Objectives of the study

The main objective of this study is to analyze the potato value chain in Jamalpur district of Bangladesh. The specific objectives of the study are as follows:

- I. Develop value chain maps and to identify the major potato value chain activities with actors.
- II. To investigate the revenue and cost of major value chain actors.
- III. To identify the problems faced by the potato value actors in the study area.
- IV. Identify strategic intervention areas for increasing the competitiveness of potato value chain in Dewanganj and Bakhshiganj Upazila.

1.5 Justification of the Study:

Potato is an important vegetable that is grown primarily for cash profit in the hope of obtaining a fair price, its range and production are heavily influenced by its price, which fluctuates dramatically. Potato production in the country has increased significantly over the last 20 years. Every year, the country grows a huge amount of potatoes. Increasing the productivity of the crop due to adoption of modern high yielding varieties and improved production and postharvest technologies, the area of production and yield have been boosted up since few decades. But due to lack of adoption of demand driven modern production technologies, absence of proper storage and marketing facilities farmers do not get fair price even sometime they cannot afford to recover the production cost. Sometimes the growers are compelled to sell major parts of their produces immediately after harvest at a very low price due to lack of storage facilities and cash need of the farmers. Farmers are forced to sell potato in a very low price at peak harvesting time in most potato growing areas of Bangladesh. It is reported that in some areas potato price is very high during off season and even in the peak season. If farmers fail to sell their produce at an incentive price they are likely to discourage for production of potato, which may adversely affect the economy of the country. So, it is very important to make the market efficient for the sustainable production of potato in the country that will restore the interest of both farmers and consumers. Marketing margin analysis of potato can be used for identifying the constraints of production and marketing of potato and help to identify probable solutions for sustainable improvement of potato industry in Bangladesh.

CHAPTER II

REVIEW OF LITERATURE

The literature has been reviewed and presented information on the basic concepts of value chain, guiding principles of agricultural value chains. The benefit of value chain in the agricultural sector, markets and marketing, market channel, market performance, measuring value chain, developing value chain for the benefit of the poor, value chain governance and upgrading of value chains, and the status of potato production and marketing in Bangladesh.

2.1 Marketing margin analysis of potato value chain actors

2.1.1 Value chain

A value chain is made up of a series of actors (or stakeholders) from input suppliers, producers and processors, to exporters and buyers engaged in the activities required to bring agricultural product from its conception to its end use (Kaplinsky and Morris, 2001). Bammann (2007) has identified three important levels of value chain.

- i. Value chain actors: The chain of actors who directly deal with the products, i.e. produce, process, trade and own them.
- ii. Value chain supporters: The services provided by various actors who never directly deal with the product, but whose services add value to the product.
- iii. Value chain influencers: The regulatory framework, policies, infrastructures, etc.

According to Anandajayasekeram and Berhanu (2009), value addition results from diverse activities including bulking, cleaning, grading, and packaging, transporting, storing and processing.

2.1.2 Conceptual framework of value Chain

A value chain encompasses the full range of activities and services required to bring a product or service from its production to its end use (Kaplinsky, 2000). Value chain include process actors like input suppliers, producers, processors, traders and consumers. At one end are the producers-the farmers who grow the crops and raise the animals. At the other end are consumers, who eat, drink and wear final products. It also includes a range of

services needed in the value chain including technical support, business enabling and financial services, innovation and communication, information brokering, etc. the value chain actors and service providers interact in different ways starting from local to national and international level. Figure 2.1. shows the value chain function.

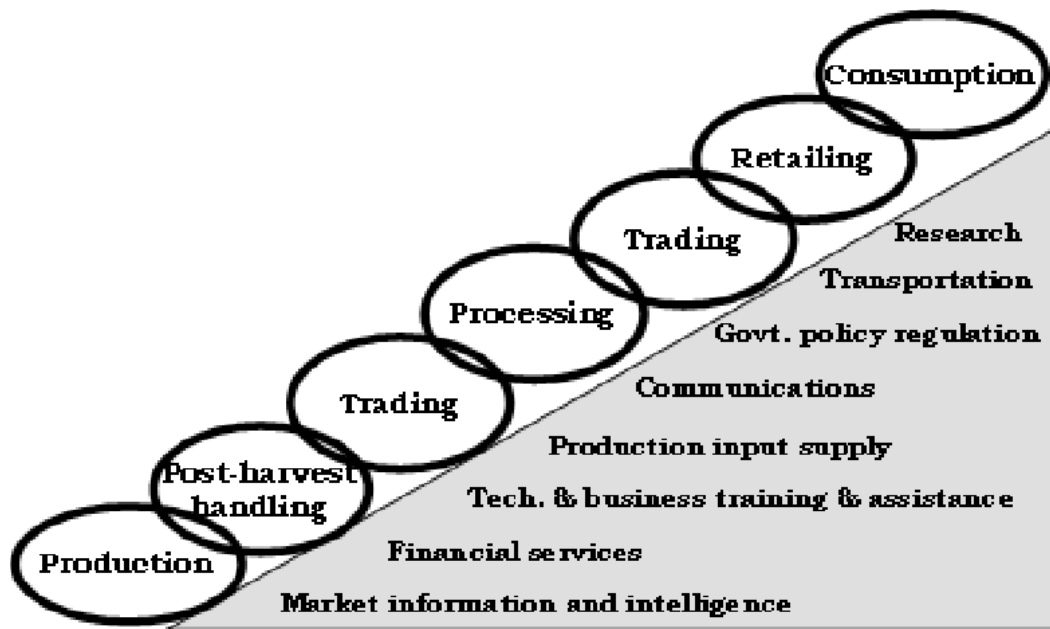


Figure 2.1. Value chain functions Source: Anandajayasekeram and Berhanu (2009).

According to (KIT et al, 2006), farmers who are involved in the value chain functions have little negotiating power and make little money and have no incentive to improve their products, and the traders face a great deal of risk and can buy only low-quality produce. The function through which each actor is prepared to invest and support other actors to maximize the benefit from the chain performance is known as a value chain. This makes the chain to function smoothly and develops the sense of benefiting all actors from having a smooth supply of top-quality products in a sustainable manner.

2.1.3 Value chain actors and support framework

Value chain include direct actors which are commercially involved in the chain (producers, traders, retailers, consumers) and indirect actors which provide services or support the functioning of value chain. These include financial or non-financial service provides such

as bankers and credit agencies, business service providers, government, researchers and extension agents. Figure 2.2. illustrates the general framework for value chain actors and support system. The chains can be simple when producers directly sell to the consumers but long and complex when the other actors play role in buying, processing, transporting and selling to the end user, the consumer. The complex chain, however, offers a multitude of choice to farmers. They may choose to supply a specific market segment and produce the crop or animal that is tailored to that segment. They may also try to process their produce to add value to it: they may dry chilies rather than selling them fresh, or they may make cheese rather than selling the unprocessed milk or cook rather than selling row potato. Farmers need to understand the players in the chain and the requirements of the different branches so they can supply the product which that branch requires. That will increase their bargaining power in the chain and improve the price they get for their product. This in turn increases farmers' comparative advantage by increasing the volume of supply, quality of the product and consistency of supply, which is often possible when farmers act as a group (Mayoux, 2003).

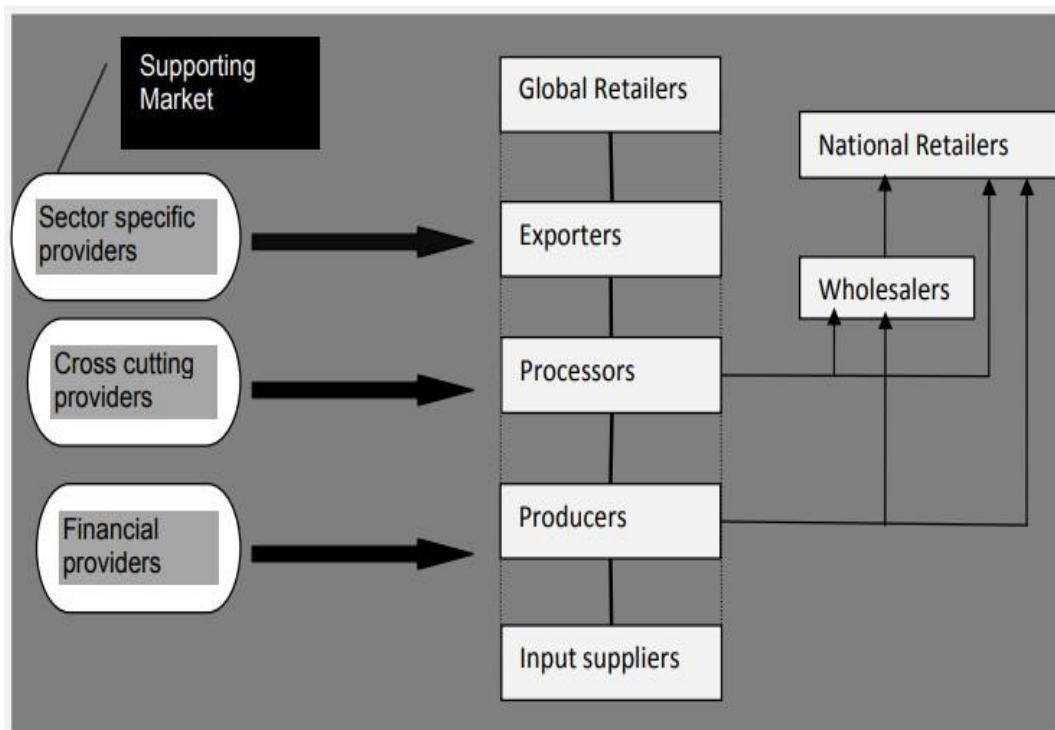


Figure 2.2. Value chain actors and support framework (Source: Mayoux, 2003)

2.1.4 Market chains versus value chains

A value chain is differentiated from a production/supply chain because participants in the value chain have a long-term strategic vision, disposed to work together, oriented by demand and not by supply, shared commitment to control product quality and have a high level of confidence in one another that allows greater security in business and facilitates the development of common goals and objectives (Hobbs *et al.* 2000).

Table 2.1 Enterprise relations: production chain versus value chain

Production market chain	Factors	Value market chain
Little or none	Information flow	Extensive
Cost / price	Principal focus	Value / quality
Basic product (commodity)	Strategy	Differentiated product
Led by supply	Orientation	Led by demand
Independent actors	Organizational	Independent actors
Competitiveness of the enterprise	Philosophy	Competitiveness of the market chain

Source: Hobbs *et al.* (2000).

The goal of a value chain is to optimize performance in the industry using the combined expertise and abilities of the members of the chain. Successful chains depend on integration, coordination, communication and cooperation between partners with the traditional measure of success being the return on investment (Bryceson and Kandampully, 2004).

2.1.5 Major concepts guiding agricultural value chain analysis

According to Anandajayasekeram and Berhanu, (2009); Kaplinsky and Morris,(2000), four major key concepts guide agricultural value chain analysis. These are effective demand, production, value chain governance, and upgrading.

2.1.5.1 Effective demand

Agricultural value chain analysis views effective demand as the force that pulls goods and services through the vertical system. Hence, value chain analysis need to recognize the dynamics of how demand is changing at both domestic and international markets, and the implications for value chain organization and performance. Value chain analysis also needs to observe barriers to the transmission of information in the changing nature of demand and incentives back to producers at various levels of the value chain (Hossain, 2016).

2.1.5.2 Production

In agricultural value chain analysis, a stage of production can be referred to as any operating stage capable of producing a marketable product serving as an input to the next stage in the chain for ultimate consumption or use. Typical value chain linkages include input supply, production, assembly, transport, storage, processing, wholesaling, retailing, and utilization, with exportation included as a major stage for products destined for international markets. According to Anandajayasekeram and Berhanu (2009), stage of production in a value chain performs a function that makes significant contribution to the effective operation of the value chain and in the process adds value.

2.1.5.3 Value chain governance

According to Kaplinsky and Morris (2000), governance refers to the role of coordination and associated roles of identifying dynamic profitable opportunities and apportioning roles to key players. Value chains imply the repetitiveness of linkage interactions. Governance ensures that interactions between actors along a value chain reflect organization, rather than randomness. The governance of value chains emanates from the requirement to set

product, process, and logistic standards, which then influence upstream or downstream chain actors and results in activities, roles and functions. Trust-based coordination is central for goods and services, whose characteristics change frequently, making a standardized quality determination for the purposes of industrial coordination difficult (Raikes *et al.* 2000). This applies to the manufacturing industry as well as agri-food chains. It is possible to identify in one industry with several coordination forms used by different firms where the choices rely on the trust existent between the firms. According to Kaplinisky and Morris (2000), value chains can be classified into two based on the governance structures: buyer-driven value chains, and producer driven value chains. Buyer-driven chains are usually labor intensive industries, and so more important in international development and agriculture. In producer-driven value chains which are more capital intensive, key producers in the chain, usually controlling key technologies, influence product specifications and play the leading role in coordinating the various links. Some chains may involve both producer and buyer driven governance.

2.1.5.4 Market and marketing

According to Hossain Mohammad Anwar (2016), a market is a point, or a place or sphere within which price making force operates and in which exchanges of title tend to be accompanied by the actual movement of the goods affected. The concept of exchange and relationships lead to the concept of market. According to Kotler and Armstrong (2003), it is the set of the actual and potential buyers of a product. Conceptually, a market can be visualized as a process in which ownership of goods is transferred from sellers to buyers who may be final consumers or intermediaries.

2.1.5.4.1 Marketing efficiency

Efficiency in marketing is the most used measure of market performance. Improved marketing efficiency is a common goal of farmers, marketing organizations, consumers and society. It is a common place notation that higher efficiency means better performance whereas declining efficiency indicates poor performance. Most of the changes proposed in marketing are justified on the grounds of improved efficiency (Kohls and Uhl, 1985).

2.1.5.4.2 Marketing channel

According to Kotler and Armstrong (2003), marketing channel is a business structure of interdependent organizations that reach from the point of product or origin to the consumer with the purpose of moving products to their final consumption or destination.

2.1.5.4.3 Marketing Performance

Market performance can be evaluated by analyzing costs and margins of marketing agents in different channels. A commonly used measure of system performance is the marketing margin or price spread. Margin or spread can be useful descriptive statistics if it used to show how the consumer's price is divided among participants at different levels of marketing system (Mendoza, 1995).

2.1.5.4.4 Marketing Costs

Marketing costs are the embodiment of barriers to access to market participation by resource poor small holders. It denotes to those costs, which are incurred to perform various marketing activities in the transportation of goods from producer to consumers. According to Holloway *et al.*, (2002), marketing costs includes handling cost (labor, loading and unloading, costs of damage, transportation, etc) to reach an agreement, transferring the product, monitoring the agreement to see that its conditions are fulfilled, and enforcing the exchange agreement.

2.1.5.4.5 Marketing Margin

Marketing margin is defined as the difference between the price the consumer pays and the price that is obtained by producers, or as the price of a collection of marketing services, which is the outcome of the demand for and supply of such services (Cramers and Jensen, 1982; William and Robinson, 1990 and Holt, 1993). The size of market margins is mainly dependent upon a combination of the quality and quantity of marketing services provided the cost of providing such services, and the efficiency with which they are undertaken and priced. For instance, a big margin may result in little or no profit or even a loss for the seller involved depending upon the marketing costs as well as on the selling and buying prices (Mendoza, 1995). Under competitive market conditions, the size of market margins

would be the outcome of the supply and demand for marketing services, and they would be equal to the minimum costs of service provision plus “normal” profit. Therefore, analyzing market margins is an important means of assessing the efficiency of price formation in and transmission through the system.

According to Mendoza (1995); Scarborough and Kydd (1992), three methods generally used in estimating marketing margin: (a) detailed analyses of the accounts of trading firms at each stage of the marketing channel (time lag method); (b) computations of share of the consumer’s price obtained by producers and traders at each stage of the marketing chain; and (c) concurrent method: comparison of prices at different levels of marketing over the same period of time.

2.1.5.4.6. Measuring value chain

A major aspect of global value chain research is how ‘value’ itself, is conceptualized and measured. Profit, value addition and price mark ups are indications of income shares across value chain actors (Gereffi, 1999). Value– added shares can be calculated for different links in the chain. A second way to calculate value added is to look its distribution by each value chain actors of vegetable market and decomposing for each actor to get approximations of each value-added share. Marketing margin is the difference between the value of a product or a group of products at one stage in the marketing process and the value of an equivalent product or group of products at another stage. According to Smith(1992), measuring this margin indicates how much has been paid for the processing and marketing services applied to the product(s) at that stage in the marketing process.

2.2 Benefit of value chain in Agricultural sector

2.2.1. Developing value chain systems towards the benefits of the poor

According to OECD (2006), in recent years, the pro-poor growth approach has become one of the key concerns of developmental organizations. The focus of the approach lies in the promotion of economic potentials of the poor and disadvantaged groups of people. According to Berg *et al.* (2006), the main aim is to enable them to react and take advantage of new opportunities arising as a result of economic growth, and thereby overcome poverty. The promotion of value chains in agribusiness aims to improve the competitiveness of

agriculture in national and international markets and to generate greater value added within the country or region. The key criterion in this context is broad impact, i.e. growth that benefits the rural poor to the greatest possible extent or, at least, does not worsen their position relative to other demographic groups. Pro-poor growth is one of the most commonly quoted objectives of value chain promotion. In recent years, the need to connect producers to markets has led to an understanding that it is necessary to verify and analyze markets before engaging in upgrading activities with value chain operators.

Thus, the value chain approach starts from an understanding of the consumer demand and works its way back through distribution channels to the different stages of production, processing and marketing (Meyer and Waltring, 2006).

2.3 Review of empirical studies

2.3.1 Value chain approach

There are a number of studies that have employed the value chain approach to agricultural commodities. Used of value chain analysis to examine inter-country distributional outcomes of the global coffee sector by mapping input-output relations and identifying power asymmetries along the coffee value chain (Fitter and Kaplinsky, 2001). Their study indicated that returns to product differentiation taking place in the face of globalization do not accrue to the coffee producers. They also found that power in the coffee value chain was asymmetrical.

At the importing end of the chain, importers, roasters and retailers compete with each other for a share of value chain rents but combine to ensure that few of the rents return to the farmer or the producer country.

USAID (2011) Nepal value chain study conducted on off-season vegetables indicated that the subsector faces some challenges such as unavailability of quality planting materials, lack of knowledge among the producers of the proper usage of fertilizers and pesticides as well as poor soil fertility management, lack of irrigation facilities, labor shortage, postharvest loss due the perishable nature of vegetables, limited access to reliable market information, unorganized market center, limited collection centers, and lack of proper packaging and transportation facilities. The study recommended short-term and long-term infrastructural and institutional innovation to reduce the above challenges.

The major constraints of marketing identified by the same study include lack of markets to absorb the production, low price for the products, large number of middlemen in the marketing system, lack of marketing institutions safeguarding farmers' interest and rights over their marketable produces, poor product handling and packaging, imperfect pricing system and lack of transparency in market information communications.

A value chain study conducted on mango by Dendena *et al.* (2009) indicated that the subsector faces some challenges. Among others: highly disorganized and fragmented industries with weak value chain linkages, long and inefficient supply chains, inadequate information flows and lack of appropriate production are explained as the major problems. The study recommended institutional innovation to reduce the above challenges.

2.3.2 Determinants of marketable surplus

The study of marketable surplus turned out to be very vital for agricultural-based countries because the transition of smallholder farmers towards commercial production is determined by it. The transition of the small-scale sector towards commercial production will ultimately be determined by the ability and willingness of producers to provide a commodity (Getachew, 2009). Similarly, Mamo (2009) claimed that the development of markets, trade, and the subsequent market supply that characterize commercialization are fundamental to economic growth.

There are a number of experiential studies on factors affecting the marketable surplus of agricultural commodities. Several factors affecting the marketable surplus of fruits by using OLS regressions. She found that fruit marketable supply was affected by; education level of household head, quantity of fruit produced, fruit production experience, extension contact, lagged price and distance to market (Ayelech, 2011).

Heckman two-stage model to analyze the determinants of vegetable market supply are applied by Akalu (2007). Accordingly, the study found out that marketable supply of vegetables was significantly affected by family size, distance from mainroad, number of oxen owned, extension service and lagged price.

Marketable supply of agricultural product could be affected by different factors including the size of land holding, the output level, family size, market access, price, inputs, formal education, oxen number, accesses to extension and credit services, distance to market, time

of selling, access to labor and age (Wolday, 1994). In sum, empirical evidence indicate that marketable supply approach has become an important framework to analyze economic agents in agricultural sector. In this study an attempt was made to identify factors affecting the marketable supply of vegetables.

2.3.3 Determinants of market channel choices

As regards factors affecting channel choices of the households, different researchers used multinomial logit and probit for categorical marketing system for different agricultural commodities.

A study by Ferto and Szabo (2002) identified variables influencing producers' decision for channel choices. The analysis was based on a survey among three supply channels of fruit and vegetable producers in Csongrad, Hungary in respect the choice of marketing channels which are wholesalers, marketing cooperative and producers' organization channel. A multinomial logit model was applied to reveal on the determinants influencing these choices among various supply channels. Farmer's decisions with respects to supply channels were influenced differently by transaction costs, and producers sell to wholesale market were strongly and negatively affected by the farmer's age, information costs, and negatively by the bargaining power and monitoring costs. The probability that farmers sell their product to marketing cooperative is influenced by the age and information costs positively, whereas by the asset specificity and bargaining power negatively.

The educational level of the operator, off-farm employment, own means of transportation and age of operator had positive effect where household size was negatively associated with supper marketing channel choices is confirmed by Rao *et al.* (2011). In second stage second stage of treatment model, off-farm employment and own means of transportation affected income of vegetables growers positively. Furthermore, dummy variable for channel choices were positive and significant. This indicated that supplying vegetable to supermarket channels rendered better income gain over spot marketing channel.

On the other hand, ownership of livestock negatively influenced income of vegetables growers supplying traditional or spot marketing channel. Jari and Fraser (2009) identified that market information, expertise on grades and standards, contractual agreements, social capital, market infrastructure, group participation and tradition significantly influence

household marketing behavior. The study uses multinomial regression model to investigate the factors that influence marketing choices among small holder and emerging farmers.

Mamo and Degnet (2012) identified that gender and educational status of the household head together with household access to free aid, agricultural extension services, market information, non-farm income, volume of sales, and time spent to reach the market have statistically significant effect on whether or not a farmer participates in the livestock market and his/her choice of a market channel. The study uses binary logit and multinomial logit to explore the patterns and determinants of small holder livestock farmer's market participation and market channel choice using a micro-level survey data from Ethiopia.

Akter (1973) conducted a study on potato marketing in Comilla Sadar Upazila of Bangladesh and he found some structural and functional features of potato marketing.

Sabur and Gangwar (1984) carried out a study on production and price structure of potato in Bangladesh and showed that the growth rate of potato in terms of production, area and productivity during the proliferation period. The study also showed that the growth rates in terms of area, production and productivity for the western districts were higher than those for the northern districts.

Sabur (1986) conducted a study on marketed surplus of potato in two districts of Bangladesh and found that production and marketed surplus of potatoes moved in same direction and land under potatoes was the most important factor determining the marketed surplus. He showed that the average production cost per hectare was Tk.29637.57 which was the lowest medium farmers and net returns, and benefit cost ratio were calculated at Tk.30947.82 per hectare and 1: 2.25 respectively which were the highest for medium farmers in both the areas. Regional Agricultural Research station, Jamalpur under the Farm Research Division of BARI, Joydebpur conducted research on "Improvement of existing fanning system through holistic approach". They summarized the findings in a report (1992-93). They found that the yield per hectare of HYV potato was 9.25 tones and cost per hectare was Tk. 17,000.00. They observed that the net return depended largely on the harvest price of potato.

Islam (1987) carried out a study on potato preservation in cold storage in Bangladesh including the marketing aspects. He found that price spread per tones of potato appropriated by traders was higher in the case cold stored potato than that of non-stored potato.

Sarkar (1990) conducted research on potato marketing in Bangladesh. His study expounded that only few growers store their potato in cold storage plants due to high storage charge. His study revealed that communication system should be developed to transport potato from production area to the terminal market to strengthen the economic condition of the potato growers. Storage facilities should be improved at the primary and secondary markets by establishing public as well as private cold storage plants at different points of potato marketing channel. His study emphasizes on the improvement of ordinary storage in scientific manner as well as innovation of low-cost storage technique which would not only ensure timely availability of quality seed but also better price at reduced storage costs throughout the year by enlarging storage period at farm level.

The marketing costs incurred per quintal potato were Tk. 60.95, Tk. 56.87, Tk. 133.60 and Tk. 37.81 for Bepari, Paiker, cold storage owners and retailer of Munshiganj bazar respectively. The marketing costs incurred per quintal were Tk. 45.42, Tk. 61.21, Tk. 134.64 and Tk. 37.32 for Bepari, Paiker, cold storage owners and retailers of Tangibari bazar respectively. The net margins of per quintal potato of Bepari, paiker, the cold storage owners and retailers of Munshiganj bazaar were calculated at Tk. 21.73, Tk. 21.50, Tk. 19.57 and Tk. 23.28 respectively.

The net margin of per quintal potato of Bepari, Paiker, the cold storage owners and retailers of Tongibari bazar were calculated at Tk. 30.02, Tk. 26.91, Tk. 25.62 and Tk. 21.94 respectively.

Kawsar (2001) carried out a study entitled "An Economic Analysis of Diamant Potato Production in Some Selected Areas of Bangladesh". The study was mainly designed to analyze the socio-economic characteristics of farmers and to estimate the costs and returns of diamant variety of potato and to determine the factors affecting yield and returns. One hundred thirty-nine farmers were purposively selected from 5 Upazilas of five districts Bogra, Comilla, Munshigonj, Rangpur and Thakurgaon. Findings showed that Diamant potato production is profitable considering the selected farm categories both in East and North Bengal. Per hectare gross margin was the highest for Rangpur whereas net returns were the highest for Munshigonj. Both gross margin and net return were higher for North Bengal. On the other hand, medium farmers obtained the highest amount of gross margin

and net return.

Saiyem (2007) investigated the potato marketing system and price behavior in selected areas of Rangpur district. The samples include 60 sample farmers and intermediaries. In this study production cost, yield, marketing cost, marketing margin, net margin and price behavior of potato farmers and intermediaries were estimated.

Hajong (2011) found many intermediaries are involved such as faria, bepari, paikar, retailers and cold storage owners in the production and marketing system of potato. The farmers distribute their production for family consumption, gift and kind payment to relatives, seed and maximum portion for sell. Again, some potatoes were damaged and loss during storage. Storing of potato in the cold storage plants certainly reduces the excessive losses of potato but all farmers can not avail the facility of cold storages due to several reasons, such as high cold storage charge, uncertainty of future market price, financial insolvency, bad communication and inadequate transport facilities and lack of any provision in getting compensation for damage of potato in the cold storage plants.

The aforesaid reviews reveal that studies were undertaken exclusively on the marketing aspect of potato. Systematic research study report on value chain analysis of potato is meager in Bangladesh. So, the existing research has been undertaken to make an in depth study to provide knowledge in the field of potato production and marketing. The findings of the study might help farmers, value chain actors and consumers to take decision in production, trading. Khadiza Akter et al., 2022 found that channel 4 is the longest marketing chain in the study area which includes the marketing actors – farmers, aratdars, wholesalers, retailers, and consumers. In the value chain of potatoes, the amount of postharvest loss is 6.6% for the producer's level, 5.3% for the wholesale level, 1.10% for the aratdar level, and 2.1% for the retailer level in the study area. The study also shows that lack of storage facility (48.94%) and poor packaging system (32.73%) are the major reasons for occurring postharvest losses of potatoes. The farmers and intermediaries suggested that it is necessary to identify the maturity stage of potatoes at harvesting time (70%), improve the cold storage facility (56.67%), and improve the loading and unloading system (56.25%), etc. for reducing postharvest losses of potato.

CHAPTER III

METHODOLOGY

3.1 Introduction

This chapter presents a detail description of the methods adopted at different stages of the study. Methodology is an indispensable and integral part of any research. This chapter presents the methodology followed in the study, which included the selection of the study area selection of samples, preparation of survey schedule, method of data collection, period of survey, editing and tabulation of data and analytical techniques. The tools and methods used and followed for the study with considering the specific objectives of the study are given below.

3.2 Selection of Study Area

As the selection of the study area is an important step and it largely depends upon the objectives of the study. Therefore, careful thought was placed on the selection of the study area. In order to make an assessment of the value chain of marketing of potato, the study was conducted in selected areas of Jamalpur district. In Jamalpur districts, Bakhsiganj and Dewanganj upazila are selected for study area. The study area has some favorable characteristics like topography, soil and climate condition for producing potato. Farmers are well known to produce potato and preserve it in traditional and cold storage methods. There is huge number of potato growers with different farm sizes. Therefore, the availability of potato growers and traders in the district of Jamalpur was the main criteria for selecting as the study area for the present study.

3.3 Selection of Period of Study

The present study covered 6 months from July 2022 to January 2023. Data were collected during the period from December 2022 to February, 2023 through face to face interview with potato growers, potato traders, and cold storage owner using structured survey schedule. For collecting supplementary data the researcher personally visited the area.

3.4 Selection of Samples and Sampling Technique

Fifty potato growers, twenty other value chain actors (wholesaler and retailer), twenty consumers and one cold storage owners were selected from the study area in the following manner.

3.4.1 Selection of Potato Growers

The potato growers of the selected areas were considered as major part of the study. A list of potato growers of the selected areas was prepared through a preliminary survey. Considering the limitation of time and fund, the sample size for potato growers was fixed at 50.

3.4.2 Value Chain Actors of Potato

In the selected areas 50 potato farmers and 21 intermediaries and 20 consumers were considered as the population of the study. Table 3.1. shows different value chain actors and sample size.

Table 3.1. Different Actors and Size of Sample

Value Chain Actors	Sample Size
Potato Farmers	50
Wholesalers	9
Retailer	11
Cold Storage Plant	1
Consumers	20
Total	91

3.5 Preparation of the Survey Schedule

Three separate types of interview schedules were prepared for collecting necessary data from different types of samples. An interview schedule contains questions about the

production, storage, marketing and disposal of potato at the grower's level. Another interview schedule was prepared for collecting data from potato traders and including question related to buying, storage and selling of potato. The third type of interview schedule was prepared for obtaining data from owners and/or authorities of the selected plants relating to potato preservation, pattern of plant utilization, expenditure incurred for it and revenue earned from cold storage plants for the year and various problems encountered by the cold storage plants. All the schedules were pretested and finally prepared after careful modifications. Interview schedules were prepared on the basis of specific objectives of this study.

3.6 Data Collection

Relevant data were collected from the selected samples through face to face interview. Before taking actual interviews the whole academic purpose of the study was clearly explained to the sample farmers, traders, consumers and cold storage owner. Initially, they were hesitated to answer the questions; but when they were assured that the study was purely an academic one and it would not affect any way, they were convinced to cooperate with the researcher. At the time of interview, the researcher asked questions systematically and explained the questions whenever it was felt necessary. Farmers were requested to provide correct information as far as possible. Many of the respondents did not any records of their businesses and activities. This problem was confronted by memory recalling technique. Data were also collected from potato traders like *Faria*, *Bepari*, wholesaler and retailer. In addition to primary data, secondary data were also collected from various publication like journals, different organization like Department of Agricultural Marketing of Bangladesh and website searching.

3.7 Tabulation and Analysis of Data

The first step was taken to scrutinize the data of each and every schedule to find out any inconsistency or omission in the data collection and to avoid irrelevant information. The data were edited carefully to eliminate possible errors contained in the schedules while recording information. Processed data were transferred to excel spreadsheet and compiled

with a view to facilitating tabulation. Information was collected initially in local units. After checking them these were converted into quantitative form by using suitable scoring. Necessary tables were prepared by summarizing the data. The collected data were analyzed according to the objectives of the study. Analysis was done using the concerned software Microsoft Excel version.

3.8 Analytical Technique

An agribusiness study could be judged by the appropriate analytical technique. Data were analyzed with the purpose of achieving the objectives of the study. The probable techniques used were as follows:

3.8.1 Gross return and net return of the farmer

Gross return was calculated by multiplying the total volume of output of an enterprise by the average price in the harvesting period (*Dillon and Hardaker, 1993*). It consisted of sum of the volume of main product and by product. The following equation was used to estimate gross return:

$$GR = \sum Q_m \cdot P_m,$$

Where:

GR = Gross Return from Product; Q_m = Quantity of Product

P_m = Average Price of Product

Net return was calculated by deducting all costs (variable & fixed) from gross return.

To determine the net return of potato production the following equation was used in the recent study:

$$\pi = \text{Gross Return} - (\text{Variable Cost} + \text{Fixed Cost})$$

Here,

π = Profit per cycle;

Gross Return = Total Production x per unit price of potato

Variable costs,

(i) Production cost of potato

Fixed costs,

- (i) Land use cost;
- (ii). Interest on operating capital

Marketing cost of potato

- (i) License fee;
- (ii) Loading and unloading;
- (iii) Power and electricity charge;
- (iv) Telephone charge;
- (v) Market toll;
- (vi) Transportation;
- (vii) Grading;
- (viii) Storagecost;
- (ix) Personal expenses;
- (x) Unofficial payment.

3.8.2 Marketing margin and net margin of value chain actors

The marketing margin and netmargin of different value chain actors were estimated by the following formula:

(i) Marketing Margin (Tk/40 Kg) = Sales Price (Tk./40 Kg)-Purchase Price (Tk/40 Kg)

(ii) Net Marketing Margin (Tk/40 Kg) = Marketing Margin (Tk/40 Kg) – Marketing Cost (Tk/40 Kg)

(iii) Value Addition (%) = $\frac{(Sales\ Price - Purchase\ Price)}{Purchase\ Price} \times 100$

(iv) Interest on Operating Capital = Amount of Operating Capital X Interest Rate (%) X Time Required (in years) ÷ 2

(v) Variable cost of potato production was considered as operating capital

3.8.3 Problems Encountered in Collecting Data

Though the respondent potato growers were available in the village, collection of required data was not an easy task. The researcher of the study had to face certain problems during data collections, which are noted below:

- (i) Education of the respondents was a pre-requisite factor for having accurate data. Since most of the respondents were not well educated they were suspicious of outsiders and therefore, they were likely to be less co-operative;
- (ii) Some respondents did not keep any written records of the farming activities. Therefore, the researcher had to depend upon their memory;
- (iii) Respondents from all categories were often unable to recall the exact information, say, income, sales volume, cost, total production etc. Reliability of data therefore, posed some confuting;
- (iv) There was the limitation of time and personnel and inadequate information about potato production and marketing aspects and for this reasons data and other necessary information had to be collected within the shortest possible time;
- (v) Since the respondents remained busy at their work, they were not always available at home. For this, frequent visits were made to get information from them;
- (vi) Cold storage owner and maximum value chain actor was avoiding information about their loan and tax.

3.9 Report Writing

Report has been written on the basis of analyzed data. Microsoft Excel has been used for preparing tables and for collection. Microsoft Word has been used for preparing the report.

CHAPTER IV

RESULTS AND DISCUSSION

4.1. Stakeholders' profile

4.1.1. Land details and characteristics of stakeholders:

Table 4.1 shows that average age of the farmers of the study area was 44 years and the main occupation of the farmers is farming and on average they have been in farming operations for 11 years. Average land area per farmer was 0.49 ha. The average cultivated land for potato cultivation was 0.37 ha. While the average share of potato cultivation area out of total cultivated land area was 71.99%.

Table 4.1: Land details and characteristics of stakeholders

Characteristics	Dewanganj	Bakshiganj	Average
	Mean	Mean	
Age	45.00	43.00	44.00
No of years in farming	12.00	10.00	11.00
Total land area(ha)	0.49	0.49	0.49
Total cultivated area(ha)	0.37	0.36	0.365
Share of potato area out of total cultivated area (%)	71.99	70.05	71.02

Source: (Field survey, 2022)

4.1.2. Educational Background and Characteristics of Actors in Value chain

Most farmers who took part in the survey are male. About 21.43 of the respondents have secondary education, only 12.86 percentage of farmer have higher secondary education. The rest are either uneducated or have primary education. Primary education have (40%) of farmers and 25.71% are illiterate (Table-4.2). Collectors' and wholesalers' businesses

are managed by male and involvement of females are very rare. On average among the collectors about 33.33% have secondary education 22.22%; Retailers have primary education.

Table 4.2: Educational background of potato value chain actors at Dewanganj and Bakshiganj Upazilas

Education category	Farmer		Wholesaler		Retailer		Total	
	N	%	N	%	N	%	N	%
Illiterate	10	20.00	3	33.33	5	45.45	18	25.71
Primary(1-5 Years)	18	36.00	4	44.44	6	54.54	28	40
Secondary (6-10 Years)	13	26.00	2	22.22	0	0	15	21.43
Higher Secondary (11-12 Years)	9	18.00	0	0	0	0	9	12.86
Total	50	100	9	100	11	100	70	100

Source: (Field survey, 2022)

4.2. Post-harvest loss at farm level

Potatoes are semi perishable commodity and contain more than 70% of moisture. They undergo a lot of physical, chemical and physiological changes during the whole process of harvesting, curing, storage, handling, transportation and marketing, resulting in a deterioration of quality and loss in weight with time. The post-harvest losses of potato at different stages of post-harvest operations at farm level in the study areas are shown in table 4.3.

Average harvesting loss was found to be (11.28%) of total production and the losses are comprised of insect damage (4.08%), rotten loss (1.69%), cutting loss (1.08%), potato remained under soil during harvesting (3.71%), and other losses (0.72%) such as off size, green potato etc.

Potatoes in the study areas were harvested manually using country ploughs or spades. No mechanical harvester is used to harvest potatoes. The harvesting loss of potato is found to

be 11.28%. Harvested potatoes were bagged from the field and the bag kept in the shade at home for several days for curing. Sometimes, potatoes were bagged from the field and transported directly to the market or cold storage without curing. This may cause heat stress in the potato and deteriorate it rapidly. In other areas potatoes were spread on the floor and kept in the shade for one to two weeks. After curing, potatoes were sorted and sometimes graded and bagged. Average curing loss was found to be 5.85%. The average pre-storage loss in the study areas was 17.14%

Table 4.3: Post Harvest loss at farm level

Particulars	Quantity			% loss of total production
	Dewanganj	Bakshiganj	Average	
Production	886.0	9220.0	5053.0	
1. Harvesting loss	618.6	521.2	569.9	11.28
Insect loss	205.4	207.2	206.3	4.08
Rotten loss	88.7	82.0	85.35	1.69
Cutting loss	56.0	53.0	54.5	1.08
Remain under soil loss	229.0	146.0	187.5	3.71
Other loss	39.5	33.0	36.25	0.71
2. Curing loss	329.0	263.0	296.0	5.86
B. Pre storage loss(1+2)	947.6	784.2	865.9	17.14
4. Home storage loss	10.5	21.5	16.0	0.32
Total loss	3410.3	11331.1	7370.7	17.45

Source: (Field survey, 2022)

4.3. Marketing Margin Analysis of Potato

4.3.1. Potato Value Chain Map and Actors

Value chain map of potato was developed based on information gathered during interview with the informants of the study. Based on the secondary information a “map” of the sub-sector has been developed to graphically present all the actors in the value chain. In potato production and marketing, there are several actors involved in the value chain e.g. input suppliers, farmers, processors, traders, exporters and retailers etc. The potato value chain represents the overall market position where farmers, retailers, wholesalers are present (Figure-4.1). The accumulative roles of various actors constitute the pillars of the potato value chain, because their presence or absence has important implications on the growth of the crop.

Considering that potato is an important vegetable in Bangladesh, the product moved from the sellers to consumers through the same chains i.e. through some market actors like Bepari, wholesaler, retailer and cold storage owner. The study revealed that there had a movement of potato from the point of production to the point of consumers through some actors forming a chain in the potato market in the study area. The assembly traders procure potatoes from fields and also from farmer’s field. Pre-harvest sale system is also in place by resource poor farmers who takes loan from the traders. Some big growers within easy reach of wholesale/distributing markets are also found selling potatoes to the urban retailers through commission agents (aratdars).

Growers living around urban areas sell in the retail markets directly to consumers. The assembly traders purchase potatoes from different rural assembly markets/growers' premises and transport the lot to the assembly traders through commission agents. These assembly traders also purchase potatoes directly from the growing areas on behalf of traders or cold storage owners on commission basis. The commission agents normally play the role of middlemen. Sometimes they play a dual role one as wholesalers and the other as aratdars.

The cold store owners purchase and store potatoes on their own and also provide service as middlemen or storing potatoes (table potatoes for the off-season and seed for next season) of traders and growers in their cold stores. The consumers in general buy potatoes from urban and rural retail markets. Hawkers rarely move with potatoes to consumers as they do for other vegetables whereas corner shops in city/town areas sell potato as a regular item to consumers.

A common value chain of potato is shown in (Figure-4.1) the value chain map shows various channels currently operating in different scales and degrees in the market.

Chain I: Farmer → Wholesaler → Retailer → Consumer.

Chain II: Farmer → Wholesaler → Cold storage → Retailer → Consumer.

Chain III: Farmer → Cold storage → Wholesaler → Retailer → Consumer.

Chain IV: Farmer → Retailer → Consumer.

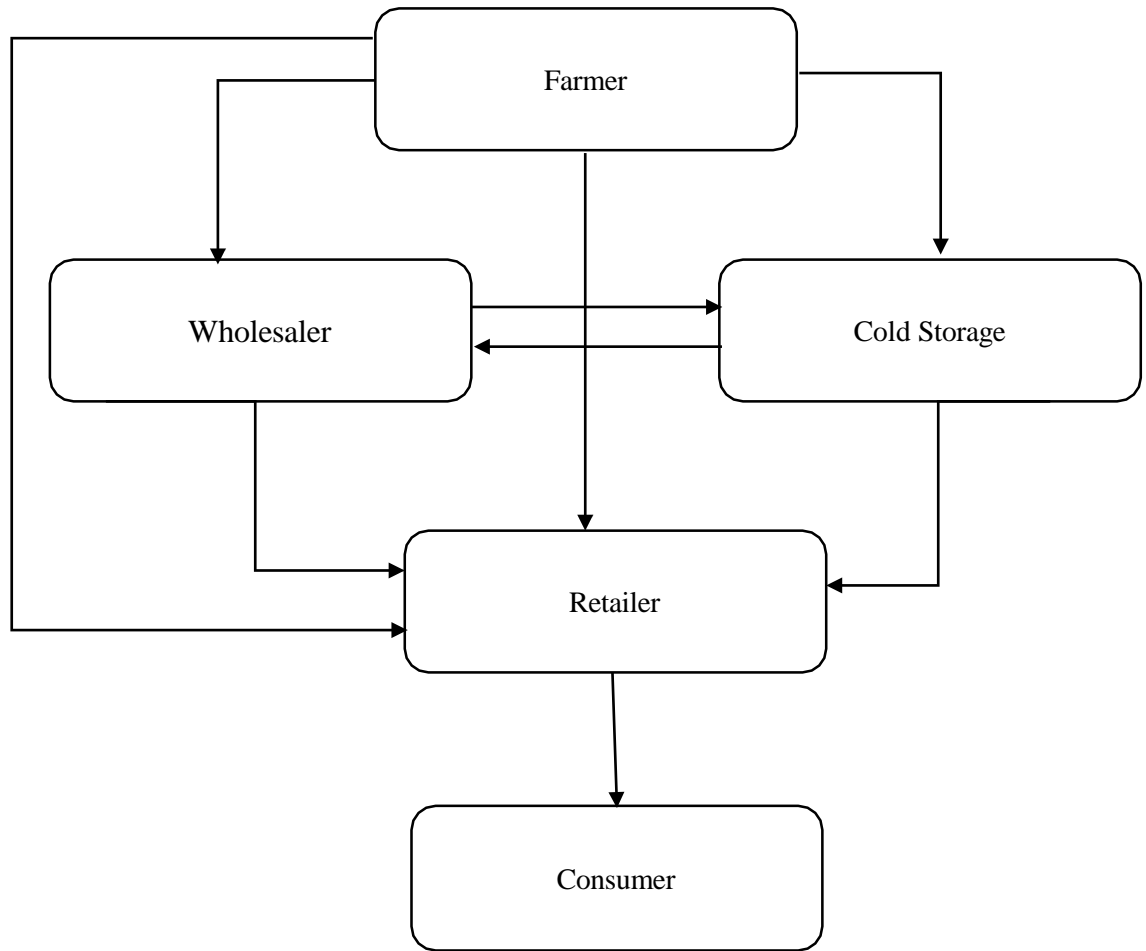


Figure 4.1: Potato Value Chain Map

4.3.2. Value Chain of Stored potatoes

The marketing chain refers to the sequential arrangements of various marketing intermediaries involved in the movement of products from producers to consumers. In the chain of potato marketing in Bangladesh, the product moves from the producers-sellers to ultimate consumers through a number of market intermediaries. In the context of Bangladesh, the work of different intermediaries often overlaps. For example, wholesaler (Bepari/Paiker) sometimes performed retail business. In the present study, different marketing chains of potato were identified. The value chain of traditionally stored potatoes is illustrated in (Table 4.4). The potatoes were purchased by Beparis (100%). Home storage in Dewanganj was 206 kg in average where in Bakshiganj the average amount was 301 kg. The average of both Dewanganj and Bakshiganj was 253.5 kg. Cold storage in Dewanganj

is 1120 kg in average where in Bakshiganj the average amount is 1390 kg. The average of both Dewanganj and Bakshiganj is 1255 kg. Home Storage is significantly less than cold storage. Cold storage potato is almost 83% where home storage 17%. The whole amount of potatoes was sold to Wholesaler. Quantity of sold potato in Dewanganj and Bakshiganj was followed by 8967 kg and 6896 kg.

Table-4.4: Quantity of potato stored and sold at farm level in the study areas

Particulars	Quantity			% of total quantity		
	Dewanganj	Bakshiganj	Average	Dewanganj	Bakshiganj	Average
Quantity stored						
Home storage	206	301	253.5	15.54	17.80	16.80
Cold storage	1120	1390	1255	84.46	82.20	83.2
Total quantity stored	1326	1691	1508.5	100	100	100
Quantity sold to						
Wholesaler	8967	6896	7931.5	100	100	100
Total quantity sold	8967	6896	7931.5	100	100	100

Source: (Field survey, 2022)

4.3.3. Average disposal pattern of potato at farm level in the study areas

Disposal pattern of potato at farm level is shown in (Table-4.5). Farmers consume 2.49% of total potatoes and provided gift to relatives (1.72%). A major portion (77.94%) of the potatoes was sold during the harvesting period. Another 13.65% of the potatoes were stored as Stored as seed potato and 2.49% potato were Stored as food potato.

Table 4.5: Average disposal pattern of potato at farm level in the study areas

Particulars	Quantity(kg)	% of total quantity
Family consumption	253.5	2.49
Given to relatives	175	1.72
Sold	7937.5	77.94
Stored as seed potato	1390	13.65
Stored as food potato	253.5	2.49
Other	175	1.72
Production on per farm	10184.5	100

Source: (Field survey, 2022)

4.4. Consumer Family Size and Average Consumption

Figure 4.2 shows the average family size is 5 and average monthly potato consumption in Dewanganj is 7.75 kg. On contrary family size is 4 and average potato consumption in Bakshiganj is 6.33 kg. Family size is bigger in Dewanganj as well as consumption is also higher in Dewanganj.

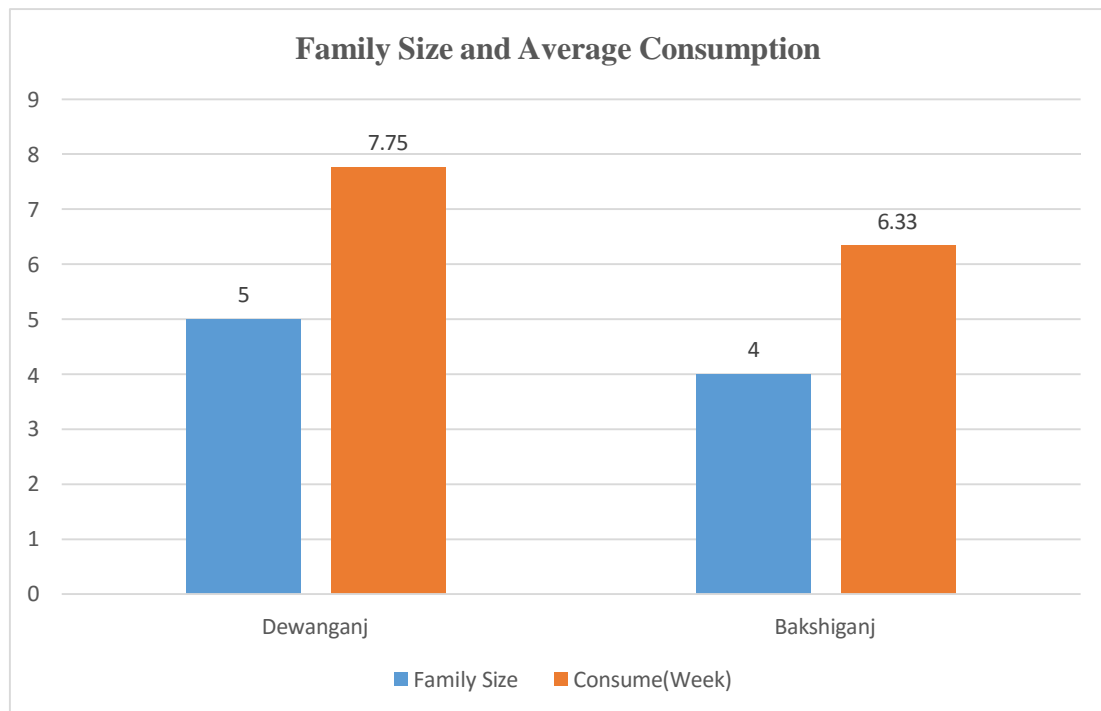


Figure 4.2: Family Size and Average Consumption
Source: (Field survey, 2022)

4.5. Marketing Margin Analysis

4.5.1. Cost and return analysis of Dewanganj farmer

The Marketing Margin analysis revealed that the hired labor cost in the potato field constitutes the highest cost Tk. 55320.00/ha about (21.02%) of the total costs of production. The second highest cost of Tk. 42070.00/ha) incurred for family labor costs (15.99%) followed by seed cost of Tk. 30650.00/ha (11.65%). Table 4.9 also shows that the land cost is Tk. 28,500.00/ha which contains (10.83%) of total input costs, as the wedding cost is Tk. 26,300.00/ ha which is (9.99%) of the total cost, and the marketing cost contains

(8.06%) which cost is Tk. 21,200.00/ha and the other cost is almost the same which shows (8.08%) of the total cost. Manure and fertilizer cost is Tk. 2110.00/ha and Tk. 13750.00/ha

respectively. The percentage of manure and fertilizer is (0.08%) and (5.23%) respectively. Here the manure and fertilizer contain FYM/OM, Urea, TSP, MoP, ZnSO₄, Gypsum, Boron, and MgSO₄. The insecticide and irrigation cost is Tk. 8100.00/ha and Tk. 13880.00/ha respectively which contains (3.08%) and (5.27%) are shown in (Table 4.6)

Table 4.6: Average production cost of Dewanganj

Cost Items	Cost (Tk./ha)	Percentage of Cost Items
Land	28500	10.83
Seed	30650	11.65
Manure	2110	0.80
Fertilizer	13750	5.23
weeding	26300	9.99
Insecticide	8100	3.08
Irrigation	13880	5.27
Family Labour	42070	15.99
Hired Labour	55320	21.02
Marketing	21200	8.06
Other Cost	21275	8.08
Total Cost	263155	100

Source: (Field survey, 2022)

4.5.2. Profitability of Dewanganj potato farmer

The Marketing Margin Analysis for potato production in Dewanganj Upazila indicates that the farmers are producing potatoes at a cost of Tk. 263155.00/ha and with an average marketable yield is 27865 kg per hectare. Where the average yield was 29232 kg per hectare and post-harvest loss is 1367 kg per hectare which losses Tk.19138.00 per hectare. The total return per hectare area is Tk. 390110.00 and the sale of potato kg is 14.00 Tk. which contains profit Tk. 126955.00/ha. Table 4.11 shows the BCR is 1.48.

Table 4.7: Profitability of Dewanganj potato farmer

Average yield (kg/ha)	29232 Kg
Estimated Post Harvest Loss	1367 Kg i.e. Tk. 19138.00
Marketable yield (kg)	27865 kg
Total return (Tk./ha)	390110.00 @ Tk. 14.00/ Kg
Total expenditures (Tk./ha)	263155.00
Profit (Tk./ha)	126955.00
BCR	1.48

Source: (Field survey, 2022)

4.5.3. Cost and return analysis of Dewanganj farmer

The value chain analysis revealed that the hired labor cost in the potato field constitutes the highest cost Tk. 49280.00/ha about (19.82%) of the total costs of production. The second highest cost of Tk. 34500.00/ha incurred for family labor costs (13.87%) followed by seed cost of Tk. 28350.00/ha (11.40%). Table 4.8 also shows that the land cost is Tk. 29750.00/ha which contains (11.96%) of total input costs, as the wedding cost is Tk. 19250.00/ ha which is (7.74%) of the total cost, and the marketing cost contains (8.53%) which cost is Tk. 21,200.00/ha and the other cost is Tk. 28,550.00/ha which shows (11.48%) of the total cost. Manure and fertilizer cost is Tk. 13320.00/ha and Tk. 9800.00/ha

respectively. The percentage of manure and fertilizer cost is (5.36%) and (3.94%) respectively. Here the manure and fertilizer contain FYM/OM, Urea, TSP, MoP, ZnSO₄, Gypsum, Boron, and MgSO₄. The insecticide and irrigation cost is Tk. 5900.00/ha and Tk. 8750.00/ha respectively which contains (2.37%) and (3.52%).

Table 4.8: Average production cost of Bakshiganj

Cost Items	Cost (Tk./ha)	Percentage of Cost Items
Land	29750	11.96
Seed	28350	11.40
Manure	13320	5.36
Fertilizer	9800	3.94
weeding	19250	7.74
Insecticide	5900	2.37
Irrigation	8750	3.52
Family Labour	34500	13.87
Hired Labour	49280	19.82
Marketing	21200	8.53
Other Cost	28550	11.48
Total Cost	248650	100.00

Source: (Field survey, 2022)

4.5.4. Profitability of Bakshiganj potato farmer

The Value Chain Analysis (VCA) for potato production in Bakshiganj Upazila indicates that the farmers are producing potatoes at a cost of Tk. 248650.00/ha and with an marketable yield is 29502 kg per hectare. Where the average yield was 30905 kg per hectare and post-harvest loss is 1403 kg per hectare which losses Tk. 18950.50 per hectare. The total return per hectare area is Tk. 398277.00 and the sale of potato kg is 13.5 Tk. which contains profit Tk. 149627.00/ha. Table 4.9 shows the BCR is 1.60.

Table 4.9: Profitability of Bakshiganj potato farmer

Average yield (kg/ha)	30905 Kg
Estimated Post Harvest Loss	1403 Kg i.e. Tk. 18950.5
Marketable yield (kg)	29502 kg
Total return (Tk./ha)	398277.00 @ Tk. 13.5/ Kg
Total cost (Tk./ha)	248650.00
Profit (Tk./ha)	149627.00
BCR	1.60

Source: (Field survey, 2022)

4.5.5. Value addition of potato by farmers

Farm gate price is that price which farmer gets through selling their produce at the farm yard. Table 4.10 shows the value addition of potato by farmers in the area of Dewanganj and Bakshiganj upazilla. It was revealed that for Dewanganj upozilla the average farm gate price was Tk.1055.5 per 100 kg of potato. Average market price was Tk.1400.00 per 100 kg of potato. The average marketing cost was Tk. 76.00 per 100 kg of potato. Value addition was Tk. 344.5 per 100 kg of potato and Tk.3.45 per kg of potato respectively. Farmer covered the 32.64 percent of value addition among the total value addition. And for Bakshiganj upozilla the average farm gate price was Tk.1028.00 per 100 kg of potato. Average market price was Tk.1350.00 per 100 kg of potato. The average marketing cost was Tk. 72.00 per 100 kg of potato. Value addition was Tk. 322.00 per 100 kg of potato and Tk.3.22 per kg of potato respectively. Farmer covered the 31.32 percent of value

addition among the total value addition.

Table 4.10. Value addition of potato by farmers

Particulars	Dewanganj	Bakhshiganj
Average farm gate price Tk. Per 100 Kg	1055.5	1028.00
Market price Tk. Per 100 Kg	1400.00	1350.00
Average marketing cost Tk. Per 100 kg	76.00	72.00
Average marketing cost Tk. Per kg	0.76	0.72
Value addition Tk. per 100 Kg	344.5	322.00
Value addition Tk. Per Kg	3.45	3.22
Value addition (%)	32.64	31.32

Source: (Field survey, 2022)

4.5.6. Cost and margin analysis of Dewanganj wholesaler

Table 4.11 it shows that the average transaction per day was 6050 kg of potato by wholesaler. The average total return of potato per day was Tk.146325.00 The average purchase price was Tk. 1400.00 per 100 kg of potato and Tk. 14.00 per kg of potato. Then the average sales price was Tk.1750.00 per 100 kg of potato and 17.50 per kg of potato. The amount of value addition was Tk.350.00 (marketing margin) per 100kg of potato and Tk. 3.50 per kg of potato respectively. Wholesaler covered 25.00% of value addition among the total value addition. The average marketing cost was Tk. 278 per 100 kg of potato and Tk. 2.78 per kg of potato. The net marketing margin cost was Tk. 72.00 per 100 kg of potato and 0.72 per kg of potato.

Table 4.11. Daily transactions and value addition incurred by wholesaler in Dewanganj

Particulars	Amount (kg)	Tk./Kg	Tk. / 100 Kg	Total return (Tk.)	Value addition (%)
Average transaction (Perday)	6050	–	–	–	–
Average purchase price	–	14.00	1400.00	–	–
Average sales price	–	17.50	1750.00	105875.00	–
Value addition	–	3.50	350.00	–	25.00
Marketing cost		2.78	278.00	–	–
Net marketing margin (Value addition – Marketing cost)		0.72	72.00	–	–

Source: (Field survey, 2022)

4.5.7. Cost and margin analysis of Bakshiganj wholesaler

Table 4.12 it was shows that the average transaction per day was 6275 kg of potato by wholesaler. The average purchase price was Tk. 1350.00 per 100 kg of potato and Tk. 13.50 per kg of potato. Then the average sales price was Tk.1750.00 per 100 kg of potato and 17.50 per kg of potato. The amount of value addition was Tk.400.00 (marketingmargin) per 100kg of potato and Tk. 4.00 per kg of potato respectively. Wholesaler covered 29.63% of value addition among the total value addition. The average marketing cost was Tk. 292 per 100 kg of potato and Tk. 2.92 per kg of potato. The net marketing margin was Tk. 108.00 per 100 kg of potato and Tk. 1.08 per kg of potato.

Table 4.12. Daily transactions and value addition incurred by wholesaler in Bakshiganj

Particulars	Amount (kg)	Tk./Kg	Tk. / 100 Kg	Total return (Tk.)	Value addition (%)
Average transaction (Perday)	6275	–	–	–	–
Average purchase price	–	13.50	1350.00	–	–
Average sales price	–	17.50	1750.00	109812.5	–
Value addition	–	4.00	400.00	–	29.63
Marketing cost	–	2.92	292.00	–	–
Net marketing margin (Value addition – Marketing cost)	–	1.08	108.00	–	–

Source: (Field survey, 2022)

4.5.8. Cost and margin analysis of Dewanganj retailer

Table 4.13 revealed the average transaction per day was 120 kg of potato by retailer. The average purchase price was Tk. 1750.00 per 100 kg of potato and Tk. 17.50 per kg of potato. Then the average sales price was Tk. 2100.00 per 100 kg of potato and 21.00 per kg of potato. The amount of value addition was Tk. 350.00 (marketing margin) per 100 kg of potato and Tk. 3.50 per kg of potato respectively. Retailer covered 20.00% of value addition among the total value addition. The average marketing cost was Tk. 152.00 per 100 kg of potato and Tk. 1.52 per kg of potato. The net marketing margin was Tk. 198 for 100 kg of potato and Tk. 1.98 per kg of potato.

Table 4.13. Daily transactions and value addition incurred by retailer in Dewanganj

Particulars	Amount(kg)	Tk./Kg	Tk. / 100 Kg	Total return (Tk.)	Value addition (%)
Average transaction (Per day)	120	–	–	–	–
Average purchase price	–	17.50	1750.00	–	–
Average sales price	–	21.00	2100.00	2520.00	–
Value addition	–	3.50	350.00	–	20.00
Marketing cost	–	1.52	152.00	–	–
Net marketing margin (Value addition – Marketing cost)	–	1.98	198.00	–	–

Source: (Field survey, 2022)

4.5.9. Cost and margin analysis of Bakhshiganj retailer

Table 4.14 revealed the average transaction per day was 105 kg of potato by retailer. The average purchase price was Tk. 1750.00 per 100 kg of potato and Tk. 17.50 per kg of potato. Then the average sales price was Tk. 2050.00 per 100 kg of potato and 20.5 per kg of potato. The amount of value addition was Tk. 300.00 (marketing margin) per 100 kg of potato and Tk. 3.00 per kg of potato respectively. Retailers covered 17.14% of value addition among the total value addition. The average marketing cost was Tk. 128 per 100 kg of potato and Tk. 1.28 per kg of potato. The net marketing margin was Tk. 172.00 per 100 kg of potato and Tk 1.72 per kg of potato.

Table 4.14. Daily transactions and value addition incurred by retailer in Bakshiganj

Particulars	Amount (kg)	Tk./Kg	Tk. / 100 Kg	Total return (Tk.)	Value addition (%)
Average transaction (Per day)	105	–	–	–	–
Average purchase price	–	17.50	1750.00	–	–
Average sales price	–	20.5	2050.00	2152.5	–
Value addition	–	3.00	300.00	–	17.14
Marketing cost	–	1.28	128.00	–	–
Net marketing margin (Value addition – Marketing cost)	–	1.72	172.00	–	–

Source: (Field survey, 2022)

4.6. Storage of Potato

4.6.1. Cost of cold storage owner

Figure 4.3 revealed that the total cost of cold storage owner was Tk. 2179000.00 per month. The highest cost of cold storage owner was power and electricity cost which is Tk.1000000.00 per month and second highest cost was machine servicing cost which was Tk. 500000.00 per month. Among the other cost items, generator fuel & oil, cooling gas, salary of staff, labour charge, other cost is Tk. 160000.00, Tk. 19000.00, Tk. 250000.00, Tk. 150000.00, Tk. 100000.00 respectively. Lowest cost in cooling gas.

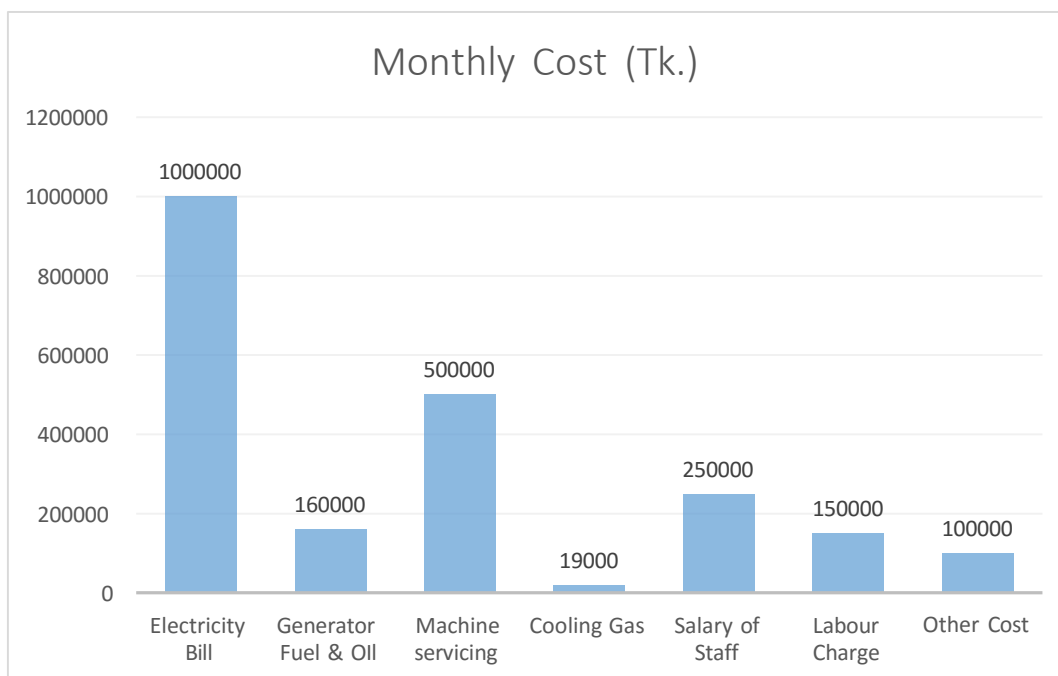


Figure 4.3: Cost of cold storage owner

4.6.2. Cold storage Information

Table 4.15 shows that the stored amount is 190000 bags. Potatoes are stored for 9 months at 2.2 °C, relative humidity 92%. Fare of bag is 250 Tk./bag. Return from the storage system is 47500000.00 Tk.

Table 4.15. Cold storage Information

Stored Amount (Bag)	Duration (Month)	Store Temperature (°C)	Relative Humidity (%)	Fare (Tk/ Bag)	Revenue
190000	9	2.2	92	250	47500000

Source: (Field survey, 2022)

CHAPTER V

CONSTRAINTS FACED BY POTATO VALUE CHAIN ACTORS

5.1. Constraints faced by farmers

Table 5.1 shows that the highest 25.71% of farmers described lower sales price of potatoes as a major constraint of potato production. On the other hand, only 2.86% of farmers explained the non-availability of quality seeds timely, insect pest and disease problems, and shortage of marketing information as constraints of potato production. Higher cold storage charges (22.86%), higher transportation cost (17.14%), lack of capital (14.29%), lack of knowledge of seed treatment (5.71%), the high price of fertilizer (5.71%) are the other constraints in potato production.

Table 5.1. Constraints faced by farmers

Constraints	No. of farmer	Percentage
Higher cold storage charge	8	22.86
Higher transportation cost	6	17.14
Lack of capital	5	14.29
Lower sales price of potato	9	25.71
Non-availability of quality seeds timely	1	2.86
Lack of knowledge of seed treatment	2	5.71
High price of fertilizer	2	5.71
Insect pest and disease problem	1	2.86
Shortage of marketing information	1	2.86
Total	35	100.00

Source: (Field survey, 2022)

5.2. Constraints faced by middlemen

In the study areas, middlemen were mention the constraints they faced in potato marketing. Table 5.2 shows the constraints faced by the middleman in a potato value chain. Itrepresents that the highest 31.03% of middlemen focus on lack of cash capital in the marketing of potatoes. On the other hand, only 6.90% of middlemen reported a lack of adequate storage facilities as a problem of potato marketing. High transportation costs (25.86%), marketing problems (12.07%), and higher cold storage charges (24.14%) are the other constraints faced by middlemen in the value chain of potatoes.

Table 5.2. Constraint faced by middlemen.

Constraints	No. of Middlemen	Percentage
Lack of cash capital	18	31.03
High transportation cost	15	25.86
Marketing problem	7	12.07
Lack of adequate storage facilities	4	6.90
Higher cold storage charge	14	24.14
Total	58	100

Source: (Field survey, 2022)

5.3. Strategic intervention for increasing the competitiveness of potato value chain in the two regions.

There were many constraints which were faced by farmers and actors in the value chain of potato. The problems that are faced by the selected farmers and actors in the production and marketing of potato. Table 5.3. shows the potato value chain functions and strategic intervention for increasing the competitiveness of potato value chain.

Table 5.3. Strategic intervention for increasing the competitiveness of potato value chain in the two regions

Potato Value Chain Functions	Strategic intervention for increasing the competitiveness of potato value chain
Input Supply (Seed Potato)	<p>Creating awareness about seed potato production, sorting, grading, quality control.</p> <p>Establish seed potato producing farmer’s groups, cooperatives.</p> <p>Strengthen capacity of research centers engaged in potato variety development.</p> <p>Set up suitable potato seed supply system involving relevant stakeholders.</p> <p>Create market link between potato seed producer and buyers.</p> <p>Tech farmers on merits and demerits by using small size potato.</p>
Input Price (Seed Potato)	Increase potato multiplication centers.
Input (Fungicide)	Train potato producers on appropriate application of fungicide to potato.
Input Supply (Fertilizer)	<p>Awareness rising for farmer’s about fertilize quality.</p> <p>Teach farmer on effect on using fertilizer below recommendation date,</p> <p>Advise on proper rate to use and demonstrate on farmer’s plot impact of using appropriate rate.</p>

	<p>Strictly follow cropping calendar in agricultural input supply.</p> <p>Teach input supply planning for input suppliers at various level.</p>
Production	<p>Establishing factories that use potato.</p> <p>Encourage establishment of SME's on potato processing.</p> <p>Expand potato production and create awareness and linkage.</p> <p>Introduce potato processing facilities.</p>
Potato Marketing	<p>Manufacture suitable potato transportation equipment's.</p> <p>Awareness creation of transporters and others involved on the issue.</p>
Potato Consumption	<p>Campaign on changing food habit to vegetables and fruits from predominant cereals based.</p> <p>Communicate consumer's preference to producers.</p> <p>Improve potato extension system.</p> <p>Establish ware potato stores at strategic locations</p>
Trading	<p>Training to farmer's and traders on potato sorting.</p>

CHAPTER VI

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1. Summary

Bangladesh's potato is an important cash and multipurpose food crop. In Bangladesh, both the poor and the wealthy consume potatoes and vegetables. As a result, the capacity to address the country's ongoing food crisis cannot be overlooked. Potato is grown for both sale and as a cash crop. This crop's appealing characteristics include high yield, nutritious, and palatable food products. A sizable number of people are curious about potato processing and marketing. A variety of actors are involved in the potato marketing scheme's value chain, including Faria, Bepari, wholesaler dealer, and cold storage owner. They played an important role in transferring potato to buyers, but the present study examines separate value chain at a sharper cost, in which the actors behaved with their costs and margins as intermediate. The study caused lights on the following specific objectives.

- I. Develop value chain maps and to identify the major potato value chain activities with actors.
- II. To investigate the revenue and cost of major market actors.
- III. To identify the problems faced by the potato value actors in the study area.
- IV. Identify strategic intervention areas for increasing the competitiveness of potato value chain in Dewanganj and Bakhshiganj Upazila.

The study was carried out in selected areas of the Jamalpur district in order to assess the value chain of potato marketing. Bakhshiganj and Dewanganj upazilas in Jamalpur districts have been chosen as study areas. The study area has some favorable characteristics for potato production, such as topography, soil, and climate conditions. Farmers are well known for growing potatoes and storing them in traditional and cold storage methods. There are a large number of potato growers with varying farm sizes.

The following individuals were chosen from the study area: fifty potato growers, twenty other value chain actors (wholesaler and retailer), twenty consumers, and one cold storage owner. The study focused heavily on the potato growers in the chosen areas. A preliminary survey was conducted to compile a list of potato growers in the selected areas.

The farmers in the study area had an average age of 44 years, and their main occupation was farming. They had been in farming operations for an average of 11 years. The average farmer had 0.49 ha of land. Per farmer, the cultivated land area was 0.37 ha. While the average share of potato cultivation area was 71.99% of total cultivated land area. Approximately 7.5 percent of respondents have a secondary education, the remainder are uneducated or have a primary education (55%), and 37.5% are illiterate (Table-4.5). Males run collectors' and wholesalers' businesses, and female involvement is extremely rare. Collectors have a secondary education on average, while retailers have a primary education.

The value chain of traditionally stored potatoes is depicted, with Beparis purchasing the potatoes (100%). The average amount of home storage in Dewanganj was 206 kg, while in Bakshiganj it was 301 kg. Both Dewanganj and Bakshiganj had an average weight of 253.5 kg. The average amount of cold storage in Dewanganj is 1120 kg, while in Bakshiganj it is 1390 kg. Both Dewanganj and Bakshiganj have an average weight of 1255 kg. Home storage costs much less than cold storage. Cold storage potatoes account for nearly 83% of the total, while home storage accounts for 17%. The entire quantity of potatoes was sold to Big Trader (Bepari). The amount of potato sold in Dewanganj and Bakshiganj was followed by 8967 kg and 6896 kg.

According to the Marketing Margin Analysis (MMA) for potato production in Dewanganj Upazila, farmers produce potatoes at a cost of Tk. 263155.00/ha, with an average marketable yield of 27865 kg per hectare. The average yield was 29232 kg per hectare, and the post-harvest loss was 1367 kg per hectare, resulting in a loss of Tk.19138.00 per hectare. The total return per hectare is Tk. 390110.00, and the sale of potato kg is 14.00 Tk., resulting in a profit of Tk. 126955.00/ha. Furthermore, the BCR is 1.48. According to the Value Chain Analysis (VCA) for potato production in Bakshiganj Upazila, farmers are producing potatoes at a cost of Tk. 248650.00/ha, with an average marketable yield of 29502 kg per hectare. Where the average yield was 30905 kg per hectare and post-harvest loss is 1403 kg per hectare which losses Tk. 18950.50 per hectare. The total return per hectare area is Tk. 398277.00 and the sale of potato kg is 13.5 Tk. which contains profit Tk. 149627.00/ha and the BCR is 1.60 which is profitable.

The total monthly cost of the cold storage owner was Tk. 2179000.00. The cold storage owner's highest monthly cost was power and electricity, which was Tk.1000000.00, and the second highest cost was machine servicing, which was Tk. 500000.00. Other costs include generator fuel & oil, cooling gas, staff salary, labor charge, and other costs of Tk. 160000.00, Tk. 19000.00, Tk. 250000.00, Tk. 150000.00, and Tk. 100000.00, respectively. The majority of farmers cited lower potato sales prices as a major constraint to potato production. On the other hand, a very small number of farmers cited lack of timely availability of quality seeds, insect pest and disease problems, and a lack of marketing information as potato production constraints. Other constraints in potato production include higher cold storage charges (22.86%), higher transportation costs (17.14%), a lack of capital (14.29%), a lack of knowledge of seed treatment (5.71%), and a high fertilizer price (5.71%).

6.2. Conclusion

Potatoes are critical for the agricultural sector's growth and sustainability, as well as for Bangladesh's national economy. It directly contributes to the nation's job creation, food security, education, and poverty alleviation. Despite its limited ability and abilities, potato has made significant progress in recent decades. However, the government has not sufficiently acknowledged its contribution and value to the private sector. To maximize the value of this significant crop, any initiatives related to technological and managerial expertise, input supplies, business and technology knowledge, and certain policy concerns are desperately needed. An intensive investigation and analysis of the supply and value chains of potatoes has been carried out in the preceding sections of this report, and constraints, service provisions to remove these constraints, and potential service providers have also been identified. Based on the findings, some important priority business development services for the development of the potato industries in Bangladesh will be undertaken. This sub-sector will see significant changes as a result of an integrated private-public collaboration strategy.

6.3. Recommendation

There are many problems in the potato production and marketing, here some probable solutions are discussed,

- i. Different financial organizations and the government can provide capital, adequate input, and adequate market information in selected areas to increase potato production and marketing in Bangladesh. The government should develop low-cost storage facilities in the primary and secondary markets to provide farmers with storage.
- ii. Government can insist of transportation to improve the communication system in the study area which will help to increase marketing efficiency by lowering the transportation cost.

CHAPTER SIX

REFERENCES

- Abay Akalu, 2007. Vegetable market chain analysis in Amhara National Regional State: the case of Fogera woreda, South Gondar zone. M. Sc thesis presented to the school of graduate studies, Haramaya University. pp70.
- Akhter, G.M. (1973). Marketing of Potato in some Selected Areas of Comilla Kotwalli Thana.
- M.S. Thesis submitted to the Department of Cooperation Marketing, Bangladesh Agricultural University, Mymensingh. Bangladesh.
- Akter, Khadiza, et al. "Postharvest losses along the supply chain of potato in Bangladesh: A micro-level study." *European Journal of Agriculture and Food Sciences* 4.2 (2022): 67-72.
- Anandajayasekeram, P. and Berhanu Gebremedhin, 2009. Integrating innovation systems perspective and value chain analysis in agricultural research for development: implications and challenges.
- Improving Productivity and Market Success (IPMS) of Ethiopian farmers project working paper 16. ILRI (International Livestock Research Institute), Nairobi, Kenya.
- Ayelech Tadesse, 2011. Market chain analysis of fruits for Gomma woreda, Jimma zone, Oromia National Regional State. M.Sc thesis presented to School of Graduate Studies, Haramaya University. p110.
- Bammann, H., 2007. Participatory value chain analysis for improved farmer incomes, employment opportunities and food security. *Pacific Economic Bulletin*, 22(3):125.
- BARRI, (1992-1993). www.barri.gov.bd

- BBS. (2022). Year book of Agricultural Statistics of Bangladesh, Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.
- Berg, B., B. Hiss, S. Fell, M., Hobinka, A. Müller, and S. Prakash, 2006. Poverty orientation of value chains for domestic and export markets in Ghana Cape Coast, Berlin.
- Bezabah Emanu, 2008. Value chain analysis of horticultural crops in Kombolcha districts of eastern Oromia Region, Ethiopia. A study conducted for Action Aid Ethiopia, Addis Ababa.
- Bongiwe G., and Micah B. Masuku. "Factors affecting the productivity and profitability of vegetables production in Swaziland." *Journal of Agricultural Studies* 1.2 (2013): 37-52.
- Bryceson, K and J. Kandampully, 2004. The balancing act: "E" issues in the Australian agri- industry sector. Proceedings of the McMaster World Congress on the Management of Electronic Business, 14–16 Jan 2004, Hamilton, Ontario.
- Cramers, L. and W. Jensen, 1982. *Agricultural economics and agribusiness*, 2nd Edition McGraw Hill Book Company, USA. 222p.
- Dendena Getachew, Efreem Lema and Lema Belay, 2009. Fresh mango value chain analysis in Arbaminch area. Organization of value chain competency. Addis Ababa, Ethiopia.
- Ferto, I. and Szabo, G.G., 2002. Vertical coordination in transition agriculture: A cooperative case study. Institute of Economics, Hungarian Academy of Sciences, Discussion Paper.
- Fitter, R. and R. Kaplinsky, 2001. Who gains from product rents as the coffee market becomes more differentiated? A value chain analysis. IDS Bulletin Paper. University of Sussex, Institute of Development Studies, Sussex.

- Gereffi, G. 1999. A commodity chains framework for analyzing global industries. Workshop on spreading the gains from globalization, University of Sussex, Institute of Development Studies.
- Hajong, P. (2011). Marketing and Storage System of Potato in Some Selected Areas of Rangpur District. M.S. Thesis, submitted to the Department of Agribusiness and Marketing, Bangladesh Agricultural University, Mymensingh. Bangladesh.
- Holloway, G. and S. Ehui, 2002. Expanding market participation among smallholder livestock producers: A collection of studies employing gibbs sampling and data from the Ethiopian highlands. Socio-economic and Policy Research Working Paper 48. ILRI, Nairobi, Kenya. 85p.
- Holt, T., 1993. Risk response in the beef marketing channel: a multivariate generalized arch-m approach. *American Journal of Agricultural Economics*, 75: 559-571.
- Hobbes et al., 2000. The late revolution? Regulation, markets and consumption in the global coffee chain. *World Development*, 30 (7): 1099-1122.
- Hossain, Mohammad Anwar, (2016). Value chain analysis of potato in selected areas of Bogra and Munshigonj districts of Bangladesh. Diss. BRAC University.
- Hossain, Mohammad Anwar and ziaul L., (2009) Participatory value chain analysis for improved farmer incomes, employment opportunities and food security. *Pacific Economic Bulletin*, 22(3):125
- Hossain, Mohammad Anwar, (2004) Production and Price structure of Potato in Bangladesh, *Indian Quarterly Journal of agricultural Marketing*26(4):10-16.
- Islam, M.T. (1987). “An Economic Study of Potato Preservation in Cold Storage in Some Selected Areas of Bangladesh”. M.Sc. Thesis,, submitted to the Department of Cooperation and Marketing, Bangladesh Agricultural University, Mymensingh. Bangladesh.

- Jari, B. and G. Fraser, 2009. An analysis of institutional and technical factors influencing agricultural marketing amongst smallholder farmers in the Kat River Valley, Eastern Cape Province, South Africa. *African Journal of Agricultural Research*, 4(11):1129-1137.
- Kaplinsky, R. and M. Morris, 2000. A handbook for value chain research, IDRC. Ottawa, Canada.
- Kaplinsky, R. and M. Morris, 2001. A handbook of value chain analysis. Working paper prepared for the IDRC, Institute for Development Studies, Brighton, UK.
- Kawsar, K.M. (2001). An Economic Analysis of Diamant Potato Production in Some Selected Areas of Bangladesh. M.S. Thesis, submitted to the department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.
- KIT, Faida MaLi and IIRR (2006), Chain empowerment: Supporting African farmers to develop markets. Royal Tropical Institute, Amsterdam; Faida Market Link, Arusha; and International Institute of Rural Reconstruction, Nairobi.
- Kohls, R., and N. Uhl, 1985. Marketing of agricultural products. 5th Edition. McMillan Publishing Company, New York, USA.
- Kotler, P. and G. Armstrong, 2003. Principle of marketing, 10th Edition. Hall of India Pvt. Ltd. New Delhi. pp 5-12.
- Mamo Girma, 2009. Choice of marketing channels and transaction costs: The case of maize marketing in Shashemene District. M.Sc thesis presented to the School of Graduate Studies, Addis Ababa University. 74p.
- Mamo Girma and Degnet Abebaw, 2012. Patterns and determinants of live stock farmers' choice of marketing channels: micro-level evidence. Ethiopian Economics Association, Addis Ababa, Ethiopia. P55.

- Mayoux, Linda. "Women's empowerment and participation in micro-finance: evidence, issues and ways forward." *Sustainable Learning for Women's Empowerment: Ways Forward in Micro-Finance, New Delhi, Hardbound* (2003): 1-43.
- Mendoza, G., 1995. A premier on marketing channel and margins. Lyme Rimer Publishers Inc., USA.
- Meyer-Stamer, Jörg, and Fränk Waltring. "Value chain analysis and 'making markets work for the poor'(m4p): Poverty reduction through value chain promotion." Eschborn, German Agency for Technical Cooperation (GTZ) (2006).
- Murshid, K. A. S., and Mohammad Yunus. "Rice prices and growth, and poverty reduction in Bangladesh." Agargaon, Dhaka-1207, Bangladesh (2016).
- OECD (Organization for Economic Cooperation and Development), 2006. Promoting pro-poor growth – Private Sector Development. Paris.
- Ponte, S., 2002. The late revolution? Regulation, markets and consumption in the global coffee chain. *World Development*, 30 (7): 1099-1122.
- Raikes, P., M. Jensen, and S. Ponte, 2000. Global commodity chain analysis and the Francilière approach: comparison and critique. *Economy and Society*, 29 (3): 390-418.
- Rao, M., O. Elizaphan and Q. Matin., 2011. Supermarkets, farm household income and poverty: insights from Kenya. Contributed paper presented at the Joint 3rd African Association of Agricultural Economists. Cape Town, South Africa. Pp. 35.
- Sarkar, S.C. (1990). "Marketing of Potatoes in Some Selected Areas of Naogaon Sadar Upazilla". M.Sc. Thesis, submitted to the Department of Cooperation and Marketing, Bangladesh Agricultural University, Mymensingh. Bangladesh.

- Scarborough, V. and J. Kydd, 1992. Economic analysis of agricultural markets. A manual of marketing series 5, Chatham, UK: Natural Resource Institute: 172p.
- Smith, D., 1992. Costs and returns in agricultural marketing. Marketing and agribusiness development paper. Department of Political Economy, University of Glasgow. Glasgow, Scotland. 67p.
- Sabur, S.A.(1986). Marketed Surplus Function for Potato in Selected Ares of Bangladesh. Bangladesh Journal of Agricultural Economics. Bangladesh Agricultural University, Mymensingh, 11(2): 15-25.
- Sabur,S.A. and Gangwar,A.C.(1984). Production and Price structure of Potato in Bangladesh, Indian Quarterly Journal of agricultural Marketing26(4):10-16.
- Saiyem, M. A. (2007). “Marketing System and Price Behaviour of Potato in Selected Areas of Rangpur District. M.S. Thesis, submitted to the Department of Cooperation and Marketing, Bangladesh Agricultural University, Mymensingh. Bangladesh.
- USAID (United States Agency for International Development), 2011. Global horticultural assessment, USA.
- William, G. and L. Robinson, 1990. Agricultural Product Prices. Cornell University Press, 3rd edition, Ithaca and London.
- Wolday Amaha,1994. Food grain marketing development in Ethiopia after reform 1990. A case study of Alaba Siraro. PhD Dissertation Presented to Verlag Koster University, Berlin 293p.
- World Bank, 2018. Gender in seed production and distribution. Gender in Agriculture Sourcebook, 764. Washington, DC: World Bank.

Survey Schedule

Production, Postharvest management and Storage of potato in Jamalpur.

A. Survey Schedule for Potato Farmers:

Serial No. Date :

1. Location :

District :; Upazila :
 Union/Pourashova :; Village :

2. Name : Age : Years, Family Size:

3. Educational Qualification (put \surd mark) :

Illiterate (00) Primary (01) Secondary (02) Higher Secondary(03) Above Degree(04)

4. Status of cultivated & other lands :

Type of Land	Area (decimal)	Type of Land	Area (decimal)
a. Own cultivated land		f. Orchard	
b. Rented in land		g. Pond	
c. Rented out land		h. Homestead	
d. Mortgaged in land		i. Barren land	
e. Mortgaged out land		j. Other	

5. How many years have you been working in potato cultivation ? years.

6. Have you got training on potato cultivation ? (put \surd mark) Yes No

If 'Yes', how many times ?

7. What was the source of potato seeds ? (put \surd mark)

<input type="checkbox"/> BARI (06)	<input type="checkbox"/> BADC/BADC dealer (05)	<input type="checkbox"/> Seed selling centre (04)
<input type="checkbox"/> Own stock (03)	<input type="checkbox"/> Neighboring farmer (02)	<input type="checkbox"/> Open market (01)

8. Technological & extension services :

Source of technological support	DAE	BARI	BADC	NGO	Other
Type of technological support					

9. Family income in the year 2021 – 2022 :

Source of income	Income (Taka)	Source of income	Income (Taka)
a.From crop		d. From business	
b. From livestock		e. From service	
c. From fishery		f. From other sources	

10. Information on potato cultivation in 2021- 2022 :

Potato Variety	Area of land (decimal)	Total production (mound)	Price at harvest (Tk./mound)	Total value (Taka)
a. Local				
b. HYV				

11. Cost of inputs for potato cultivation (plot):

Variety	Area (decimal)	Land preparation	Seed	Manure	Fertilizer	Weeding & earthing-up	Insecticide	Irrigation	Other cost	Total Cost
Local										
HYV										

12. Disposal pattern of fresh potato in this year (Kg.) :

Total production	Family consumption	Given to Relatives	Sold	Stored as seed potato	Stored as food potato	Other

13. How did you harvest potato ?
(put \surd mark)

a. With spade (01)
c. With machine(03)

b. With plough (02)
d. Other –specify (04)

14. How much damaged potato was found during harvesting?

Type of damage	Amount of damaged tubers (Kg.)	Cause of damage
a . Damaged by insect pest & vertebrate		
b. Rotten potato		
c. Cut potato		
d. Remained in the soil (unharvested)		
e. Other damage (if any)		

15. After harvesting did cure the potato ? (put \surd mark) Yes No

If 'Yes', how did you cure the harvested potato ? (put \surd mark)

Keep in the field as a heap, Duration

Keep in the sun, Duration

Keep in the shade, Duration

16. How much potato was lost during curing?.....kg.

17. Before selling did you sort and grade the potato ? (put \surd mark) Yes No

If 'Yes', how much potato was rejected ?..... kg.

18. Information on potato buyer and amount sold during this year (2021-2022) :

Buyer	Place of selling	Amount sold (Kg)	Price (Tk/kg)
Stockiest			
Whole seller			
<i>Bepari</i>			
Retailer			
Consumer			

Field, home, local market, Upazila market, whole sell market, district market etc.

19. Last year how did you store potatoes ? (put \surd) Traditionall
y Cold storage Both

20. Information on storage of potato in 'Traditional Storage' system (at home)

Storage method	Type of potato (food/seed)	Amount stored (kg)	Storage period	Storage cost (Tk)	Amount damaged (kg)	Causes of damage

21. Is there any cold storage in your Upazila/District ? (put \surd mark) Yes No

If 'Yes', what was the distance from your home ?km.

22. Information on storage of potato in cold storage :

Type of potato	Amount stored	Storage period	Storage cost (Tk.)				Amount loss (Kg)	Causes of damage
			Transportation	Storage charge	Other Charge	Total cost		
Food								
Seed								

23. How much potato damage occur during transportation? :

Type of potato	Means of transportations	Distance (Km)	Amount transported (Kg)	Amount lost (Kg)
Field to home				
Home to market				
Home to cold storage				
Cold storage to home				
Field to cold storage				

24. Please suggest, how can we reduce postharvest losses of potato ?

.....

.....

.....

.....

.....

.....

.....

.....

.....

Signature of interviewer

Name :

Mobile:

Survey Schedule

Production, Postharvest management and Storage of potato in Bangladesh.

B. Survey Schedule for Cold Storage (potato):

Serial No.

Date :

1. Location of cold storage :

Name of cold storage:

District :; Upazila :

Union/Pourashova :; Village/Road:

2. Name of the interviewee: Age.....Years,

3. (a) Relation with cold storage : Owner/Manager/Supervisor/Staff

(b) Relevant experience of cold storage management year.

4. Educational qualification (put \surd mark):

Illiterate (00)

Primary
(01)

Secondary
(02)

Higher Secondary
(03)

Above Degree(04)

5. Have you got training on cold storage management? (put \surd mark)

Yes

No

If 'Yes', how many times ?

6. When this cold storage was established (year)?

7. What was the installation cost then: Tk.

8. What is the capacity of the cold storage ? :.....ton/bag.

9. What is the source of electric supply ? (put \surd mark)

PDB

REB

10. What is the frequency of electricity failure per day (in 24 hours)?.....hours.

11. How do you operate the cooling system during electricity failure? :

(a) Operating generator

(b) Left without electricity

12. If generator provide back-up electricity, then how long do you operate the generator?

(a) Continuously (until electricity comes)hours;

(b) Break (interval)hours

13. Statement of monthly average operating cost (Tk.) :

Sl No.	Description of cost	Monthly cost (Tk.)	Remarks
1	Electricity bill		
2	Generator fuel & oil		
3	Machine servicing		
4	Cooling gas (ammonia)		
5	Salary of staff		
6	Labour charge		
7	Other costs (Telephone, Tax etc.)		

14. What is the source of potato storage?

Own production By purchasing Hire basis Other

15. Do you sort/grade potato before storage? (put \checkmark mark) Yes No

If 'Yes', how much potato was rejected during sorting/grading? kg

16. Is there any grading system before storage? (put \checkmark mark) Yes No

17. How much sorted/graded (by farmers/traders) potato stored? kg/bag

18. How much immature potato stored? Kg/bag

19. (i) How are potato kept in cold storage? (put \checkmark mark)

(a) Gunny bags (b) Plastic bag (c) Other (specify)

(i) How many old were used for potato storage? quantity/percent.

20. Did you pre-cool the potato before storage? Yes No

If 'Yes', at what temperature and how time? °C, hour

21. Are the bags kept directly on the floor? Yes No

If 'No', what materials do you provide below the bags (stack)? (put \checkmark mark)

(a) Wooden frame (b). Bamboo frame (c) Other (specify)

22. What is layer of bags vertically in each of the bag?

23. When (name of month) do you start store potato?

24. What is the last date of release of potato from cold storage ?

25. Information on potato storage system :

Type of potato	Amount stored (Bag)	Duration	Store temperature (°C)	Relative humidity (%)	Fare (Tk/bag)	Amount of loss (Kg)	Causes of loss
Food potato							
Seed potato							

Weight per bag =Kg.

26. Do you use any chemical during storage? (put \sqrt mark) Yes No

If 'Yes' ,wh at is the name of chemical?

27. How many times do you check the bags ?..... times

28. Do you invert the bags during storage for proper cooling? (put \sqrt mark) Yes No

If 'Yes' , how many times?

29. Do you refresh the storage with fresh air? (put \sqrt mark) Yes No

If 'Yes' , how many times?

30. Do you pre-heat the potato after end of storage (before delivery) ? Yes No

If 'Yes' , at what temperature and how time? °C,hour.

31. What are the causes of losses in the cold storage ? Please give your answer –

32. What are the problems of potato storage in cold storage ? Please give your answer –

33. What are your suggestions to reduce the post harvest losses of potato? Please give your suggestions –

.....

Signature of interviewer

Name :

Mobile:

Survey Schedule

Production, Postharvest management and Storage of potato in Bangladesh.

C. Survey Schedule for Potato Traders:

Serial No.

Date :

Type of marketed potato : Traditionally Stored/Cold Stored

Type of markets : Primary/Secondary/Tertiary Market

Type of Traders : *Bepari/Faria/Aratdar/Paikar/Retailer*

1. Name of the Market:

District :; Upazila :

Union/Pourashova :; Village:

2. Name of the trader: Age Years,

3. Educational qualification (put \surd mark): Year of Schooling..... years

Illiterate (00) Primary(01) Secondary (02) Higher Secondary (03) Above Degree (04)

4. How many years are you associated with potato trade ?.....years

5. How many potato traders are in this market?

(a) Aratdar :, (b) Whole Seller/Paikar:, (c) Faria :, (d) Bepari :, (e) Stockiest :

(f) Retailer, (g) Other:

6. How much and from whom did you purchase potato last month?

Purchased from		Traditional Storage Potato		Cold Storage Potato	
Person	Place	Amount(Mound)	Price (Tk/Mound)	Amount(Mound)	Price (Tk/Mound)
Farmer					
Cold Storage					
Whole Seller					
Bepari					
Faria					
Retailer					

7. How much and to whom did you sell potato last week?

Soled to		Traditional Storage Potato		Cold Storage Potato	
Person	Place	Amount(Mound)	Price (Tk/Mound)	Amount(Mound)	Price (Tk/Mound)
Cold Storage					
Whole Seller					
Bepari					
Faria					
Retailer					
Consumer					

8. Handling of Potato :.

Type of Handling	Amount Handled	Amount Lost	Causes of Losses
Storing/Grading			
Weighing & Bagging			
Loading			
Unloading			
Other (Specify)			

9. Transportation :

Mode of Transportation	Distance of Transportation (Km)	Amount Transported (Kg)	Amount Lost(Kg)	Causes of Losses

10. In the last week did you store potato between each lot of buying & selling?

Method of Storage	Amount Stored (Kg)	Storage Time (Day)	Storage Loss (Kg)			
			Weight	Rotten	Other	Total

11. What are the problems do you face during potato business ? Please give your answer –

12. What are your suggestions to reduce losses of potato during different business operations? Please give your suggestions –

.....

Signature of interviewer

Name :

Mobile :

Survey Schedule

Production, Postharvest management and Storage of potato in Bangladesh.

D. Survey Schedule for Potato Consumers:

Serial No.

Date :

Type of Consumer : Household / Restaurant

1. Location :

District :; Upazila :

Union/Pourashova :; Village:

Name of the Restaurant :

2. Name of the Restaurant Owner/manager:

. Age :Years, Sex : Female/Male

3. Educational qualification (put \surd mark): Year of Schooling..... years

Illiterate(00) Primary(01) Secondary(02) Higher Secondary(03) Above Degree(04)

4. What is your family size ?.....persons

5. How much of potato did you buy last week?..... kgs.

6. To Whom Did You Buy Potato? (put \surd mark)

Grower Retailer *Faria* *Bepari* *Aratdar* Other

7. What type of potato did you buy? (put \surd mark)

Fresh Potato Cold Storage Potato Traditional Storage Potato

8. What was the price of potato?..... Tk/Kg

9. How did you consume the potato ?

(a) As Vegetable Kg ; (b) Other (Specify)..... kg

10. How much was the loss of potato found after buying?..... Kg

11. What were the types of Losses ?

Type of Damage	Amount of Damaged Potato (Kg)
a) Damaged by Insect	
b) Rotten Potato	
c) Cut Potato	
d) Mechanical Injury	
e) Other Damage	

12. Where did you store potato before consumption? - - - - -

13. How much potato damage during temporary storage ? - - - - -

14. What are the main causes of loss of potato during storage? Please give your answer –

15. How much potato was lost/rejected during processing (cutting, peeling etc.)?.....Kg

16. What are your suggestions to reduce post harvest losses of potato during different operations?

Please give your suggestions –

.....

Signature of interviewer

Name :

Mobile :
