AN ECONOMIC AND PROFITABILITY ANALYSIS OF SELECTED MINOR CROPS CULTIVATION IN BOGURA DISTRICT

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*This is to certify that the thesis entitled, "**AN ECONOMIC AND PROFITABILITY ANALYSIS OF SELECTED MINOR CROPS CULTIVATION IN BOGURA DISTRICT" was** submitted to the faculty of Agribusiness Management, Sher-e-Bangla Agricultural University, Dhaka in partial fulfillment of the degree of **MASTER OF SCIENCE Agricultural statistics** embodies the result of a piece of bona fide research work carried out by **MD. MEHEDY HASAN,** Registration No. 19-10269 under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma in any other institutes.*

I further certify that any help or sources of information, as have been availed during this investigation have duly been acknowledged.

Dated:
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DEDICATED TO MY BELOVED PARENTS AND TEACHERS WHO LAID THE FOUNDATION OF MY SUCCESS

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The Author

AN ECONOMIC AND PROFITABILITY ANALYSIS OF SELECTED MINOR CROPS CULTIVATION IN BOGURA DISTRICT

ABSTRACT

The present study is an attempt to examine the profitability of major minor crop production in some selected areas of Bogura district in Bangladesh. In order to attain the objectives, a total 101 farmers were randomly selected from three thanas namely Bogura sadar, Gabtoli and Sariakandi under Bogura district. Both tabular and statistical analysis (simple statistical technique, Cobb-Douglas production function) were done to achieve the objectives of the study. The study found that production of all the selected minor crop were profitable. Per hectare gross cost of producing pointed gourd, bitter melon, pumpkin and cucumber were Tk. 111692.67, Tk 136112.6, Tk 132821.58 and Tk. 141658.73 respectively and the corresponding per hectare gross return from pointed gourd, bitter melon, pumpkin and cucumber amounted at Tk. 186586, Tk 215763, Tk 229080 and Tk. 217910 respectively. Per hectare net returns of producing of pointed gourd, bitter melon, pumpkin and cucumber were Tk. 74893.33, Tk 79650.4, Tk 97068.72 and Tk. 76251.27respectively. Benefit cost ratios of pointed gourd, bitter melon, pumpkin and cucumber production per hectare were 1.67,1.58,1.72 and 1.54 respectively. The farmers earned the highest profit from pumpkin followed by pointed gourd, bitter melon, and cucumber cultivation. The study reported some problems and constraints faced by the farmers during production and marketing of selected minor crops. Probable solutions to these problems were also suggested. Considerable scope apparently exists in the study areas to increase the productivity of pointed gourd, bitter melon, pumpkin and cucumber. Based on the findings of the study, some recommendations were made to improve practices for selected minor crops production with a view to increasing the income and employment opportunities the farm

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ABBREVIATION AND ACRONYMS

SAU = Sher-e-Bangla Agricultural University

BBS = Bangladesh Bureau of Statistics

BER = Bangladesh Economic Review

BCR = Benefit Cost Ratio

et al = Et alia/ alii (and others)

etc = et cetra

FAO = Food and Agriculture Organization

GDP = Gross Domestic Product

Ha = Hectare

i.e = id est (that is)

IOC = Interest on Operating Capital

Kg = Kilogram

TSP = Triple Super Phosphate

MOP = Muriate of Potash

NGO = Non- Government Organization

No. = Number

GDP = Gross Domestic Product

GM = Gross Margin

GR = Gross Return

HH = Households

SSC = Secondary School Certificate

HSC = Higher Secondary Certificate

VIF = Variance Inflation Factors

TC = Total Cost

TFC = Total Variable Cost

Chapter I

Introduction

1.1 Background of the study

Bangladesh is an agro-economy based country. The economy of Bangladesh is predominantly agricultural. Minor Crop production is very suitable here due to fertile land and environment. Minor crops contributes an important share to the total agricultural export in Bangladesh. Minor crop and crops sub-sector also contributes an essential share to the agricultural GDP of Bangladesh.

Minor Crops are herbaceous plants whose fruits, seeds, roots, tubers, leaves etc., are used as food. Production of Minor Crops is a main factor in ensuring a continuous supply of raw materials for the development of agribusiness in horticulture. It is over and over argued that minor crops production in Bangladesh has comparative advantages.

cultivation of minor crops for the market Improved and local methods are used in commercial production on field plots under irrigated and rainfed circumstances. In this method, high producing cultivars and hybrids are used, together with close planting, multiple cropping, effective nutrient and field management, and appropriate marketing management. Due to favorable agroecological conditions and stronger marketing infrastructure, some minor crops are only produced locally. Some of the crops grown in concentrated zones are pointed gourd in Bogura, onion in Natore, hyacinth bean in Chittagong, early cauliflower in Tangail, tomato in Jessore, and Nawabganj. Minor crops like bottle gourd, yard-long bean, okra, teasle gourd, and French bean are currently farmed on a small scale for export.

Agriculture accounts for 11.52 % to the gross domestic product (GDP) (BBS, 2022), and absorbs 40.6% of the country's labor force (BBS, 2022). Sustained government investment in irrigation facilities, rural infrastructure, agricultural research, and extension services has helped Bangladeshi farmers to achieve revolutionary increases in agricultural production.

In fact, 30% to 40% vegetable are produced in summer season and most districts produce marketable surplus during that season. Minor crop production in Bangladesh is growing thanks to the consumers growing interest in dietary diversity, availability of quality seeds and prospect of profit for farmers, according to data from the Bangladesh Bureau of Statistics (BBS) and the Department of Agricultural Extension (DAE).Both agencies estimate increased acreage and production but there is a huge gap in data between the two. However, the agriculture ministry is currently using the DAE estimate on vegetable production. Bangladesh is now the third largest producer of minor crops in the world," said Agriculture Secretary Md Sayedul Islam at a press briefing at the agriculture ministry.

The event was organized ahead of the National Vegetable Fair-2022 on the premises of Krishibid Institution Bangladesh (KIB) in Dhaka's Farmgate area. Citing the DAE data, Islam said farmers produced 1.97 crore tones of minor crops in fiscal year 2020-21, up from 1.84 crore tones the previous year. Minor crops were grown on 9.35 lakh hectares of land that year, he said. Islam went on to say that farmers now grow 100 species of minor crops. The BBS is yet to release its estimate on vegetable production for fiscal year 2020-21 but its estimate for fiscal 2019-20 was 45.74 lakh tones, which was one-fourth of the DAE estimate. Despite the huge gap, there has been an upward trend in production and acreage. For instance, Bangladesh grew minor crops on 9.08 lakh acres of land in fiscal 2009-10 to produce 29.93 lakh tones of crops that year, according to the BBS 2021.

The growth of crop production now relay on almost entirely on technological progress and intensive farming by introducing better management for all the crops and other enterprises to be produced. The country also faces a critical distribution problem in order to achieve food security for all groups in society.

Table No1.1 Gross Value Added, Share & Growth rate of Agricultural Sector at Current Price

(million Tk)

Items	2017-18	Growth rate(%)	2018-19	Growth rate(%)	2019-20	Growth rate(%)
1.Agricultural & Forestry	2273525	10.69	2481190	9.13	2651815	6.88
a)Crop & Horticulture	1591711	10.76	1723298	8.27	1830185	6.20
b)Animal Farming	396246	9.99	432151	9.06	466733	8.00
c)Forest & Related Services	285568	11.26	325741	14.07	354897	8.95
2.Fishing	668823	12.17	742747	11.05	824565	11.02
Total Agriculture(1+2)	2942347	11.02	3223938	9.57	3476381	7.83
Total Agriculture percentage of GDP		13.82		13.32		13.02

Source: National Accounting Wings, BBS (2020)

The structural transformation of GDP of Bangladesh reflects the positive trend of industry sector. In contrast, increase in the share of service sector to GDP was not satisfactory, and that of the industries to GDP increased. It means that the decline in the contribution of agricultural GDP was compensated by a rise in the share of the industries. The service

sector in Bangladesh did not grow properly over time. So, the transfer of labor occurred mainly from agricultural to industries rather than to low paid service.

Table 1.2 Contribution of different sub-sectors of agriculture to GDP

Year	Sector/Sub-sector				
	Agriculture	Crop	Livestock	Fisheries	Forestry
2011-12	13.70	10.01	1.09	3.68	1.78
2012-13	13.09	9.49	1.84	3.68	1.76
2013-14	12.81	9.28	1.78	3.69	1.74
2014-15	12.32	8.87	1.73	3.69	1.72
2015-16	11.70	8.35	1.66	3.65	1.69
2016-17	11.12	7.86	1.60	3.61	1.66
2017-18	10.67	7.51	1.53	3.56	1.62
2018-19	10.15	7.06	1.47	3.49	1.62
2019-20	9.83	6.76	1.43	3.52	1.64

Source: Bangladesh economic review, 2020

The variability in food grain production is not same all over Bangladesh. It varies region to region. A considerable amount of variation in production performance across regions may be expected due to the differences in different factors 2 prevailing in the regions such as: agro-climatic factors, infrastructural factors, cultural practices and social and institutional factor.

1.2 The role of agriculture in the economy of Bangladesh

Agriculture sector plays a key role in the overall economic performance of Bangladesh not only in terms of its contribution to GDP but also as a major source of foreign exchange earnings and in providing employment to a large segment of the population, particularly the poor.

The agricultural sector comprises of four sub-sectors, e.g. crops, livestock, fisheries and forestry. Most of the people of our country directly or indirectly depends on agriculture. Agricultural sector exports of primarily products and contribute to the GDP. Now the crop sector alone contributes 7.86% to the GDP and 67.06% to agricultural GDP. This sector not only employs most of the national labor force also supplies food for human and animal consumption, raw material for industrial production, Sustaining the rural economy and keeping natural balance.

1.3 Role of minor crops in the economy of Bangladesh

In Bangladesh, more than 30 different types of minor crops of indigenous and exotic origin are grown. At present, total minor crops growing area in the country is about 225,153 hectares (2.47 acre is equal to a hectare), of which 35% are cultivated during summer (DAE, 2020). The production of minor crops in 2018-19 was 1871387 MT and the production area was 524106 acres, in 2019-20 the production was 2000266 MT cultivating an area of 534787 acres, in 2020-2021 the production was 2045311.52MT and production area 540536.9 acres (Yearbook of Agricultural Statistics, 2021).

Table 1.3 Contribution of minor crops to value added in agriculture (at current market price)

Year	Estimated value of the product (TK)	Total agriculture	(%) of total agriculture value
2011-12	136169	2240755	6.08
2012-13	149453	2458419	6.09
2013-14	167365	2839254	5.89
2014-15	182395	3097204	5.89
2015-16	202936	3379046	6.01
2016-17	232559	3661220	6.35

Source: BBS, Yearbook of Agricultural Statistics, 2017

From Table 1.3 it can be seen that in 2015-16 minor crops contributed 6.01% value added to agriculture while in 2016-17 they stood at 6.35%. Total cultivated area in Bangladesh was 18148 thousand hectares of which minor crops were cultivated 1025 thousand hectares (BBS, 2017).

1.4 Present production status of minor crops in Bangladesh:

Minor crops play a very important role in the human diet, supplying some of the things in which other food materials are deficient. They are important in neutralizing the acid substances produced in the course of digestion of meats, cheese and other foods. They are important sources needed by the body, being especially rich in calcium and iron. They are also valuable sources of vitamins. Although minor crops in general are not considered of great importance in furnishing proteins, carbohydrates and fats.

Bangladesh is located in a natural resource based geographical areas. As its in tropical region, fertile land, moisture-rich loamy soil and production-friendly climate make Bangladesh one of the notable growers of a vast range of fruits and minor crops of

impeccable quality. Based on the growing season, minor crops are mainly categorized as summer season minor crops, rainy season minor crops, winter season minor crops, and all-season minor crops. Of the summer minor crops, various cucurbits, cowpea, stem amaranth, several aroids and Indian spinach are predominant. Winter minor crops include gourd, cucumber, tomato, cabbage, cauliflower, eggplant, spinach, bush bean and radish. Crops like okra, heat-tolerant tomato, eggplant, carrot, spinach are grown all year round. Summer minor crops are grown from May to October. And winter minor crops are grown from October-November to March-April. Minor crops occupied areas are shown in (Table 1.4).

Table 1.4 Minor crops production during 2010-11 to 2015-16

Year	Total cropped area in '000 ha	Area under vegetable '000 ha	Yield (ton/ha)
2010-11	14949.80	367.61	8.34
2011-12	15085.43	367.21	8.33
2012-13	15040.49	376.92	7.78
2013-14	15211.63	374.89	9.50
2014-15	15252.63	405.26	9.30
2015-16	15444.53	406.88	9.55

Source: Year Book of Agricultural Statistics, (2017), Different issues, BBS.

It has been observed from the (Table 1.3) that both the area and production of minor crops had increased from year to year. About 30 types of minor crops are grown in summer season in Bangladesh.

1.5 Importance of minor crops in the economy of Bangladesh

1.5.1 Combating malnutrition

Minor crops and fruits are the sources of many essential nutrients. It is evident that Minor crops are rich in protein and calcium, carbohydrate, Protein, vitamins such as vitamin A, vitamin C, niacin, riboflavin and thiamin and minerals like calcium and iron make human diet complete and balanced .They provide dietary fiber necessary for digestion and health and combating malnutrition, curing nutritional disorders and diseases like anemia, blindness, scurvy, goiter etc. including physical and mental growth and help increase efficiency of labor and span of working life which eventually influence the economic potentials of the nation. Minor crops are the most inexpensive and rich sources of the above-mentioned nutrients.

1.5.2 Reduce dependence on cereals

People of Bangladesh take 469 gm of cereals per capita per day whereas actual cereals need is 372 gm/capita day (IRRI, 2007).So People take more cereals daily 9 than what they need. If quantity of rice intake can be reduced by 50 gm through motivation and consumption of more minor crops, then quantity of rice saving will be about 21 million tons per annum. By this way the country can reduce dependence on cereals gradually and release more land for production of minor crops.

1.5.3 Employment opportunity

As Minor crops is a labor intensive cash crop, so it can provide the opportunity of employment for a large number of redundant labor in the agriculture sector of Bangladesh. Rahman (2000) reports that while the overall share of women in minor crops production in terms of labor hours performed is high (47.79% of all labor activities, compared to 11 to 18% in food grains), only a minor share of this performed by hired labor (1.2%).

1.5.4 Contribution of minor crops to total export earnings of Bangladesh

In a developing country like Bangladesh, where the numbers of exportable items are not many, international trade is mainly import based and the country faces serious balance of

payment problem. The demand for minor crops is steadily rising at home and abroad as their consumption's are income elastic and the affluent people in the developed countries prefer fruits and Minor crops to high cholesterol foods because of rising health consciousness. Again, production of Minor crops is more labor intensive.

Table 1.5 Total export earnings from minor crops from 2013-14 to 2016-17

Year	Export quantity (kg)	Value'000 TK
2009-10	14214743	246399
2010-11	16958935	3169859
2011-12	1954689	3946629
2012-13	1425102	112239
2013-14	745570	108443
2014-15	1297986	178274
2015-16	937942	160713
2016-17	2327242	409742

Source: Yearbook of agricultural statistics, 2017

From the (Table 1.5) it can be seen that the quantity (kg) and value of export earning fluctuates every year. The highest export earning was in 2016-17 and lowest in 2013-14.

1.5.5 Poverty alleviation and minor crops production

The export of horticultural products benefits the rural poor. Increases in export certainly raise the income of the rural poor producers and cater to the alleviation of rural poverty through generating rural employment in performing marketing functions for channeling products from to the export point.

1.6 Changing land use pattern and food security

Bangladesh is characterized by diversified farming to meet the household's requirements and to minimize the risk and uncertainty. The agricultural sector is being developed and advanced through the adoption of improved technology. Before a couple of decades, famer households mainly produced rice, jute and wheat in the country. Only rice based cropping system is under change, at the same time area under non-cereal crops, fruits and minor crops has been expanding. As a results land use pattern as well as allocation of land for crops, minor crops and fruits has increased over the last decade to increase food production and have greater food security.

1.7 Safe minor crops production in Bogura district

Minor crop is one kind of minor crops and it is on the platform in the last one era, there has been a silent revolution in minor crops production. Farmers in the district who had started cultivation of minor crops earlier are reaping good harvest, while others are busy getting their land ready for cultivation. Seeing a production, the farmers are expecting to get a good profit this reason.

District Deputy Assistant Agricultural Officer (DAAO) Farid Ahmed said Sadar, Shahjahanpur, Sherpur, Nandigram, Gabtoli and Shibgonj upazillas have the highest production as a land in those places are most suitable for growing all kinds of minor crops and seed beds.

Around 6,500 hectares of land have been fixed for cultivation for summer minor crops with production target of over 1.23 lakh tonnes, Farid said. Over 3000 hectares have already been taken under cultivation, Of which minor crops on 50 percent of the land are ready for picking, he added.

Minor crops grower Nazrul Islam of Majhira are Shajahanpur Upazila said that he has been Nursing the New minor crops plants and removing the dried plants from this bed.

Bikash Roy who was a farmer said the weather in the winter season was favourable for growing minor cops and they also got high prices for their produce.

The village of Shahnagar in Shahjahanpur of Bogura district has earned the name charanagar (seedling City) as more than 250 nurseries in the village and adjacent ones supply seedlings of seasonal minor crops to at least 23 districts across the country including the Capital. The nurseries used to supply seedlings worth tk 40 core a year before the pandemic which this year came down to 10 crore to grow the seedlings. There are 250 nurseries in the area covering at least 250 bright of land. The first nursery was established in Shahnagar some 36 years ago.

From Bangla month Asharh (June) to Kartik (October), the nurseries work on green chilli and onion seedlings, and from Aswin (September) the plant tomato, brinjal, papaya and bitter gourd along with other varieties of winter minor crops,the farm owners seed adding cultivating these minor crops in three to four phases consecutively on a seedbed.

Amzad Hossain, Proprietor Ankhi Beej Bhandar, the pioneer of commercializing vegetable seedling in the district, said over 3000 farm labors, mostly rural women are employed in 250 nurseries in the area.

To ensure fair prices of agricultural products, the government is taking initiative to create “farmers markets” in 64 districts of the country. Farmers will be able to sell agricultural products directly in these markets without any rent. The government will even provide transport assistance to bring goods from farmers homes to the market. According to the Ministry of Agriculture and the Department of Agricultural Marketing, these markets will be launched on a temporary basis first. Then light infrastructure will be built. These markets will get a permanent from later.

1.8 Justification of the study

Still Bangladesh depends on agriculture. Agriculture accounts for 11.52% of its domestic product (GDP) (BBS, 2022), and absorbs 38.04% of the country's labor force (BBS, 2022). The government of Bangladesh has given emphasis on minor crop production to meet the nutritional and caloric need for the growing population and for increasing employment opportunities and income of farmers. In this context, pointed gourd, Bitter melon, Pumpkin, Luffa, Snake gourd, and cucumber may be considered as five important minor crops, which could provide such opportunities. For this reason, it is essential to increase the minor crops

production which will obviously ensure the food security of the famer households along with providing significant cash income. To sustain the minor crops production and increase the production efficiency, it is needed to provide necessary support to the minor crops farmers. In this regard, study on an economic analysis of major minor crops production would be helpful in planning and setting up strategies for future development to the country and achieving food security From the farmers point of view, the present study has, therefore, been designed to provide information about profitability, availability and food consumption and nutritional status, factors affecting the yields and economic return of winter minor crops production. This finding from the study may also help the policy makers is making decisions for minor crops production. This information will also be useful to the extension workers.

1.9 Objectives of the study

- To identify the socioeconomic characteristics of minor crops farmers.
- To estimate cost, return and profitability of Minor crops cultivation.
- To determine the factors affecting the economic returns of minor crops cultivation.
- To identify the problem and constraint facing by minor crops farmers.

1.10 Outline of the thesis

The thesis consists of eight chapters. Chapter I describes introduction of the study. Review of literature is presented in Chapter II. Chapter III deals with the methodology of the study. Socioeconomic profile of the sample farmers are presented in Chapter IV. Chapter V estimates and analyses the costs and returns of the selected minor crop cultivation. The results of Cobb-Douglas production function analysis are given in Chapter VI. Chapter VII is designed to identify production and marketing problems of the minor crop farmers. Finally, summary, conclusion and policy recommendations of the study are presented in Chapter VIII. At the end references are added in chapter IX.

CHAPTER II

REVIEW OF LITERATURE

Review of literature in any research is an important because it provides opportunities for reviewing the stock of data and information for the research purpose which gives a guideline in designing the future research problems. Some of essential works regarding present study are reviewed here.

Mukalia *et al.* (2022) discovered that the marketing of agricultural products in Nigeria, which is the main source of income for farmers and marketers, has a number of flaws that have impeded both sustainable development and economic progress. Therefore, this study examined the marketing of carrots and cucumbers in Enugu State, Nigeria, as well as the barriers to their successful promotion. The primary methods used to analyze the data were descriptive statistics, marketing margin, and the Likert type rating methodology. The findings indicate that women (65%) who were still in their prime earning years and did not live in a cooperative society dominated the minor crops marketing industry. A retail marketing function is performed by half of them, a retail and wholesale function by 30%, and a wholesale function by 20%. Vegetable marketing brought in an average of N25,667.7 (USD 66.93) each month, which helped marketers increase their income. Cucumber and carrot had marketing margins of 26.30% and 20.18%, respectively.

Alam *et al*. (2021) conducted a study a study on the impact of COVID-19 on the supply chain for minor crops and food security, using data from Bangladesh**.** In order to understand how COVID-19 will affect the growers' future production plans and the supply chain for minor crops, this study conducted a mobile phone survey of vegetable farmers. The shutdown in Bangladesh has hampered the flow of food and raised the possibility of food security. Vegetable growers have suffered a significant loss as a result of the yield price's more than 50% decline. Due to COVID-19, farmers suffered losses of BDT 4900, BDT 10900, BDT 57400, BDT 52500, and BDT 18500 per acre, respectively, when growing brinjal, cucumber, pointed gourds, yearlong beans, and bottle gourds.

Hasan *et.al*. (2020). found Trichosanthes dioica Roxb, a dioceious cuvurbit vegetable and green fruit that can be cooked, with 2n=2x=22 protons Due to the hard shells of seeds,

consumers prefer to eat seedless or fruit with fewer seeds. Therefore, the development of seedless or fruit with fewer seeds will benefit from the cross compatibility between the diploid and induced tetraploids, the present study used ripe seeds that were submerged in 0.05%,0.1% and 0.5% colchicine for 24,48,and 72 hoursn the inter-ploidy and intra-ploidy crosses, these tetraploids were employed as parents (male or female).

Elavarasan *et al*. (2019) Conducted a study on the economics of marketing winter-safe minor crops in the Manipur, India district of Bishnupur. Since 78.02 percent of the channel's sales were of broad beans, it was discovered that it was more popular. Cauliflower, pea, and cabbage all scored 78.07 and 78.96 percent, respectively. The primary factor in this channel's success was the ability of vegetable farmers to sell a large volume of their produce at their doorsteps while also obtaining financing from local dealers.

Akhter *et al*. (2019) Conducted a study on Intercropping of pointed gourd with leafy vegetable and spices. In this study, to find out the performance of pointed gourd (*Trichosanthes dioica*) intercropped with two leafy minor crops (Redamaranth, Amaranthus cruentus & Spinach, Beta vulgari) and one spices (Coriander, Coriandrum sativum). An intercropping experiment was conducted at the farmer’s field of Multi location Testing (MLT) site (medium highland under AEZ-03), Goneshpur of Shibganj upazilla under Bogura district during two consecutive rabi season of 2012-13 to 2013-14. The experiment was laid out in randomized complete block design (RCBD) with six replications. There were four treatments viz.T1 = Sole pointed gourd (100%), T2= 100% pointed gourd + 50% red amaranth, T3 = 100% pointed gourd +50% spinach and T4 = 100% pointed gourd + 50% coriander. The highest pointed gourd equivalent yield (29.36 t ha-1) and higher gross return (TK. 446288 t ha-1) were found from T4 (100% pointed gourd + 50% coriander) which was statistically similar to T3 (100% pointed gourd + 50% spinach) & T2 (100% pointed gourd + 50% red amaranth. The lowest equivalent yield (24.11tha-1) and lowest BCR (3.46) were obtained from respective sole pointed gourd in the experiment. The result revealed that all the intercrops produced higher in terms of pointed gourd equivalent yield, gross return, gross margin and benefit cost ratio (BCR) over the sole pointed gourd in both the years. Therefore, the suitable intercropping system

pointed gourd with spices crop is more profitable than that of other intercropping system in Bogura region.

Makadia *et al*. (2018) Based on information gathered from 144 pointed gourd producers in the Nava Based on information gathered from 144 pointed gourd producers in the Navsari and Surat districts of South Gujrat during the agricultural year 2015-16 and using a multitasking random sampling technique, this study was conducted to determine the effectiveness of resource use and marketing for pointed gourd cultivation in cultivation in South Gujrat) According to the coefficient of multiple determination (R2) value, the model's variables could account for 98% of the variation in the pointed gourd yield. Only machine labor and chemical fertilizer, however were discovered to be statistically significant. Irrigation and seedlings were determined to be unfavorable but not substantial. An additional rupee spent on plant protection chemicals, irrigations, human labor, machine labor, and FYM yielded returns of 3.68, 1.03, 4.06, 2.43, and 1.80, respectively. In the markets of Surat and Navsari, the producer's share of the consumer's rupee was discovered to be 63.08 and 59.46%, respectively.

Makadia *et al*. (2018) the investigation into the profitability and cost of producing pointed gourds in South Gujrat Based on information obtained from 144 pointed gourd producers in the Navasari and Surat districts using a multistage random sample technique. the analysis of the costs and profitability of pointed gourd production in South Gujarat. Based on data collected via a144 pointed gourd producers in the Navasari and Surat areas were selected using a multistage random sample technique. 242159 was the operating cost (cost A).Costs B1 and B2 were found to have averages of 244350 and 251795,respectively. It was discovered that Cost C1 and Cost C2 were 304472 and 311917, respectively. Per hectare, the total cost (Cost C3) came to 343108. Cost A consumes the line share (71% of the total cost). The production cost per quintal and the cost of cultivation per hector. The production cost per quintal and the cost of cultivation per hectare were 34108 and 1949, respectively. The average gross and net income per acre were 518130 and 175022, respectively. It is calculated that the returns on investment for Cost A1 and Cost C3 are 2.14 and 1.51, respectively.

Shende and Meshram (2015) conducted a research on cost benefit analysis and marketing of tomato. According to the study,76417.41 rupees per hectare were spent on tomato growing, which was more expensive than cost C2. For tomatoes, the net return over cost-C2 was discovered to be 65139.23 Rs./ha. For tomatoes, the benefit cost ratio over cost A2, or available cost, was found to be 3.73. However, the BCR over C2, or cost of cultivation for tomatoes was 1.85. It appears that growing minor crops is a successful business.

Shende and Meshram (2015) conducted a research on cost benefit analysis and marketing of tomato. The study stated that the cost of cultivation per Hectare for Tomato over the cost C2 was found 76417.41 Rs./ha. The net return over cost- C2 was found to 65139.23 Rs./ha. for Tomato. The Benefit Cost ratio over cost A2; which is known as available cost was found to 3.73 for Tomato. However the BCR over C2 i.e. cost of cultivation was 1.85 for Tomato. It performs that vegetable cultivation is a profitable venture.

Angula *et al*. (2014) Carried out a study on economics of small-scale vegetable cultivation in northern Namibia**.** According to the study, the two main factors influencing farmers' participation in the project are the size of the project plot and having a car (a proxy for affluence). The study suggests that project farmers' profitability is negatively influenced by their level of education and capacity to recruit labor.

Saha S (2013) Conducted a study on NGO intervention in the production of minor crops in an economic analysis of Mymensingh. According to the study's key findings, brinjal and okra had per-hectare gross costs of Tk. 288315 and Tk. 220462, respectively, with NGO involvement. Ocra and brinjal, on the other hand, had gross costs per hectare without NGO involvement of Tk. 208071 and 315412, respectively. In the case of NGO assistance, brinjal and okra per hectare gross returns were assessed to be Tk. 615758 and Tk. 410398, respectively. In the absence of NGO intervention, brinjal and okra per hectare gross returns were estimated to be Tk. 544619 and Tk. 361500.Okra and brinjal output per hectare with NGO assistance had benefit-Cost ratios of 2.14 and 1.86,respectively Without the help of NGOs, the yields of okra and brinjal per hectare were 1.73 and 1.52, respectively.

Xaba (201**3)** carried out study on the variables influencing the productivity and profitability of the production of minor crops in Swaziland**.** The findings show that access to credit,

selling, the amount of fertilizer used, the farmer's distance from the market, and his or her gender had a substantial impact on vegetable producers' output. Level of education, area used for vegetable cultivation, and type of marketing agency made up the profitability of vegetable production.

Karim *et al*. (2011) study was undertaken to assess the comparative advantage of production and export of minor crops from Bangladesh. The importing countries were mostly in the middle East. The demand for summer vegetable was found than those of winter minor crops. Total export quantity was found 6046 metric tons of minor crops and earned foreign exchange of tk 1120 million, which was only 1.18 percent of total vegetable production in Bangladesh. Among the export marketing cost items, air freights charges was height

Nahar (2009) conducted a study on an economic study of year round minor crops production in selected areas of Jessore district. The major findings of the recent study were that the year round minor crops production was profitable from the viewpoints of marginal, small, medium and large farmers. Area under minor crops production was 19.51, 21.98, 32.43 and 28.07 percent of total land for marginal, small, medium and large farmers respectively and considering all famers the area under minor crops production was 27.99 percent of total land. Bean, cabbage, cucumber and snake gourd were mainly produced in the study areas and per ha net returns of producing these crops were Tk. 89385, 90040, 90737.6 and 65473, respectively and undiscounted Benefit cost ratio came out to be 1.81, 1.87, 1.82 and 1.76 respectively which represent that minor crops production was profitable in the study area. The farmers gain the maximum profit from cucumber minor crops.

Chainu *et al*. (2009) found promoting a versatile yet minor crop soyabean in the farming system of keneya. How to achieve this for crops, other than major staples (e.g., maize) and traditional export crops (e.g., tea), remains a problem since most African countries tend to focus policy attention to major staples and traditional export crops. Using a three-tier-approach, developed and based on successful soybean promotion strategies in Nigeria and Zimbabwe, this study assesses the effect of market development at household-level, community-level, and linking farmers’ groups to industrial processors on sustainable

soybean promotion in Kenya. Results show an increase in farmers' confidence to produce, process, and consume more soybeans than before.

Barman (2008) conducted a comparative economic study to assess the effectiveness of traditional and supermarket marketing channels for winter minor crops in Dhaka. In the regular market and supermarket, average marketing cost per ton of minor crops was Tk 481and TK 453 correspondingly. Net margins were correspondingly Tk. 11,988 per ton and Tk. 7,544 per ton. The outcome shows that the supermarket had a bigger profit margin than the traditional market. Supermarkets are more effective marketing channels. The market effectiveness of the supermarkets was 13.45,78.95, and 4.87 in Shepherd's and Acharya's methods, respectively.

Parvin (2008) did an economic analysis of the production of alternate rice and minor crops in a chosen region of Mymensingh Districts. The study's main conclusions were that, from the perspective of marginal, small, medium, and big farmers, alternate rice and vegetable production was lucrative. All farmers had an average family size of 5.67, which was somewhat higher than the national average (4.48). Farming was the primary occupation of the sampled farmers and almost 50% of the household heads had some from of schooling. The study areas mostly produced boro rice, aman rice, lady's finger, cabbage, and white gourd, with corresponding per-ha net returns of Tk. 23581, 3896, 86898, 89640, and 99000. White gourd minor crops brought in the most money for the growers.

Suraiya (2008) conduct research on the economics of the production of a few chosen winter minor crops in purbaadhala upazilla in Netrokona Districts. Cucumber, okra, snake gourd, and white gourd are the chosen minor crops. The study's key conclusions were that all of the chosen winter veggies were profitable. Cucumber, okra, white gourd, and snake gourd had gross production costs per hectare of Tk. 108548.0, 91620.0, 108104.0, and 92157.0, respectively, while the corresponding gross returns were Tk. 202000.0, 162000.0, and 151000.0. Cucumber, okra, white gourd, and snake gourd production had net returns per hectare of Tk. 93452.0, 70380.0, 96896.0, and 58843.0, respectively. In other words ,the farmers and middlemen who supplied the winter veggies chosen were all extremely profitable. White gourd, however, brought in the most money for the growers.

Ferdous (2007) conducted a study on the cultivation and marketing of brinjal in a chosen region of Mymensingh Sadar, within the city of Mymensingh. The researcher has concentrated on gathering fundamental data on socioeconomic traits, profitability, marketing cost and margin, price volatility and issues facing farmers and other respondents. The calculated gross and net returns per hectare were 1,08,201 and 16,190 Tk., respectively. The brinjal has a benefit-cost ratio of 1.18. According to the study, the marketing costs for paiker, aratdar, and retailer were Tk. 65, Tk. 11, and Tk. 70 per quintal of brinjal, respectively.

Hoq (2006) carried out a study on the production and export of quality minor crops from selected areas of Gazipur district. In this study vegetable products and suppliers were selected from Ulokhola of Kaligonj Upazila and exporters were selected from Dhaka city (Motijheel, Kakrail, Shantinagar, and Sham Bazar). He found that per hectare production cost for cowpea, snake gourd and biter gourd were estimated at Tk. 73838, 72029 and 104644 respectively and value addition for cowpea, snake gourd and biter gourd were calculated at Tk. 86162, 52611 and 237556 respectively by famers. The average estimated marketing cost calculated by suppliers was Tk. 2905 per ton. The value addition by supplier was Tk. 3094 per ton. The average estimated marketing cost incurred by different types of exporters for UK, Saudi Arabia, Kuwait and Qatar were Tk. 169442, 98429, 103499 and 85324 per ton respectively. Among all the cost items, airfreight charge was the highest. The value addition by different types of exporters for UK, Saudi Arabia, and Qatar were Tk. 55778, 16660, 16902 and 23753 per ton respectively. It was found from the study that UK market was more profitable for minor crops export. Minor crops producers, suppliers and exporters in the study area faced many problems and prospects in production, marketing and export of minor crops and also suggested some policy measures.

Wadhwani et al. (2006) Additionally discovered were the economics of pointed gourd production and post-harvest management under the Diara eco-system of the lower Indo genetic plants. The diara area, which is often categorized as active flood plains, is located between the natural levees and displays a riverine landscape with unstable land surfaces that are vulnerable to annual floods, erosion, and redeposition. The study's foundation is primary data(2001-02) gathered from 144 diara farmers who were chosen as a sample using

the Multi-Stage Random Sampling Technique According to the report, technology adoption was substantially lower than what was advised, which caused a significant (34%) difference between the realized and prospective output. Positive net returns could be seen. The post-harvest activities were not properly performed which resulted is loss of quality and quantity (25% at producers' level). The producers' share in consumers' price was estimated as 54%. Lack of technology and finance were found to be important constraints in adoption of technologies, and limited by market imperfection in realizing reasonable price/profit in production of pointed gourd.

Nahar (2005) Carried out study on Bangladeshi fresh vegetable export issues. According to the study, exporting veggies to Asian nations was more profitable than exporting them to middle eastern nations. Although selling crops to EU nations generated the biggest profit. There are numerous formalities and risks associated with exporting to such nations. Due to a lack of necessary air cargo facilities and excessive freight rates charged by Biman Bangladesh Airlines, fresh vegetable exporters were having difficulties competing in the international market. One of the biggest marketing issues is cold storage and packaging.

Kashem and Sarker (2004) completed a research project on Bangladesh's food security. There are significant regional disparities in household food security in Bangladesh. However, other factors do come into play, such as a region's propensity for natural disasters, the quality of its agricultural land, the accessibility of its schools and hospitals, and the degree of its infrastructure development and access to jobs for its residents.

Uddin (2004) in his study identified five aspects of constraints in commercial cultivation of vegetables viz. seed constraints, disease and insect infestation constraints, field management constraints, marketing of vegetable constraints and extension work constraints. Among these aspects of constraints they revealed marketing problem severely faced by the farmers.

Steen *et al*. (2004) conducted research and found that the cost of resources has increased for farmers. Depending on the type of activity and various agro-climatic zones, these expenses can vary substantially. The profitability of the farm appears to have been impacted by the rise in resource costs. Fruits and minor crops are more profitable, it was

also found. According to our estimates, minor crops are more profitable than fruits and cereals per acre. Farmers that participate in cooperatives or other associations that use modern farming techniques (such tunnel farming) are more productive. The availability of financing and consultancy services has enhanced farm revenues.

Farmers who were more intimately connected to supply chain participants were more successful. According to our examination of the second stage of production's features, growers of fruits and minor crops are more productive than those of gains and types of crops.

Hunt *et al.*(2003) found Resource-advantage theory, relationship marketing, and market orientation. The field of marketing has greatly added to the corpus of knowledge on corporate strategy during the past 20 years, despite being rather ignored by non-marketing discipline. This essay assesses these contributions, considers how they add to prevalent non-marketing theories of company strategy, and demonstrates how marketing provides a broad theory of competition that unifies the ideas of both marketing and non-marketing theories of business strategy.

Salam (2003**)** in his study identified constraints in adopting environmentally friendly farming practices. Top six identified constraints according to their rank order were : i) low production due to limited use of fertilizer (ii) lack of organic matter in soil, (iii) lack of Government support for environmentally friendly farming practices, (iv) lack of capital and natural resources for integrated farming practices, (v) lack of knowledge on integrated farm management and (vi) marketing facilities.

Musnicki (2003) showed in Poland that high soil cultivation requirements, low frost resistance, high crop protection costs and a relatively long vegetative season are some of the major constraints.

Chaudhry et al. (1996**)** The agricultural sector of Pakistan experienced better growth rates in the 1960s than it did from 1979 to 1980, according to an analysis of growth indicators from 1950 to 2005. The population growth rate, which was linked to the expansion of the national economy, the welfare of the masses, and the provision of food for an enormously expanding population, simply outpaced the average growth rate. The results of the study

showed that in order to increase agricultural productivity in Pakistan, it is necessary to invest in research and development that stimulates prices for farmers and sets prices for goods along with the corresponding parity prices of imports and exports.

Erbe and Neubauer (2002) reported that potato production area in Germany increased by 2.1% to 288000 ha in 2002 compared to production area in 2001. The area reduced in 2001 because of marketing problems. The greatest reduction (14%) was in Sachsen- Anhalt. The main varieties are Agria (7.3% of total area), Kuras (5.4%), Cilena (4.1%), Marabel (3.9%) and 20 other varieties. Seventeen new varieties were approved for 2002, including 1 very early, 3 early, 10 semi-early (5 for consumption and 5 for processing), and 3 semi-late and late ripening, while 5 varieties were removed from the German national list.

Ismail (2001) conducted a study on farm youth of haor area of Mohangonj upazila. Study revealed that there were six top problems in rank order were (i) no arrangement of loan for the farm youth for fishery cultivation, (ii) lack of government programmes in agriculture for the farm youth, (iii) absence of loan giving agencies for establishing farm,(iv) general people face problem for fishery due to government leasing of Jalmohal, lack of government programmes for establishing poultry farm, (vi) lack of agricultural loan for the farm youth.

Pramanik (2001**)** made an extensive study on the twenty-four problems of farm youth in Mymensingh villages relating to different problems in crop cultivation and marketing. Out of twenty-four problems top five problems in rank order were; i) local NGO take high rate of interest against a loan, ii) lack of agricultural machinery and tools, iii) lack ofcash iv) financial inability to procure improved seeds, fertilizers and irrigation v) marketing facilities.

Yadev *et al.* (2000) conducted a survey during 1996-97 in the Basti district of Uttar Pradesh, India, among farmers of 6 selected villages who were classified based on the size of their farmland: below 1 ha (38 farmers), 1-2 ha (33) and 2 ha and above (19). Three potato disposal channels (I: producer-consumer, II: producer-retailer-consumer and III: producer-wholesaler-retailer-consumer) were used. Under channel III, 3 storage systems were used: without storage, storage by producer and storage by wholesaler. Tabulated data were presented on

(1) the pattern of potato disposal by size of farmland.

(2) potato price spread in Basti vegetable markets for the 3 channels and (3) inter- channel comparisons as a whole. Potato marketing problems can be overcome by cooperative marketing.

Sharma *et al.* (1996) Highlighted that as a result of the changes in crop structure that occurred in Rajastan between 1960-1961 and 1993-1994 as well as the increasing production of various crops. According to the findings, there was a significant improvement in the growth rates of sown areas and oilseeds by 8.45 and 13.2 percent, respectively. This resulted in a significant increase in production of 32.42 percent per year, and the proportion of wheat sown area in gross sown area increased from 7.8 to 10.5 percent. This demonstrated how crops are now structured differently in order to be profitable.

CHAPTER III

METHODOLOGY OF THE STUDY

3.1 Introduction

An appropriate methodology is very essential for conducting scientific research essentially the producer by which researcher go about their work of describing, explaining and predicting phenomenon are called research methodology. A socioeconomic research by its nature essentially involves collection of primary data from the respondent. The method of collection data depends on nature, aims and objectives of study undertaken. Methodology deals with study area selection, survey design, data collection and analytical producers.

3.2Study area

For this research, the area will be selected on the basis of concentration of minor crop cultivation in Bangladesh. The land conversion from minor crop cultivation is mostly concentrate in the essential part of Bangladesh will consider for this study. The minor crop survey area about 12 villagers, 6 post office, and 3 thana. Three major concentrate thana Bogura Sadar, Gabtoli and Sariakandi will be consider of Bogura districts. These are substantial for safe minor crop cultivation due to the availability of the crop land and industrially manufacture and feed favorable resources and climatic condition.

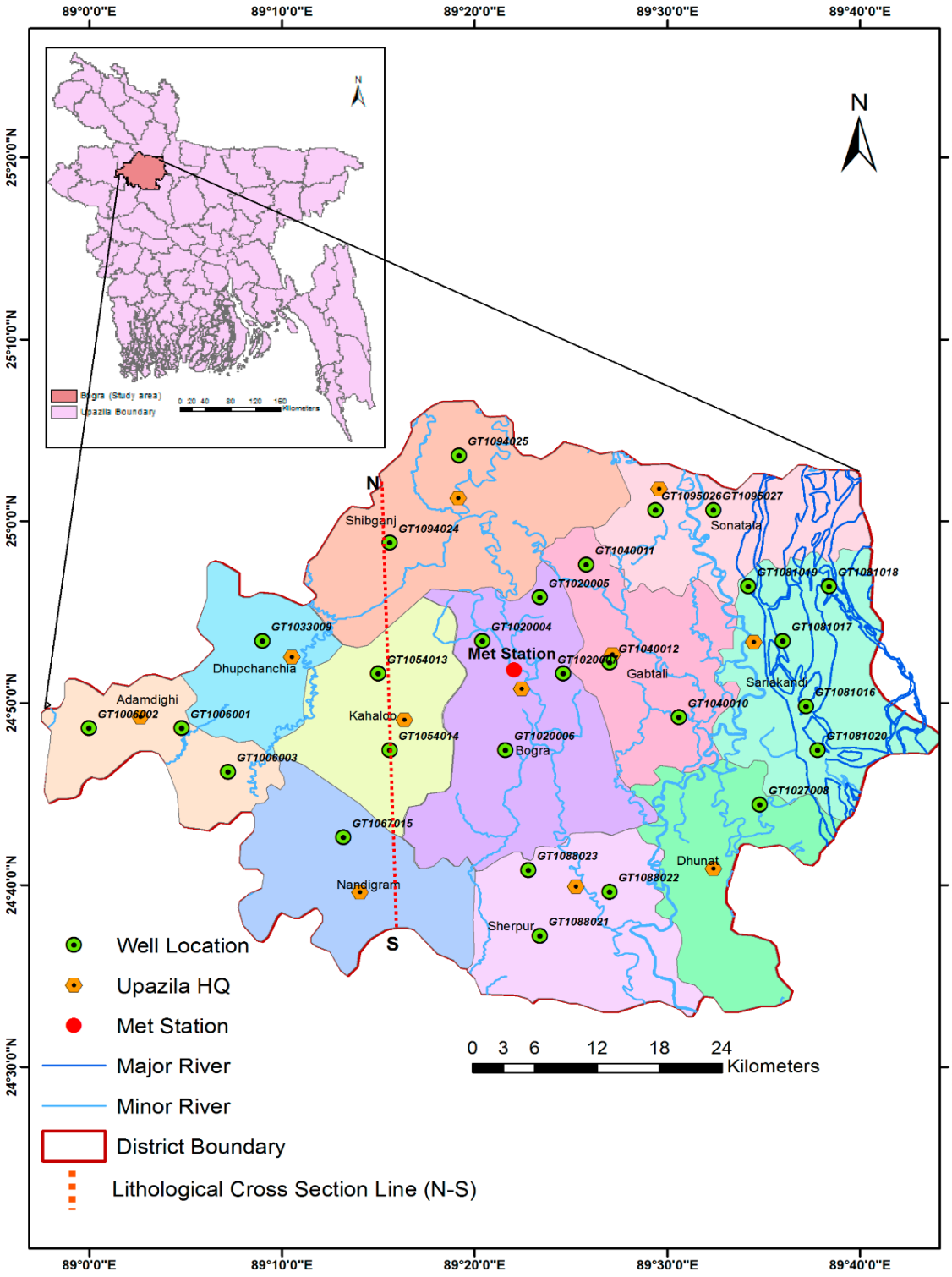

Figure 3.1: Map of Bogura districts

3.3Preparation of interview schedule

The survey schedule was developed by keeping in view the objectives of the study to collect the expected primary data from crop land farmers. At first, draft schedule was prepared and pre-tested with a few farmers and the draft schedule was improved, rearranged and modified in the light of the practical examinations. After pre-testing and necessary adjustment, a final interview schedule was developed.

After making necessary adjustments a final schedule was developed in logical sequence of the following items of information.

- Socio-economic characteristic of minor crop cultivation farmers.
- Production practices and inputs use cost and returns.
- Expenses including human labor supplies.
- Supplementary fertilizer and pesticide.
- Problems and constraints of vegetable cultivation farmers other related aspects.

3.4 Sampling technique and sample size

The collection of necessary information for a research study from each and every elements of population become costly and time consuming. So the selection of sample size was one of the crucial aspects for the study. A reasonable size of sample to achieve the objectives of the study was considered. A sample of representative farms is therefore chosen in such a way that the information meets the purpose of the study. As the population is not so large and considering the limited time, efforts and fund, a sample of 101were randomly selected.

3.5Survey Instrument:

The minor crops cultivation questionnaire was developed by the Supervisor and Co-supervisor. Later, the questionnaire was finalized with necessary changes and adjustment on basis of pre-testing findings. The finalized questionnaire was then used for interviewing 101 farmers' respondents at 3 thana (Bogura Sadar, Gabtoli, Sariakandi) in Bogura districts.

3.6 Determination of sample size

In order to determine the required sample size an approach based on confidence level and precision rate was followed for periodic surveys. The advantage of this approach is that the statistical validity of the sample does not depend on its size relative to the population being investigated. The initial sample size was determined by using the following formula with 95% confidence level and design effect (confidence interval 8%):

$$n_0 = Z^2\left[\frac{p(1-p)}{(d^2)}\right]$$

$$= (1.96)^2\left[\frac{0.21\times 0.79}{(0.08)^2}\right]$$

$$= 99.58148$$

Where

n_0 = initial sample size

Z= 1.96 for 95% confidence level

p = probability of selecting a village which is interested to cultivate vegetable (0.21)

d = design effect (confidence interval, 0.08)

If N is small the formula to be used assumes the following form:

$$n = \frac{n_0}{1+\frac{n_0-1}{N}}$$

$$= \frac{99.58148}{1+\frac{99.58148-1}{329}}$$

$$= 76.62237$$

Where

$n =$ New sample size

$n_0 =$ Initial sample size

$N =$ Population size

The sample size was estimated to be 80 by rounding up from 76.62237. we had to collect 101.

The collection of necessary information for a research study from each and every elements of population become costly and time consuming. So the selection of sample size was one of the crucial aspects for the study. A reasonable size of sample to achieve the objectives of the study was considered. A sample of representative farms is therefore chosen in such a way that the information meets the purpose of the study. As the population is not so large and considering the limited time, efforts and fund, a sample of 100 were randomly selected.

3.7 Period of data collection

Data and information were collected from three thana under Bogura sadar, Gabtoli and Sariakandi in Bogura district in the time of July to August 2022. Through field survey by making personal visits in the study area using the basis of a structured questionnaire. To get the require information for this research all source of primary data were collected within the period. In this period whole time upazilas agricultural officer assisted throughout the data collection. The upazilas agricultural officer was provided essential basic information of the safe minor crops cultivation farmers.

3.8 Processing, tabulation and analysis of data

After collection of primary data from the study area, the collected data were summarized and scrutinized carefully before the actual tabulation was done. The recorded data were coded in code sheets according to a comprehensive plan. The data were edited rigorously by the data supervisor to make correction of any inconsistencies in data during their entry and to

minimize non-sampling error of the study. Data was further edited to have complete, consistent, accurate and homogenous data after their entry.

The processed data were transferred to a M.S. Excel sheet. The entire analysis of data was performed by using a computer package, called Statistical Package for Social Science (SPSS.11.5). After checking and editing, the data were entered on M.S Excel. Such data were analyzed after checking and editing by using SPSS software program and appropriate statistical tools were applied to analyze the data.

3.9Analytical techniques

Mainly two techniques of analysis were used in this study:

1) Tabular analysis and
2) Functional analysis

3.7.1 Tabular analysis

Data were presented mostly in the tabular form. This form is simple in calculation, widely used and easy to understand. Some statistical measures like average, percentage and ratios were calculated as these were simple to understand and easy to calculate. This analysis also includes socio-demographic characteristics of sample farmers, production practices, input use, costs and return of minor crop cultivation. Per hectare profitability of selected minor crop cultivation from the view point of individual farmers was measured in terms of gross return, gross margin, net return and benefit cost ratio.

Comparative profitability analysis of pointed gourd, bitter melon, pumpkin and cucumber production

After collecting data will be post a master table sheet. Then table will arrange according to the objective of the study then analysis will be performing. In tabular analysis simple relation between dependent and independent variable will be study. Farm business analytical technique such as enterprise costing gross margin analysis will perform to see the profitability of the enterprises. The formula are given below:

Total fixed cost: It is calculated by adding up interest on operating capital and land use cost.

Interest on operating cost: An interest expense is the cost incurred by an entity for borrowed funds. It is essential calculated as the interest rate times the outstanding principle amount of the debt.

Interest on operating cost =AI×I×t

Where, AI= (Total investment÷2)

I=rate of interest

t= length of crop period in a month

Total cost: The total cost is calculated by adding up all cost of variable input and fixed input.

Given formula,

TC=T VC +TFC

Here, TC=Total cost

TVC= Total variable cost

TFC= Total fixed cost

Variable item includes: Seedling, labor (applying fertilizer, harvesting), fertilizer (urea, TSP, Vermicompost, manure, etc), pesticide etc.

Gross return: Gross return will calculated by multiplying the total volume of output of an enterprise by the average price in harvesting period .The following equation will be use to estimate GR

$GR_i = \sum Q_i\ p_i$

GR_i= Gross return of i^{th} product (Tk/ha)

Q_i= quantity of i^{th} product (Tk/ha)

P_i= Average price of the i^{th} product (Tk/kg)

I=1,2,3,……,n

Total cost: Total cost include all type of variable and fixed cost item involved in the production process. Total cost will be estimate as follow:

$TC= \sum P_{xi} \times X_i \times A+TFC$

Here,

TC= Total cost (Tk/ha)

P_{xi}= Per unit price (Tk/kg)

X_i= quantity of input (kg/ha)

A= Area under vegetable cultivation measured in hectare

TFC= Total fixed cost

Goss margin (GM): Gross margin is the different between revenue and cost before accounting for certain other cost. It will calculate by the difference between gross return and total variable cost.

The following equation was used.

GM=GR-TVC

Here,

GM= gross margin

GR=Gross return

TVC= Total variable cost

Net return: Net return analysis consider fixed cost ie. cost and land rent, interest on operating capital etc. The profitability analysis will be calculated by deducting all cost from gross return. The following equation will be used.

$\Pi=\sum(P_y Y)-\sum_{i=1}^{n} P_{xi} X_i$ -TFC

Here,

Π= net return (Tk/ha)

P_y= per unit price of product (Tk/ha)

Y= quantity of the production per hector (kg)

P_{xi}= per unit price of the input

X_i= quantity of input per hector

TFC= Total fixed cost

Benefit cost ratio: BCR is an indicator use for formal discipline of cost benefit analysis attempts to summarize the overall value for money of all research. BCR will estimate as a ratio of gross return and gross cost. General rule of them is that if the benefit is higher than the cost (BCR>1) the project is good investment. The formula of calculating BCR as follow:

BCR=Gross benefit / Gross cost

3.7.2 Functional analysis

Cobb-Douglas forms of production function were initially used for minor crops to determine the effects of the variable inputs. Data were converted to per farm per hectare to facilitate the analysis. Minor crops were hypothesized to explain the production of selected winter minor crops. Regression analysis was used to determine the effect of these inputs. The general model was specified comprehensively in such way that it can specify adequately the production process of the minor crops.

The selected Cobb-Douglas production function model, in its stochastic form may be expressed as:

$Y= aX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X_5^{b5}X_6^{b67}e^u$

The function was linearized by transforming it into the following double log or log-linear form i.e.

$1n\ Y = 1n\ a + b_i 1n\ X_1 + b_2 ln\ X_2 + b_3 ln\ X_3 + b_4 ln\ X_4 + b_5 ln\ X_5 + b_6 ln\ X_6 + b_7 ln\ X_7 + +Ui$

Where,

Y-Gross return (Tk/ha);

X_1-Human labor cost (Tk/ha);

X_2=Tillage cost (Tk/ha);

X_3= Seed/ Seedling cost (Tk/ha);

X_4= Fertilizer cost (Tk/ha);

X_5= Manure cost (Tk/ha);

X_6= Irrigation cost (Tk/ha);

X_7= Insecticides cost (Tk/ha);

i=1, 2, 3... n;

bi, b2... bz = Regression co-efficient to be estimated; and

U_i= Error term

CHAPTER IV

SOCIO ECONOMIC CHARACTERISTICS OF THE SAMPLE FARMERS

4.1 Introduction

Farmers socio economic characteristics affects their production pattern and technology use. To get a more complete picture of Pointed Gourd, Bitter melon, Pumpkin, and Cucumber cultivation. It is essential to know the socioeconomic characteristics of farmers. In this chapter, an attempt was made to identify the socioeconomic characteristics, age, family size, educational, occupational status and farm size etc.

4.2 Socio economic characteristics of sampled farmer

4.2.1 Socio Economic Background of Farm Households

Age of the farmers ranged from 24 to 70 years, the average being 44.24 years and the standard deviation, 10.71. All the variables were categorized on the basis of their possible scores except age was categorized based on the classification provided by the Ministry of Youth and Sports, Government of the People's Republic of Bangladesh. The distribution of the farmers according to their age is shown in Table 4.2.1

Table 4.2.1 Distribution of the farmers according to their Farm House

Among the 100 respondents, 93 was the male and 8 was the female. Thus, the male respondents represented 92.1% and the female respondents was 7.9% for the minor crops survey in Bogura district. There mean was 1.08 and Standard of deviation was .271.The list is given below the table

Gender	**Farmers**		Mean	SD
	Number	Percent		
Male	93	92.1	1.08	.271
Female	8	7.9		
Total	**101**	**100**		

4.2.2Respondents' Age:

Age of the farmers ranged from 15 to 75 years, the average being 30.7 years and the standard deviation, 1.15. All the variables were categorized on the basis of their possible scores except age was categorized based on the classification provided by the Ministry of Youth and Sports, Government of the People's Republic of Bangladesh. The distribution of the farmers according to their age is shown in Table 4.2.2.

Table 4.2.2 Distribution of the farmers according to their age

Age	Farmers		Mean	SD
	Number	Percent		
15-25	4	4.0	3.36	1.1547
25-35	21	20.8		
35-45	31	30.7		
45-55	27	26.7		
55-65	16	15.8		
65-75	2	2		
Total	**100**	**100**		

Table 4.4 showed that, 4.0 percent of them were "(15-25) aged" category, 20.8 percent of the farmers were "(25-35) aged" category, 30.7 percent of the farmers were "(35-45) aged" 26.7 percent of the farmers were "(45-55) aged" category, 15.8 percent of the farmers were "(55-65) aged" category, and 2 percent of the farmers were "(65-75) aged" category. The findings indicate that the highest proportion 30.7 percent of the farmers were "(35-45) aged" category.

4.2.3 Education

The education scores of the farmers ranged from 0 to 16. The average was 2.24 and the standard deviation was 1.159. On the basis of their educational scores, the farmers were classified into four categories, namely "illiterate (0-0.5), primary (1-5), secondary (6-10)

and above secondary (above 10). This distribution was supported by Hoque (2016) and Masud, (2007) and shown in the Table 4.2.3

Table 4.2.3 Distribution of the farmers according to their education

Education	Farmers		Mean	SD
	Number	Percent		
Illiterate(0-0.5)	41	40.6	2.24	1.159
Primary level(1-5)	12	11.9		
Secondary level(6-10)	31	30.7		
Above secondary level(>10)	17	16.8		
Total	101	100		

Similar result was observed by Nasreen *et al*. (2013) where highest numbers of respondents were Illiterate Table 4.5 indicated that the majority (40.6 percent) of the farmers illiterate compared to16.8 percent of them having above secondary. About 11.9 percent of the farmers were primary level, while 30.7 percent had secondary level of education. Thus, the overwhelming majority (59.4 percent) of the farmers were primary to above secondary level of education.

4.2.4 Family size

To describe the family size of the respondents, the category has been followed as represented by Poddar (2015). Family size scores of the fanners ranged from 2 to 9 with an average of 2.09 andstandard deviation of .709. According to family size, the respondents were classified into categories (Mean±SD) as shown in Table 4.2.4.

Table 4.2.4 Distribution of the farmers according to their family size

Family size	Farmers		Mean	SD
	Number	Percent		
Small family (up to 4years)	21	20.8	2.09	.709
Medium family (5 to 6 years)	50	49.5		
Large family (above 6 years)	30	29.7		
Total	101	100		

Data contained in Table 4.6 indicates that (49.5%) of the farmers had medium family while 29.7 percent of them had large family and 31.07 percent of them had small family. Thus, the overwhelming majority (70.3 percent) of the farmers were small to medium family size which is consistent with national scenario.

The analysis result showed that there is no significant relationship between problems and family size of the farmers. The similar result was found in the study of Alam et al (2018) and Arafat (2018) They found a non-significant relationship between family size and problems in been cultivation and guava marketing. It seems that the family contribution in farming is declining now-a-days and dependency on machinery is increasing. It also may be due to the increased financial capability of maintaining medium to large family of the farmers.

4.2.5 Annual family income

Annual income score of the respondents ranged from 60 to 310 with an average of 160.63 and standard deviation 55.08.On the basis of the observed scores, the respondents were classified into three categories (Mean ±0.5SD) as shown in Table 4.2.5.

Table 4.2.5 Distribution of the farmers according to their annual family income

Annual Family Income	Farmers		Mean	SD
	Number	Percent		
Low annual income(<Mean-SD i.e. <105.55)	16	16.50	160.63	55.63
Medium annual income(Mean ±0.5SD i.e. 105.55-215.71)	67	65.05		
High annual income(>Mean+SD i.e.>2154.71)	18	18.45		
Total	101	100		

Data presented in Table 4.2.5 indicate that the highest proportion (65.05 percent) of the respondent had medium annual family income, while (16.50 percent) had low annual income and (18.45 percent) had high family income. Overwhelming majority (81.55 percent) of the farmers had low to medium annual family income. Dominance of lower income farmers may be due to poor socio-economic condition, small and medium farm size of the majority farmers. As well as Average annual income of the locale was lower than the national average of $2824 USD (Economic survey 2021-22).It may due to more involvement of the farm families in business, service and getting foreign remittance.

Analysis showed that there is a negative significant relationship between annual family income and problem faced by the farmers. Arafat et al. (2018) and Azad et al. (2014) that income from vegetable cultivation of the vegetable growers has significant negative relationship with faced by vegetable cultivation.

4.2.6 Minor crops cultivation land

The minor crops cultivation land of the respondents varied from 0.12 to 0.76 hectares. The average vegetable cultivation land was 1.8 hectare with a standard deviation of 0.4. The respondents were classified into two categories based on their vegetable cultivation land as followed by DAE (DAE, 1999): "marginal farm" (upto 0.2 ha) and "small farm" (0.21 – 1.0 ha). The distribution of the farmers according to their vegetables cultivation land is shown in Table 4.2.6.

Table 4.2.6 Distribution of the farmers according to their minor crops cultivation land

Farm Size(Per hectare)	Farmers		Mean	SD
	Number	Percent		
Marginal farm (up to 0.2 ha)	20	19.8	1.8	.4
Small farm (0.21-1.0 ha)	81	80.2		
Total	101	100		

Table 4.2.6 indicated that the majority (80.2percent) of the farmers possessed small growing land and 19.8% of the farmers marginal cultivation land. Majority of the farmers were under small farmers category which is consistent with national scenario.

According to the correlation result there is no significant relationship between vegetable cultivation land and problems. This statement is supported by Alam *et al*.(2018) and cultivation land problems. This statement is supported by Alam *et a l*(2018) and Hoque (2006) who demonstrated that there is no – significant relationship between vegetable cultivation land problems. It may be due to majority of te farmers own almost similar amount of land. Although Islam (2017) found a significant positive relationship with problems and vegetable cultivation.

4.2.7 Income from minor crop cultivation

Income from vegetable cultivation of the respondent farmers ranged from 20 to 235 thousand taka with a mean and standard deviation of 103.50 and of 36.34 respectively. The farmers were classified into three categories, viz. low, medium and high income on the

basis of mean ± 0.5 SD. The distribution of the farmers according to income from vegetable cultivation is presented in Table 4.2.7.

Table 4.2.7 Distribution of the farmers according to their income from minor crops cultivation

Income	Farmers		Mean	SD
	Number	Percent		
Low income (< Mean – SD i.e.<67)	11	10.68	103.50	36.34
Medium income (Mean ±0.5SD i.e. 67.16 – 139.84)	76	75.73		
High income (>Mean + SD i.e. >139.84)	14	13.59		
Total	101	100.00		

Data reveal that the farmers having medium income from vegetable cultivation constitute the highest proportion (75.73%) followed by low income (10.68%) and high income (13.59%). Overwhelming majority (86.41%) of the farmers has low to medium income from minor crop cultivation. It may be due to the fragmentation of lands and decreasing the rate of participation of the educated families in farming activities.

Analysis showed that there is a negative significant relationship between income from minor crop cultivation and problems of 1% significant level of probability which means that when the income from minor crops cultivation increases problem decreases. Simillar result showed that Azad et al (2014) and pandit et al (2013).

4.2.8 Occupation

Most of the farmers occupation in Agriculture that was 88.1 percent Farmers doing business 3 percent, job was 1 percent, agriculture and job was 2 percent and housewife was 5.9 percent. The average was this occupation 1.61 and their standard of deviation was 1.76. We found out 88.1 percent farmers were related to Agriculture.

Table 4.2.8: Distribution of the farmers according to their occupation from minor crops cultivation

Occupation	Farmers		Mean	SD
	Number	Percent		
Agriculture	89	88.1	1.61	1.761
Business	3	3.0		
Job	1	1.0		
Agriculture + Business	2	2.0		
Housewife	6	5.9		
Total	101	100		

4.2.9 Land ownership

Most of the farmers land owership in Own land is 43.6 percent, Barga was 7.9 percent. Agreement was 2.0 percent,Own and Borga was 14.9 percent, Own and Agreement was 19.8 percent, Borga and Agreement was 4.0 percent, Own, Bogra and Agreement was 7.9. Farmers Maximum farmers had their own land 43.6 percent. Their mean was 3.03, and standard of variations 2.105 in table 4.2.9.

Table 4.2.9: Distribution of the farmers according to their land ownership from minor crops cultivation

Land Ownership	Farmers		Mean	SD
	Number	Percent		
Own land	44	43.6	3.03	2.105
Barga	8	7.9		
Agreement	2	2.0		
Own+Borga	15	14.9		
Own+Agreement	20	19.8		
Barga+Agreement	4	4.0		
Own+Borga+Agreement	8	7.9		
Total	101	100		

4.2.10 Family income

Annual income score the respondents ranged from 60 to 310 with the average of 160.63 and standard deviation 55.08. On the basis of the observed scores, the respondents were classified into three categories (Mean± 0.5SD) as shown in table 4.2.10

Table 4.10 Distribution of the farmers according to their annual family income

Annual family income	Farmers		Mean	SD
	Number	Percent		
Low income (<Mean-SD i.e<105.55)	17	16.50	160.63	55.08
Medium income (Mean± SDi.e. 105.55 – 215.71)	66	65.05		
High income (>Mean +SD i.e. >216)	18	18.45		
Total	101	100		

Data presented in Table 4.7 indicate that the highest proportion (65.05 percent) of the respondent had medium annual family income, while (16.50 percent) had low annual income and (18.45 percent) had high annual family income. Overwhelming majority (81.55 percent) of the farmers had low to medium annual family income.

As well as Avarage annual income of the locale was lower than the national average of $2824 USD (Economic survey 2021-22).It may due to more involvement of the farm families in business, service and getting foreign remittance.

Analysis showed that there is a negative significant relationship between annual family income and problem faced by the farmers. Arafat et al. (2018) and Azad et al. (2014) that income from vegetable cultivation of the vegetable growers has significant negative relationship with faced by vegetable cultivation.

4.2.11 Experience on minor crops cultivation

Computed scores of the farmers about experience ranged from 4 to 40 years with a mean of 24.58 and standard deviation of 13.49. On the basis of farming experience, the respondents were classified into three categories as follows in Table 4.2.11

Table 4.2.11 Distribution of the farmers according to their experience

Experience (Years)	Farmers		Mean	SD
	Number	Percent		
Low experience (<Mean-SD i.e<11.09)	40	39.81	24.58	13.49
Medium experience (Mean ±0.5SD i.e. 11.09 -38.07)	57	56.31		
High experience (>Mean +SD i.e. >38.07)	4	3.88		
Total	10	100		

Data contained in Table 4.2.11 showing that 56.31 percent of the farmers had medium experience in vegetable cultivation, whereas 39.81 percent had low experience in vegetable cultivation and only 3.88 percent had high experience in vegetable cultivation. Experience in vegetable cultivation is helpful to increase knowledge, improve skill and change attitude of the farmers. It also builds confidence of the farmers for making appropriate decisions at the time of need. The findings of the present study again revealed that overwhelming majority (96.12 percent) of the farmers in the study area had low to medium experience in minor crop cultivation cultivation.

It was found that there is a negative significant relationship between experience and problems faced by farmers in minor crop cultivation. It means when experience increases

problem will be decreased. Islam (2008) found the similar findings on vegetable production by women members in homestead area under world vision project.

4.2.12Training exposure

The score of training exposure of the farmers ranged from 0 to 24 days, the mean being 9.57 and standard deviation of 5.10. Based on training exposure, the farmers were classified into three categories namely "no", "low", "medium" and "high". The distributionof the farmers according to their training exposure is presented in Table 4.2.12.

Table 4.2.12 Distribution of the farmers according to their training exposure

Training Exposure (days)	Farmers		Mean	SD
	Number	Percent		
No training (0)	9	8.74	9.57	5.10
Low training (1-8)	38	37.86		
Medium training (9-16)	48	47.57		
High training (above 16)	6	5.83		
Total	103	100.00		

Data contained in Table 4.11 indicate that majority (47.57%) of the farmers had medium training exposure; while 8.74 percent of the farmers had no training exposure, 37.86 percent had low training and 5.83 of the farmers had high training exposure. It means that an overwhelming majority (85.43%) of the farmers had low to medium training exposure. It means that an overwhelming majority (85.43%) of the farmers had low to medium training exposure. Training increases knowledge and skills of the farmers in a specific area. Individuals who gain high training exposure are likely to be more competent in performing in different activities. But the fact of worry is that the vegetable farmers of the locale received low training, therefore there needs attention of the authorities of extension services (GOs and NGOs) in the country.

Analysis revealed that there is a significant negative relationship between training exposure and problems in vegetable cultivation at 1% level of probability which means when training exposure increases problems will be decreased significantly. Basher (2006) found that training exposure of the farmers had high significant negative relationship with their problem confrontation in mushroom cultivation.

4.2.13 Media exposure

Media exposure scores of the farmers ranged from 0 to 28 with an average of 10.44 and standard deviation of 2.27. On the basis of their media contact, the respondents were classified into three categories (Mean ±SD) namely, low, medium and high. The scale used for computing the media exposure score of a respondent is given Table 4.2.13.

Table :4.2.13Distribution of the farmers according to their media exposure

Media exposure (days)	Farmers		Mean	SD
	Number	Percent		
Low (<8)	21	20.36	10.44	2.27
Medium (8-16)	66	65.05		
High (>16)	14	13.59		
Total	101	100		

Data contained in the Table 4.12 indicated that the highest proportion (65.05%) of the respondents had medium media exposure as compared to (21.5%) and (13.59%) having low and high media exposure respectively. The majority (86.41%) of the respondents had low to medium extension contact.

According to correlation co-efficient value media exposure had no significant relationship between media exposure and problems . Ismail (2001) found similar result in their study of farm youth's extension contact and their agricultural problem confrontation.

4.2.14 Knowledge on minor crop cultivation technologies

The computed knowledge on minor crop cultivation technologies scores of the farmers ranged from 14 to 36 against the possible range of 0 to 40, the mean being 26.88 and standard deviation of 5.13. Based on their vegetable cultivation knowledge scores, the farmers were classified into three categories namely 'low, 'medium' and 'high' as shown in Table 4.2.14.

Table 4.2.14 Distribution of the farmers according to their minor crop cultivation knowledge

Technologies (scores)	Farmers		Mean	SD
	Number	Percent		
Low (Mean-SD i.e. <22)	20	19.42	26.88	5.13
Medium (Mean S± D i.e. 22-32)	69	67.96		
High (>Mean +SD i.e. >32)	13	12.62		
Total	101	100.00		

Data presented in the Table 4.13 indicates that majority (67.96%) of the farmers had medium vegetable cultivation knowledge as compared to 12.26 percent had high and 19.42 percent had low vegetable cultivation knowledge. This means that most of the vegetable farmers (67.96%) had low to medium minor crop cultivation knowledge. It may be due to conventional practice of farming amongst the medium to old aged farmers for years.

Analysis revealed that there is a highly significant negative relationship between knowledge and problems faced by the farmers that happened at 1% level of probability which means when the knowledge of the farmers increases problems will definitely decrease. Alam et al. (2018) found a significant negative relationship between knowledge and problems faced in bean cultivation.

CHAPTER V

COSTS AND RETURNS OF PRODUCING SAFE MINOR CROPS

5.1 Introduction

The purpose of this chapter is to determined cost, return and profitability of Pointed gourd, bitter melon, pumpkin and cucumber cultivation. In study area farmer use purchased input for Pointed gourd, bitter melon, pumpkin and cucumber cultivation, which were valued at the prevailing market price during the survey period. The output is also valued at the prevailing market price, purchased input such as seedling, fertilizer, hired labor, insecticide, pesticides. For Pointed gourd, bitter melon, pumpkin and cucumber cultivation both cost and return were estimated per hectare cost and return.

Table 5.1 Per hectare human labor cost for producing pointed gourd

Activities/ Operation	Total labor (man-day)	Average wage rate for labor (Tk/man-day)	Total cost (Tk/ha)	Percentage of total labor cost.
Land preparation	24	500	12000	21.24
Sowing	22	386	8492	15.03
Weeding	22	358	7876	13.94
Fertilizer, insecticides application	22	343	7546	13.36
Harvesting	74	278	20572	36.42
Total	164	1865	56486	100

Source: Author's estimation based on field survey, 2022

Table 5.2 Per hectare cost of material input for producing Pointed gourd

Input used.	Unit	Quantity	Average price/unit (Tk)	Total cost (Tk/ha)	Percentage of total cost
Seedling	Kg	3.432	8231.28	28249.75	30.11
Fertilizer					
Urea	Kg	344.38	14	4821.32	5.14
TSP	Kg	192.68	17	3275.56	3.49
Manure	Kg	3215	2	6430	6.86
Vermicompost	Kg	377.36	20	7547.2	8.04
Pesticide	Per/bottle	44.37	100	4437	4.73
Fence				10234	10.91
Tillage				13693.84	14.59
Irrigation				15108	16.11
Total	Tk			93796.67	100.00

Source: Author's estimation based on field survey, 2022

Table 5.3 Per hectare human labor cost for producing Bitter melon

Activities/ Operation	Total labor (man-day)	Average wage rate for labor (Tk/man-day)	Total cost (Tk/ha)	Percentage of total labor cost.
Land preparation	28	500	14000	24.58
Sowing	24	392	9408	16.91
Weeding	24	368	8592	15.08
Fertilizer, insecticides application	24	341	8832	15.51
Harvesting	52	310	16120	28.30
Total	152	1911	56952	100

Source: Author's estimation based on field survey, 2022

Table 5.4 Per hectare cost of material input for producing Bitter melon

Input used	Unit	Quantity	Average price/unit (Tk)	Total cost (Tk/ha)	Percentage of total cost
Seedling	Kg	4..55	7415	33738.25	49.40
Fertilizer					
Urea	Kg	199.36	16	3189.76	3.71
TSP	Kg	97.65	22	2148.3	2.50
Manure	Kg	3058.52	2	6117.04	7.12
Vermicompost	Kg	319	25	7975	9.34
Pesticide	Per/bottle	43.86	110	4824.6	5.66
Fence				10092.26	11.82
Tillage				8716.28	10.20
Irrigation				8814.66	10.33
Total	Tk			85616.49	100.00

Source: Author's estimation based on field survey, 2022

Table: 5.5 Per hectare human labor cost for producing pumpkin

Activities/ Operation	Total labor (man-day)	Average wage rate for labor (Tk/man-day)	Total cost (Tk/ha)	Percentage of total labor cost.
Land preparation	18	500	9000	23.98
Sowing	16	375	6000	15.99
Weeding	16	358	5728	15.26
Fertilizer, insecticides application	16	331	5296	14.11
Harvesting	65	177	11505	30.66
Total	131	1741	37529	100

Source: Author's estimation based on field survey, 2022

Table 5.6 Per hectare cost of material input for producing Pumpkin

Input used.	Unit	Quantity	Average price/unit (Tk)	Total cost (Tk/ha)	Percentage of total cost
Seedling	Kg	2.22	8331.28	18495.44	22.03
Fertilizer					
Urea	Kg	336.48	17	5720.16	6.81
TSP	Kg	192.78	16	3084.48	3.67
Manure	Kg	3016	2	6032	7.18
Vermicompost	Kg	383.37	22	8434.14	10.05
Pesticide	Per/bottle	49.38	100	4938	5.88
Fence				10234	12.19
Tillage				12793.84	15.24
Irrigation				14208	16.93
Total	Tk			83940.06	100.00

Source: Author's estimation based on field survey, 2022

Table 5.7 Per hectare human labor cost for producing cucumber

Activities/ Operation	Total labor (man-day)	Average wage rate for labor (Tk/man-day)	Total cost (Tk/ha)	Percentage of total labor cost.
Land preparation	24	500	11500	21.54
Sowing	20	385	7700	14.43
Weeding	20	357	7140	13.38
Fertilizer, insecticides application	20	341	6820	12.77
Harvesting	73	277	20221	37.88
Total	156	1860	53381	100

Source: Author's estimation based on field survey, 2022

Table 5.8 Per hectare cost of material input for producing cucumber

Input used.	Unit	Quantity	Average price/unit (Tk)	Total cost (Tk/ha)	Percentage of total cost
Seedling	Kg	2.42	8231.28	19919.69	24.16
Fertilizer					
Urea	Kg	334.38	12	4012.56	4.86
TSP	Kg	182.68	18	3288.24	3.98
Manure	Kg	3015	2	6030	7.31
Vermicompost	Kg	373.37	20	7467.4	9.06
Pesticide	Per/bottle	48.38	100	4838	5.86
Fence				10134	12.28
Tillage				12693.84	15.38
Irrigation				14108	17.11
Total	Tk			82491.73	100.00

Source: Author's estimation based on field survey, 2022

Table 5.9 Per hectare return for Pointed gourd, Bitter melon, Pumkin, Cucumber

Item	Unit	Quantity	Unit price	Total Return (main product+ by product)
Pointed gourd	Pieces	7251	25	186586
Bitter melon	Pieces	9381	23	215763
Pumpkin	Mound	332	690	229080
Cucumber	Mound	283	770	217910

Source: Author's estimation based on field survey, 2022

Table: 5.10Per hectare cost and return of Pointed gourd

Per hectare cost and return of pointed gourd		
Item	Cost (Tk)	Percentage
A. Variable cost		
Labor cost	12000	10.90
Seedling	28249.75	25.67
Fertilizer cost		
Urea	4821.32	4.38
TSP	3275.56	2.97
Manure	6430	5.84
Vermicompost	7547.2	6.86
Pesticide	4437	4.03
Fence	10234	2.29
Tillage	13693.84	12.44
Irrigation	15108	13.73
Land use cost	4250	3.86
Total variable cost	110046.67	
B. Fixed cost		
Interest on operating cost	1646	1.15
Total fixed cost	1646	
C. Total cost (A+B)	111692.67	100.00
D. Gross return	186586	
E. Gross margin (D-A)	76539.33	
F.Net return (D-C)	74893.33	
G. Benefit cost ratio (D/C)	1.67	

Source: Author's estimation based on field survey, 2022

5.3 The cost item pointed gourd cultivation were classified under the followings

Source: Author's estimation based on field survey, 2022

5.2 The cost item Pointed gourd cultivation were classified under the following's heads

5.2.1. Human labor cost (pointed gourd)

For cucumber cultivation human labor input is one of the most important input. Both hired and family labor were engaged in the pointed guard cultivation. Family labor include farmer and other member of farm family they may be male or female, for hired labor owner had pay wage in cash .it can be seen from the (Table 5.6) that, in case of pointed gourd cultivation per hectare human labor cost were Tk. 12000 which is 10.90 percent of total cost of pointed guard cultivation.

5.2.2Cost of seedling (pointed guard)

A seed is an embryonic plant enclosed in a protective outer covering. The formation of the seed is part of the process of new plants. For the pointed guard cultivation seed is one of the most important input, most of the farmer used purchased seeds. In fewer time they used in market seeds. The cost of purchased seeds were calculated on the basis of actual price paid by farmer. The cost of seed per hectare for pointed guard in the study area was Tk. 28249.75, which is 25.67 percent of total cost of pointed guard cultivation. (Table 5.6)

5.2.3: Cost of fertilizer, pesticide (pointed guard)

Application of optimum doses of fertilizer is one of the main requirement for the pointed guard cultivation. In the study area in case of pointed guard cultivation per hectare use of Urea, TSP, manure, Vermicompost and pesticides were, 4821.32 Kg, 3275.56Kg, 6030 Kg, 6430 Kg and 7547.2 Kg and their respective cost were Tk. 14, Tk. 17, Tk. 2, Tk. 20, Tk.100. It was represented, 4.38 percent, 2.97 percent, 5.84 percent, 6.86 percent, and 6.86 percent of total material input cost. (Table 5.6)

5.2.4: Cost of fence, tillage and irrigation (pointed guard)

The per hectare average cost of fence, tillage and irrigation for pointed guard cultivation was Tk10234., Tk.13693.84 and Tk.15108 which shared 2.29 percent ,12.44 and 13.73 percent of total cost of cucumber cultivation. (Table 5.6)

Table 5.11 Per hectare cost and return of Bitter melon

Per hectare cost and return of cucumber		
Item	Cost (Tk)	Percentage
A. Variable cost		
Labor cost	43381	32.28
Seedling	33738.25	25.11
Fertilizer cost		
Urea	3189.76	2.37
TSP	2189.76	1.63
Manure	6117.04	4.55
Vermicompost	7975	5.93
Pesticide	4824.6	3.59
Fence	10092.26	7.51
Tillage	8716.28	6.49
Irrigation	8814.66	6.55
Land use cost	5338	3.97
Total variable cost	134376.6	
B. Fixed cost		
Interest on operating cost	1736	1.27
Total fixed cost	1736	
C. Total cost (A+B)	136112.6	100.00
D. Gross return	215763	
E. Gross margin (D-A)	81386.4	
F.Net return (D-C)	79650.4	
G. Benefit cost ratio (D/C)	1.58	

Source: Author's estimation based on field survey, 2022

5.3 The cost item Bitter melon cultivation were classified under the followings

Source: Author's estimation based on field survey, 2022

5.4 The cost item bitter melon cultivation were classified under the followings heads

5.3.1 Human labor cost (Bitter melon)

For cucumber cultivation human labor input is one of the most important input. Both hired and family labor were engaged in the bitter melon cultivation. Family labor include farmer and other member of farm family they may be male or female, for hired labor owner had pay wage in cash .it can be seen from the (Table 5.6) that, in case of cucumber cultivation per hectare human labor cost were Tk. 43381 which is 32.28 percent of total cost of bitter melon cultivation.

5.3.2: Cost of seedling (bitter melon)

A seed is an embryonic plant enclosed in a protective outer covering. The formation of the seed is part of the process of new plants. For the bitter melon cultivation seed is one of the most important input, most of the farmer used purchased seeds. In fewer time they used in market seeds. The cost of purchased seeds were calculated on the basis of actual price paid by farmer. The cost of seed per hectare for bitter melon in the study area was Tk. 33738.25, which is 25.11 percent of total cost of bitter melon cultivation. (Table 5.6)

5.3.3: Cost of fertilizer, pesticide (bitter melon)

Application of optimum doses of fertilizer is one of the main requirements for the bitter melon cultivation. In the study area in case of bitter melon cultivation per hectare use of Urea, TSP, manure, Vermicompost and pesticides were, 3189.76 Kg, 2148.3 Kg, 6117.04 Kg, 7975 Kg and 4824.6 Kg and their respective cost were Tk. 16, Tk. 22, Tk. 2, Tk. 25, Tk.110. It was represented, 3.7 percent, 2.5 percent, 7.1 percent, 9.3 percent, and 5.6 percent of total material input cost. (Table 5.6)

5.3.4: Cost of fence, tillage and irrigation (bitter melon)

The per hectare average cost of fence, tillage and irrigation for cucumber cultivation was Tk.10092.26, Tk.8716.28 and Tk.8814.66 which shared 7.51 percent ,6.49 and 6.55 percent of total cost of cucumber cultivation. (Table 5.6)

Table 5.12 Per hectare cost and return of pumpkin

Per hectare cost and return of pumpkin		
Item	Cost (Tk)	Percentage
A. Variable cost		
Labor cost	46728	35.51
Seedling	18495.44	14.05
Fertilizer cost		
Urea	5720.16	4.34
TSP	3084.48	2.34
Manure	6032	4.58
Vermicompost	8434.14	6.41
Pesticide	4938	3.75
Fence	10234	7.78
Tillage	12793.84	9.72
Irrigation	14208	10.79
Land use cost	4020	3.05
Total variable cost	131603.58	
B. Fixed cost		
Interest on operating cost	1218	0.91
Total fixed cost	1218	
C. Total cost (A+B)	132821.58	100.00
D. Gross return	229080	
E. Gross margin (D-A)	98286.42	
F.Net return (D-C)	97068.42	
G. Benefit cost ratio (D/C)	1.72	

Source: Author's estimation based on field survey, 2022

5.5 The cost item Pumpkin cultivation were classified under the followings

Source: Author's estimation based on field survey, 2022

5.4 The cost item cucumber cultivation were classified under the followings heads

5.4.1 Human labor cost (Pumpkin)

For cucumber cultivation human labor input is one of the most important input. Both hired and family labor were engaged in the Pumpkin

cultivation. Family labor include farmer and other member of farm family they may be male or female, for hired labor owner had pay wage in cash .it can be seen from the (Table 5.6) that, in case of Pumpkin cultivation per hectare human labor cost were Tk. 46278 which is 35.51 percent of total cost of Pumpkin cultivation.

5.4.2 Cost of seedling (Pumpkin)

A seed is an embryonic plant enclosed in a protective outer covering. The formation of the seed is part of the process of new plants. For the cucumber cultivation seed is one of the most important input, most of the farmer used purchased seeds. In fewer time they used in market seeds. The cost of purchased seeds were calculated on the basis of actual price paid by farmer. The cost of seed per hectare for Pumpkin in the study area was Tk. 18495.44, which is 14.04 percent of total cost of cucumber cultivation. (Table 5.6)

5.4.2 Cost of fertilizer, pesticide (Pumpkin)

Application of optimum doses of fertilizer is one of the main requirements for the Pumpkin cultivation. In the study area in case of Pumpkin cultivation per hectare use of Urea, TSP, manure, Vermicompost and pesticides were, 5720.16 Kg, 3084.48 Kg, 6032 Kg, 8434.48 Kg and 4938 Kg and their respective cost were Tk. 17, Tk. 16, Tk. 2, Tk. 2, Tk.100. It was represented, 4.34 percent, 2.34 percent, 4.58 percent, 6.41 percent, and 3.75 percent of total material input cost. (Table 5.6)

5.4.3: Cost of fence, tillage and irrigation (Pumpkin)

The per hectare average cost of fence, tillage and irrigation for Pumpkin cultivation was Tk.10234, Tk.12793.84 and Tk.14208 which shared 7.78 percent ,9.72 and 10.79.

Table 5.13 Per hectare cost and return of cucumber

Per hectare cost and return of cucumber		
Item	Cost (Tk)	Percentage
A. Variable cost		
Labor cost	53381	37.6
Seedling	19919.69	14.06
Fertilizer cost		
Urea	4012.56	2.83
TSP	3288.24	2.32
Manure	6030	4.26
Vermicompost	7467.4	5.27
Pesticide	4838	3.43
Fence	10134	7.15
Tillage	12693.84	8.96
Irrigation	14108	9.96
Land use cost	4150	2.93
Total variable cost	140022.73	
B. Fixed cost		
Interest on operating cost	1636	1.15
Total fixed cost	1636	
C. Total cost (A+B)	141658.73	100.00
D. Gross return	217910	
E. Gross margin (D-A)	77887.73	
F.Net return (D-C)	76251.27	
G. Benefit cost ratio (D/C)	1.54	

Source: Author's estimation based on field survey, 2022

5.6 The cost item gourd cultivation were classified under the followings

Source: Author's estimation based on field survey, 2022

5.5 The cost item cucumber cultivation were classified under the followings heads

5.5.1 Human labor cost (cucumber)

For cucumber cultivation human labor input is one of the most important input. Both hired and family labor were engaged in the cucumber cultivation. Family labor include farmer and other member of farm family they may be male or female, for hired labor owner had pay wage in cash .it can be seen from the (Table 5.6) that, in case of cucumber cultivation per hectare human labor cost were Tk. 53381 which is 37.68 percent of total cost of cucumber cultivation.

5.5.2: Cost of seedling (cucumber)

A seed is an embryonic plant enclosed in a protective outer covering. The formation of the seed is part of the process of new plants. For the cucumber cultivation seed is one of the most important input, most of the farmer used purchased seeds. In fewer time they used in market seeds. The cost of purchased seeds were calculated on the basis of actual price paid by farmer. The cost of seed per hectare for cucumber in the study area was Tk. 19919.69, which is 14.06 percent of total cost of cucumber cultivation. (Table 5.6)

5.5.3: Cost of fertilizer, pesticide (cucumber)

Application of optimum doses of fertilizer is one of the main requirement for the cucumber cultivation. In the study area in case of cucumber cultivation per hectare use of Urea, TSP, manure, Vermicompost and pesticides were, 4012.56 Kg, 3288.24 Kg, 6030 Kg, 7467.4 Kg and 4838 Kg and their respective cost were Tk. 12, Tk. 18, Tk. 2, Tk. 20, Tk.100. It was represented, 2.83 percent, 2.32 percent, 4.26 percent, 5.27 percent, and 3.43 percent of total material input cost. (Table 5.6)

5.5.4: Cost of fence, tillage and irrigation (cucumber)

The per hectare average cost of fence, tillage and irrigation for cucumber cultivation was Tk.10134, Tk.12693.84 and Tk.14108 which shared 7.15 percent ,8.96 and 9.96 percent of total cost of cucumber cultivation. (Table 5.6)

5.6Land use cost

For Pointed gourd cultivation per hectare per year average land use cost was calculated at TK.4250 and this comprises 3.86 percent of total cost of cucumber cultivation. Table (5.6)

For bitter melon cultivation per hectare per year average land use cost was calculated at TK. 5338 and this comprises 9.97 percent of total cost of bitter melon cultivation. Table (5.6)

For pumpkin cultivation per hectare per year average land use cost was calculated at TK. 4020 and this comprises 0.91 percent of total cost of pumpkin cultivation. Table (5.6)

For cucumber cultivation per hectare per year average land use cost was calculated at TK. 4150 and this comprises 2.93 percent of total cost of gourd cultivation. (Table 5.7)

5.7Interest on operating capital

Interest on operating capital was calculated by taking into account the cost incurred on all field operations but excluding those items for which interest had already calculated. For pointed gourd cultivation interest on operating capital represented Tk. 1636 and which shared 1.15 percent of total cost of pointed gourd cultivation. (Table 5.6)

Interest on operating capital was calculated by taking into account the cost incurred on all field operations but excluding those items for which interest had already calculated. For bitter melon cultivation interest on operating capital represented Tk.1736 and which shared 1.27 percent of total cost of bitter melon cultivation. (Table 5.7)

Interest on operating capital was calculated by taking into account the cost incurred on all field operations but excluding those items for which interest had already calculated. For bitter pumpkin cultivation interest on operating capital represented Tk.1218 and which shared 0.91 percent of total cost of bitter melon cultivation. (Table 5.7)

Interest on operating capital was calculated by taking into account the cost incurred on all field operations but excluding those items for which interest had already calculated. For cucumber cultivation interest on operating capital represented Tk1636 and which shared 1.15percent of total cost of cucumber cultivation. (Table 5.7)

5.8Total cost

Total cost was calculated by adding up all cost use in production process. Per hectare cost of pointed gourd cultivation were Tk. 111692.67 (Table 5.6). Per hectare cost of bitter melon cultivation were Tk. 136112.6. (Table 5.7). Per hectare cost of pumpkin cultivation were Tk. 132821.58. (Table 5.7). Per hectare cost of cucumber cultivation were Tk. 141658.73. (Table 5.7).

5.9 Gross return

Gross return per hectare was estimated by multiplying the total amount of product and by products with their respective market price in term of monetary unit, the respective gross return per hectare pointed gourd cultivation was Tk. 186586 (Table 5.6), gross return for bitter melon cultivation per hectare per year was Tk. 215763 (Table 5.7). gross return for pumpkin cultivation per hectare per year was Tk. 229080 (Table 5.7). gross return for cucumber cultivation per hectare per year was Tk. 217910(Table 5.7) It is clear that for pumpkin cultivation gross return is higher than that of pointed gourd, bitter melon and cucumber cultivation.

5.10 Gross margin

Producer generally wants to gain maximum return over variable cost of production. (Gross margin calculation was done by excluding the value of total variable cost from gross return or difference between gross return and total variable cost). The gross margin of pointed gourd cultivation was estimated at Tk. 76539.33 (Table 5.6). bitter melon cultivation gross margin was estimated Tk. 81386.4. (Table 5.7), pumpkin cultivation gross margin was estimated Tk. 98286.42. (Table 5.7), In case of cucumber cultivation gross margin was estimated Tk. 77887.73. (Table 5.7).

5.11 Net return

Per hectare net return was calculated by deducting Total cost from gross return. Net return from per hectare pointed gourd cultivation was Tk. 74893.33. (Table 5.6) bitter melon cultivation per hectare net return was Tk. 79650.4. (Table 5.7) Net return from per hectare pointed pumpkin cultivation was Tk. 97068.42. (Table 5.6) Net return from per hectare

pointed cucumber cultivation was Tk. 76251.27. so per hectare profitability of pumpkin cultivation was higher than that of pointed gourd, bitter melon and cucumber cultivation.

5.12 Benefit cost ratio

The BCR is estimated as a ratio of gross return and Total cost. The formula of calculating gross return BCR is shown below:

BCR= Gross return / Total cost.

The (Table 5.6) and (Table5.7) Show that BCR of pointed gourd, bitter melon, pumpkin and cucumber production were 1.67,1.58,1.72 and 1.54 respectively which implies that Tk. 1.67, Tk 1.58, Tk1.72 and Tk.1.54 would be earned by investing every Tk.1 in Pointes gourd, bitter melon, pumpkin and cucumber cultivation. It should be noted that the BCR of pumpkin cultivation is much greater than that of pointed gourd, bitter melon, pumpkin, and cucumber cultivation. It indicated that the production of pumpkin was more profitable than other cultivation.

5.13: Concluding remarks

It is clear from the above activity budget that major costs were incurred for human labor. Gross margin and net return of pumpkin was higher than those of producing pointed gourd, bitter melon cucumber. Benefit cost ratio was higher in pumpkin than those of pointed gourd, bitter melon cucumber. Finally, it can be seen that pumpkin production was most profitable among pointed gourd, bitter melon cucumber cultivation. In the study areas, pumpkin famers, management practices were found efficient enough than those of gourd farmers. pumpkin farmers used various inputs in right time with right doses. On the other hand, pointed gourd, bitter melon cucumber farmers did not follow scientific culture and management which caused lower production and relatively lower profit.

CHAPTER VI

FACTORS AFFECTING THE PRODUCTIVITY OF SELECTED SAFE MINOR CROPS

6.1 Introduction

An attempt has been made to a functional analysis of minor crops production in this chapter. Efforts have been made, which can provide a compromise between (a) adequate fit of the data, (b) computational feasibility and (c) sufficient degrees of freedom unused to allow for statistical testing with the help of samples. Considering the importance and potentiality of the inputs involved in minor crops production which were discussed earlier inputs like human labor, animal labor, seed, manure, fertilizer and other cost etc. were considered as explanatory variables. For the purpose Cobb- Douglas production function model has been chosen to determine the effects of selected variables on cucumber and gourd production. When the Cobb- Douglas production function takes the form of multiple linear regression of ordinary least squares (OLS) in logarithm, the regression coefficients represent production elasticity and if all the inputs related to the production are taken into account as the independent variables, the sum of the production elasticity indicates whether the production process as a whole yields increasing constant or decreasing returns to scale.

Functional analysis was designed to study the contribution of resources employed in the production of these enterprises. To accomplish that goal a production function analysis was carried out to explore the productivity of the individual inputs. The data were arranged on per farm per hectare basis. Then suitable variables were included to run the regression model.

To determine the effect of the variable inputs, Cobb-Douglas forms of production function were initially estimated for minor crops. Seven variables were hypothesized to explain the production of selected winter minor crops.

Regression analysis was used to determine the effect of these inputs. The general model was specified comprehensively in such way that it can specify adequately the production process of the minor crops.

6.2 Results and discussion

Estimated values of the co-efficient and related statistics of the Cobb-Douglas production functions of all minor crops are presented in (Table 6.1). Major characteristics of the models are noted below:

i. Goodness of fit for different types of minor crops was measured by F-values.

ii. Total variation of the total output were measured by co-efficient of multiple determination R^2.

iii. For testing the significance level of individual co-efficient which has sufficient degrees of freedom 1 percent, 5 percent and 10 percent probabilities were used.

iv. Stages of production were measured by returns to scale which were the summation of all the co-efficient of various inputs of individual minor crops.

Table :6.1 Coefficient of Cobb-Douglas production function of pointed gourd and Bitter melon

Explanatory variables	Pointed gourd			Bitter melon		
	Coefficient	Standard error	P-value	Coefficient	Standard error	P-value
Intercept	2.53	0.54	0.00	6.05	0.60	0.00
Seedling	0.14**	0.06	0.01	0.40***	0.12	0.00
Human labor	0.53***	0.09	0.00	0.14	0.20	0.92
Fertilizer	0.18	0.12	0.15	0.27	0.42	0.15
Vermicompost	0.00	0.05	0.95	0.16	0.28	0.63
Pesticide	0.27	0.15	0.08	0.67***	0.15	0.00
Tillage	0.10	0.30	0.74	0.59**	0.20	0.04
Irrigation	0.08	0.25	0.75	0.03	0.18	0.75
R^2	0.73			0.79		
Adjusted R^2	0.72			0.79		
Standard Error	0.15			0.30		
F-value	94.30			649.57		

Source: Author's calculation based on field survey, 2022

6.2 Coefficient of Cobb-Douglas production function of pumpkin and cucumber

Explanatory variables	**Pumpkin**			**Cucumber**		
	Coefficient	Standard error	P-value	Coefficient	Standard error	P-value
Intercept	1.26	0.27	0.00	4.04	0.40	0.00
Seedling	0.07**	0.03	0.01	0.20***	0.06	0.00
Human labor	0.27***	0.04	0.00	0.07	0.10	0.07
Fertilizer	0.09	0.07	0.08	0.09	0.14	0.53
Vermicompost	0.00	0.02	0.95	0.08	0.05	0.12
Pesticide	0.13	0.08	0.04	0.57***	0.12	0.00
Tillage	0.05	0.15	0.37	0.39**	0.16	0.02
Irrigation	0.04	0.12	0.37	0.01	0.16	0.95
R^2	0.83			0.76		
Adjusted R^2	0.81			0.75		
Standard Error	0.49			0.09		
F-value	44.76			266.66		

Source: Author's calculation based on field survey, 2022

iii. For testing the significance level of individual co-efficient which has sufficient degrees of freedom 1 percent, 5 percent and 10 percent probabilities were used.

iv. Stages of production were measured by returns to scale which were the summation of all the co-efficient of various inputs of individual minor crops.

Note: ***Significant at 1 percent level of significance.

**Significant at 5 percent level of significance.

*Significant at 10 percent level of significance.

6.3 Interpretation of result pointed gourd

Seedling cost (X1)

It can be seen from (Table 6.1) that regression coefficient of seedling cost was 0.01 with a positive sign. This indicates that an increase in one percent of seed cost, remaining other factors constant, would result in a increase in the gross return by 0.01 percent. The coefficient was significant at one percent probability level. Because in the use of high quality seed the production is increase. In gourd, good yields largely depend on good seeds. So manage the good quality seed to improve the production of the gourd minor crops.

Human labor cost (X2)

It can be seen from (Table 6.1) that regression coefficient of seedling cost was 0.00 with a positive sign. This indicates that an increase in one percent of seed cost, remaining other factors constant, would result in a increase in the gross return by 0.00 percent. The coefficient was significant at one percent probability level. Labor is easily available in our country. As a result we can easily use labor for productive work. In the improve of gourd production the use of labor is essential.

Fertilizer cost (X3)

The magnitude of the regression coefficient of fertilizer cost was 0.15. This indicates that an increase in one percent of fertilizer cost, remaining other factors constant, would

increase the gross return by 0.15 percent. This coefficient was, however, not significant at desired level of confidence.

Vermicompost cost (X4)

The regression coefficient of vermicompost cost was 0.95 with a positive sign (Table 6.1). It implies that one percent increase of vermicompost cost, keeping other factors constant, would lead to an increase in the gross return by 0.95 percent. This coefficient was, however, not significant at desired level of confidence.

Pesticide cost (X5)

The regression coefficient of pesticide cost was 0.08 with a positive sign (Table 6.1). It implies that one percent increase of pesticide cost, keeping other factors constant, would lead to an increase in the gross return by 0.08 percent. This coefficient was, however, not significant at desired level of confidence.

Tillage cost (X6)

The regression coefficient of tillage cost was 0.74 with a positive sign (Table 6.1). It implies that one percent increase of tillage cost, keeping other factors constant, would lead to an increase in the gross return by 0.74 percent. This coefficient was, however, not significant at desired level of confidence.

Irrigation cost (X7)

The regression coefficient of irrigation cost was 0.75 with a positive sign (Table 6.1). It implies that one percent increase of irrigation cost, keeping other factors constant, would lead to an increase in the gross return by 0.75 percent. This coefficient was, however, not significant at desired level of confidence.

6.4 Interpretation of result bitter melon

Seedling cost (X1)

It can be seen from (Table 6.1) that regression coefficient of seed cost was 0.00 with a positive sign. This indicates that an increase in one percent of seed cost, remaining other factors constant, would result in a increase in the gross return by 0.00 percent. The coefficient was significant at one percent probability level. Because in the use of high quality seed the production is increase. In cucumber, good yields largely depend on good seeds.

Human labor cost (X2)

It can be seen from (Table 6.1) that regression coefficient of human labor cost was 0.92with a positive sign. It implies that one percent increase of human labor, keeping other factors constant, would result in an increase of gross return by 0.92 percent (Table 6.1). This coefficient was, however, not significant at desired level of confidence.

Fertilizer cost (X3)

The magnitude of the regression coefficient of fertilizer cost was 0.15. This indicates that an increase in one percent of fertilizer cost, remaining other factors constant, would increase the gross return by 0.15 percent. This coefficient was, however, not significant at desired level of confidence.

Vermicompost cost (X4)

The regression coefficient of vermicompost cost was 0.63 with a positive sign (Table 6.1). It implies that one percent increase of vermicompost cost, keeping other factors constant, would lead to an increase in the gross return by 0.63 percent. This coefficient was, however, not significant at desired level of confidence.

Pesticide cost (X5)

It can be seen from (Table 6.1) that the regression coefficient of pesticide cost was 0.00 with a positive sign. It implies that one percent increase of pesticide cost, keeping other

factors constant, would lead to a decrease in the gross return by 0.2766 percent. The coefficient was significant at one percent probability level. Because in the proper use of right dose of pesticides to increase the production of cucumber. Timely use of pesticides reduces insect infestation which results in better yields.

Tillage cost (X6)

The magnitude of the regression coefficient of tillage cost was 0.04 with a positive sign. This indicates that an increase in one percent of tillage cost, remaining other factors constant, would lead to a increase in the gross return by 0.04 percent. The coefficient was significant at five percent probability level. Because in the proper of tillage to increase the production of the cucumber. In the cucumber production the timely tillage improve the soil productivity which increase the yields of the cucumber. Every year there is drought and flood in our country which requires regular cultivation of land which increase our production.

Irrigation cost (X7)

The coefficient of insecticides cost was 0.75 with a positive sign. This indicates that an increase in one percent of insecticides cost, remaining other factors Constant, would result an increase in the gross return by 0.75 percent. This coefficient was, however, not 6.4

Interpretation of result pumpkin

Seedling cost (X1)

It can be seen from (Table 6.2) that regression coefficient of seedling cost was 0.00 with a positive sign. This indicates that an increase in one percent of seed cost, remaining other factors constant, would result in a increase in the gross return by 0.00 percent. The coefficient was significant at one percent probability level. Because in the use of high quality seed the production is increase .In pumpkin, good yields largely depend on good seeds. So manage the good quality seed to improve the production of the pumpkin minor crops.

Human labor cost (X2)

It can be seen from (Table 6.2) that regression coefficient of seedling cost was 0.00 with a positive sign. This indicates that an increase in one percent of seed cost, remaining other factors constant, would result in a increase in the gross return by 0.00 percent. The coefficient was significant at one percent probability level. Labor is easily available in our country. As a result, we can easily use labor for productive work. In the improve of gourd production the use of labor is essential.

Fertilizer cost (X3)

The magnitude of the regression coefficient of fertilizer cost was 0.08. This indicates that an increase in one percent of fertilizer cost, remaining other factors constant, would increase the gross return by 0.08 percent. This coefficient was, however, not significant at desired level of confidence.

Vermicompost cost (X4)

The regression coefficient of vermicompost cost was 0.95 with a positive sign (Table 6.2). It implies that one percent increase of vermicompost cost, keeping other factors constant, would lead to an increase in the gross return by 0.95 percent. This coefficient was, however, not significant at desired level of confidence.

Pesticide cost (X5)

The regression coefficient of pesticide cost was 0.04 with a positive sign (Table 6.2). It implies that one percent increase of pesticide cost, keeping other factors constant, would lead to an increase in the gross return by 0.04 percent. This coefficient was, however, not significant at desired level of confidence.

Tillage cost (X6)

The regression coefficient of tillage cost was 0.32 with a positive sign (Table 6.2). It implies that one percent increase of tillage cost, keeping other factors constant, would lead to an increase in the gross return by 0.32 percent. This coefficient was, however, not significant at desired level of confidence.

Irrigation cost (X7)

The regression coefficient of irrigation cost was 0.38 with a positive sign (Table 6.1). It implies that one percent increase of irrigation cost, keeping other factors constant, would lead to an increase in the gross return by 0.38 percent. This coefficient was, however, not significant at desired level of confidence.

6.5 Interpretation of result cucumber

Seedling cost (X1)

It can be seen from (Table 6.1) that regression coefficient of seed cost was 0.00 with a positive sign. This indicates that an increase in one percent of seed cost, remaining other factors constant, would result in a increase in the gross return by 0.00 percent. The coefficient was significant at one percent probability level. Because in the use of high quality seed the production is increase. In cucumber, good yields largely depend on good seeds.

Human labor cost (X2)

It can be seen from (Table 6.1) that regression coefficient of human labor cost was 0.46 with a positive sign. It implies that one percent increase of human labor, keeping other factors constant, would result in an increase of gross return by 0.46 percent (Table 6.3). This coefficient was, however, not significant at desired level of confidence.

Fertilizer cost (X3)

The magnitude of the regression coefficient of fertilizer cost was 0.53. This indicates that an increase in one percent of fertilizer cost, remaining other factors constant, would increase the gross return by 0.53 percent. This coefficient was, however, not significant at desired level of confidence.

Vermicompost cost (X4)

The regression coefficient of vermicompost cost was 0.12 with a positive sign (Table 6.1). It implies that one percent increase of vermicompost cost, keeping other factors constant,

would lead to an increase in the gross return by 0.12 percent. This coefficient was, however, not significant at desired level of confidence.

Pesticide cost (X5)

It can be seen from (Table 6.1) that the regression coefficient of pesticide cost was 0.00 with a positive sign. It implies that one percent increase of pesticide cost, keeping other factors constant, would lead to a decrease in the gross return by 0.2766 percent .The coefficient was significant at one percent probability level. Because in the proper use of right dose of pesticides to increase the production of cucumber. Timely use of pesticides reduces insect infestation which results in better yields.

Tillage cost (X6)

The magnitude of the regression coefficient of tillage cost was 0.02 with a positive sign. This indicates that an increase in one percent of tillage cost, remaining other factors constant, would lead to a increase in the gross return by 0.02 percent. The coefficient was significant at five percent probability level. Because in the proper of tillage to increase the production of the cucumber. In the cucumber production the timely tillage improve the soil productivity which increase the yields of the cucumber. Every year there is drought and flood in our country which requires regular cultivation of land which increase our production.

Irrigation cost (X7)

The coefficient of insecticides cost was 0.95 with a positive sign. This indicates that an increase in one percent of insecticides cost, remaining other factors Constant, would result an increase in the gross return by 0.95 percent. This coefficient was, however, not significant.

6.7 Value of R^2

For pointed gourd cultivation the coefficient of multiple determination, R^2 was 0.73 which indicate that that 73% of return from gourd cultivation was explain by explanatory variable,

which were include in the model and it also indicated that the exclude variable accounted 27% of the variation in pointed gourd cultivation. (Table 6.1)

The coefficient of multiple determination, R^2 was 0.79 which indicate that that 79% of return from bitter melon cultivation was explain by explanatory variable, which were include in the model and it also indicated that the exclude variable accounted 21% of the variation in cucumber cultivation. (Table 6.1)

For pointed pumpkin cultivation the coefficient of multiple determination, R^2 was 0.83 which indicate that that 83% of return from gourd cultivation was explain by explanatory variable, which were include in the model and it also indicated that the exclude variable accounted 17% of the variation in pumpkin cultivation. (Table 6.1)

The coefficient of multiple determination, R^2 was 0.76 which indicate that that 76% of return from cucumber cultivation was explain by explanatory variable, which were include in the model and it also indicated that the exclude variable accounted 24% of the variation in cucumber cultivation. (Table 6.1)

6.8 F-value

In case of pointed gourd cultivation the F-value of the equation is 94.30 which was significant implying that all the included explanatory variable were important for explaining the variation of gourd cultivation. Therefore, the inclusion of independent variable was reasonable.

The measure of the overall fit of the estimated regression, F-value of the equation derived 649.57. Which were significant, implying that the variables explained the variation in returns of bitter melon cultivation.

pumpkin cultivation the F-value of the equation is 44.7 which was significant implying that all the included explanatory variable were important for explaining the variation of pumpkin cultivation. Therefore, the inclusion of independent variable was reasonable

The coefficient of multiple determination, R^2 was 0.97 which indicate that that 97% of return from cucumber cultivation was explain by explanatory variable, which were include

in the model and it also indicated that the exclude variable accounted 3% of the variation in cucumber cultivation. (Table 6.1)

6.8 Concluding remarks

Cobb-Douglas production function model revealed that the key variables included in the model were individually or jointly responsible for variation in gross return or output of cucumber and gourd. It also revealed that all farmers allocated their resources in the zone of increasing returns (i.e., in Stage - II), which indicates that they were operating their farming in the rational zone of production.

Chapter VII

PROBLEMS AND CONSTRAINTS OF THE MINOR CROPS FARMERS

7.1 Introduction

In this chapter, an attempt has been made to identity the major problems confronted by the winter safe minor crops. It may be noted here that the problems of safe minor crops production and marketing were identified based on opinion of the famers. It has been shown that farmers in Bangladesh seldom get the required quantity of seeds, quality seeds, fertilizers, pesticides, technical support and finally the optimum price of their production. They are economically not very capable of investing the required amount for producing crops because of shortage of financial capital. Farmers generally complain of getting insufficient support from governmental agencies. It is also complained that farmers do not get required technical and financial support from the government. The present study was undertaken to identify the major problems faced by the farmers who were involved in winter minor crops production, especially who produces cucumber and gourd. For the sake of analytical convenience, the of problems and constraints were classified into three general groups.

1. Production Problems,
2. Marketing Problems; and
3. Social and natural problems;

7.2 Production problems faced by the farmers

Farmers faced various problems in producing minor crops. Some of the major problems and constraints, which the farmers emphasized upon, are discussed below:

7.2.1 Lack of capital

About 63 percent farmers in the study areas reported that they suffered due to lack of capital (Table 7.1). They cannot produce minor crops in the large scale due to lack of capital. So they produced minor crops only in limited quantities.

Table 7.1 Problems and constraints reported by the minor crops farmers

Nature of problems	Distribution of farmers reported				
	Pointed gourd	Bitter melon	Pumpkin	Cucumber	Average remarks
A. Production Problem					
i. Lack of capital	68	66	52	64	63
Ii. Lack of scientific knowledge and technology	45	49	32	47	43
iii. Inadequate supply of good quality seed	73	76	48	72	67
iv. Insufficient irrigation	28	29	24	27	27
v. Lack of human labor availability	35	32	20	28	29
vi. High prices of fertilizer	36	38	22	32	32
vii. Unavailability and high price of insecticides	46	50	31	54	45
B. Social and natural problems					
i. Attack by pest and disease	42	47	21	45	39
ii. Loss of production due to theft	18	20	14	30	21
iii. Minor crops damage by domestic animal	16	14	12	18	15
C. Marketing problems					
i. Low market price of product at harvesting period	46	58	42	50	49

ii. Lack of adequate transportation facilities	14	17	12	15	12
iii. Credit sale	22	24	12	18	19
iv. Lack of marketing facilities	32	36	28	40	34
v. Lack of marketing information	23	24	14	20	30
vi. Dominance of intermediaries	32	30	16	28	29

Source: Author's calculation based on field survey, 2022

7.2.2 Lack of scientific knowledge and technology

Low productivity of pointed gourd. Bitter melon, pumpkin and cucumber is a serious problem. In the study areas most famers are illiterate. About 43percent of the selected minor crops famers reported that the productivity of minor crops was low due to lack of scientific knowledge about cultural practices.

7.2.3 Inadequate supply of good quality seeds

Inadequate supply of good quality seed was one of the major problems. Farmers usually used home supplied seed due to lack of good quality seed about 67 percent of farmers in the study areas reported that in the open market the supply of good quality seed was not available. Sometimes, vegetable seeds of inferior quality were sold in the market. Nobody is there to cheek the quality of imported seeds and seed packets. For this, farmers often get disappointed with low level of germination of seeds.

7.2.4 Insufficient irrigation

Irrigation water was an important input for producing the minor crops. In the study area about 27 percent farmers had faced this problem. The selected farmers reported that lack of irrigation facilities was a major constraint to winter safe minor crops production.

7.2.5 Lack of human labor availability

Minor crops productions are labor intensive. Non-availability of human labor was one of the major problems faced by the farmers. If was observed from (Table 7.1) that about 29 percent of the sample farmers faced acute shortage of human labor during minor crops production.

7.2.6 High prices of fertilizers

In the study areas, about 32 percent farmers complained that higher prices of fertilizers were one of the crucial problems. They did not get fertilizer in time and with the government approved price.

7.2.7 Unavailability and high price of insecticides

Unavailability and high price of insecticide was one of major problem. About 45 percent farmers reported that they did not get insecticides and pesticides in time and that they had to spend more to collect the recommended insecticides and pesticides. Adulterated insecticides are also sold in the markets.

7.3 Social and natural problems faced by the farmers

It was found that farmers were facing some social and natural problems in producing minor crops. These are discussed below:

7.3.1 Attack by pest and disease

About 39 percent farmers producing selected minor crops mentioned that considerable amount of yield of minor crops were lost by the attack of pests and diseases. In the study areas, most of the minor crop farmers faced this problem.

7.3.2 Loss of production due to theft

During the harvesting period, stealing of pointed gourd, bitter melon, pumpkin and cucumber was a common phenomenon which discouraged the farmers to grow these minor crops. In the study areas, 21 percent minor crop famers reported that their products were stolen.

7.3.3 Minor crop damage by domestic animal

About 15 percent farmers in the study area claimed that the minor crops were damaged by free grazing of neighbor's livestock, by the children and storm. Therefore, it was difficult to establish minor crops and raising seedlings in homestead without fencing.

7.4 Marketing problems faced by the farmers

The farmers faced the following problems during the marketing of minor crops.

7.4.1 Low market price of product at harvesting period

It was observed that the prices of selected minor crops in the harvesting period were very low. About 49 percent selected farmers reported that the price of minor crops were low during the harvesting period. Many farmers were compelled to make distress sale in order to meet the urgent needs of cash for their day-to-day's household expenditures that led to increase the supply of their products in the village market at harvesting period and thereby lowering the selling price per unit. Thus the production of the selected minor crops became a less profitable venture.

7.4.2 Lack of adequate transportation facilities

Due to transportation problem the farmers used to sell their product to Paiker' at the local markets and a few farmers sold their products at home in the study area most of the selected minor crops farmer treated lack of transportation facilities as a problem. About 12 percent farmers in the study area reported that they could not take advantage of the higher price prevailing at distant market due to lack of transportation facilities. Adequate transport facilities at reasonable cost would improve the efficiency of vegetable marketing.

7.4.3 Credit sale

About 19 percent farmers reported that they suffered for credit sale to the suppliers sometimes the suppliers did not pay their money. Due to credit sale many farmers were discouraged in the cultivation of minor crops.

7.4.4 Lack of marketing facilities

There is no shed to protect the farmer's minor crops from rain or sun and the farmers had to sell their produce standing in the open place. So, lack of market facilities such as pucca floor, tin shed, drainage, water supply was mentioned as problems by minor crop farmers. About 30 percent farmers in the study area claimed that they would earn more profit they had adequate marketing facilities.

7.4.5 Lack of market information

In the study areas, 30 percent farmers did not get the market information properly. As a result, they did not get fair price of their produce as compared to terminal market.

7.4.6 Dominance of intermediaries

About 29 percent farmers in the study area claimed that due to dominance of intermediaries in the local markets the farmers were compelled to sell their minor crops at a lower price. In the local markets, intermediaries were small in number but organized. Moreover, the farmers were scattered and large in number. So intermediaries always dominated the marketing system and they were in better position in determining price than the farmers. This was more because minor crops are highly perishable commodities.

7.5 Measures suggested by farmers

7.5.1 Improvement of transport facilities

Transport facilities should be improved in the study area. On the basis of priority village roads should be developed at least brick bedded road should be made and maintain, so that the rickshaw or other motor vehicles could move easily. It would also help reducing the transportation cost. Local government administration might develop such facilities.

7.5.2 Arrangement of storage facilities

Low cost storage facilities might have developed at the primary and secondary markets by the local government authority to provide storage facilities to the farmers.

7.5.3 Development of market facilities

Market facilities such as pucca floor, tin-shed, drainage and water supply etc. should be arranged by the appropriate government authority.

7.5.4 Establishment of organization

Farmers organization should be established which might improve the bargaining power of the farmers, enabling them to face the intermediaries and ensuring better return for their produce.

7.6 Concluding remarks

The above mentioned discussions as well as the results presented in (Table 7.1) indicates that farmers producing pointed gourd, bitter melon, pumpkin and cucumber have currently been facing some major problems in conducting their minor crops farming These are the major constraints for the producers pointed gourd, bitter melon, pumpkin and cucumber in the study area. Public and private initiative should be taken to reduce or eliminate these problems for the sake of better production of these minor crops.

CHAPTER VIII

SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1 Introduction

This chapter highlights of the major findings and conclusions of the research. The findings of the survey, observation of the selected minor crops growers on various issues related to the minor crops production as well as the livelihood of households are presented in this chapter. Some important policy recommendations and scope for further study are also presented in this chapter

8.2 Summary

Bangladesh is an agro-based country of the third world. It is the most densely populated non industrialized country in the world. Its economy primarily depends on agriculture. As a developing country, it has been striving for rapid developing of its economy.

The economy of Bangladesh mostly depends on agriculture. Minor crops sub- sector plays as important role for development of Bangladesh. Minor crops are an herbaceous plant whose fruits, seeds, roots, tubers, leaves etc. are used as food Minor crop is important in Bangladesh for nutrition, economy and food security.

Minor crops compared to other food items provide low cost nutrition source. Production requires lesser amount of land preparation, irrigation, fertilizer, etc. Moreover, minor crops grow within a short time period and more than one crop can be grown within a production season. Minor crops are generally labor intensive crops and thus offer a considerable promise for generating increased rural employment opportunities.

Minor crops grow on alluvial as well as marginal (inferior) lands and currently infertile sandy lands by the sides of the rivers embankments are being extensively allocated to Minor crops production and these are gradually growing as commercial vegetable belt. Some other crops are also grown here but minor crops productions throughout the year dominate the crop production scenario.

As a developing country, Bangladesh is badly suffering from the problems of poverty, unemployment and malnutrition. Minor crops sub-sector can play important role to solve these problems in the shortest possible time. The importance of minor crop can be realized from two stand points such as, economic point of view and nutritional point of view. It creates a great opportunity of employment for the large number unemployed women of Bangladesh. In respect of nutrition, vegetable is an excellent source of minerals and vitamins as it contains the most essential carotene, B1, B2, C, calcium and iron which are the most nutritious components of human diet.

Due to Imitation of time and resources, a small area with uniform tropological and ecological characteristics was considered. Keeping in mind the main objective, keeping in views the objectives, Four major concentrate Union and One pourosova such as Nepaltoli, Shekherkola, Pollimongol, Lahiri para and 14 number word,Sakharia will be consider of Bogura districts were purposively selected for data collection. In all 101 samples were randomly selected. Data were collected by comprehensive interview schedules. Simple statistical techniques as well us Cobb-Douglas production function were used to process and analyze the data to achieve the objectives of the study.

The specific objectives to the study were as follows:

- To identify the socioeconomic characteristics of minor crops.
- To estimate cost, return and profitability of minor crops cultivation.
- To determine the factors affecting the economic returns of minor crops cultivation.
- To identify the problem and constrain facing by minor crops farmers;

8.3 key finding of the study

8.3.1 Socio economic characteristics of minor crops farmers

As regards socioeconomic characteristic of sample farmers, the finding of the study revealed that major proportion of the farmer were active age group 35-45years (30.7%). 92% was the higher proportion distribution of the farmer according their sex. 40.6% farmers was illiterate (0-0.05) .49.5% farmers belong medium family that was up to 5 to 6.75.2% farmers annual income was small (10000-30000).Minor crop cultivation land was 80.2% that belongs to small farmer(0.21-1.0ha). Medium annual income of minor crop

production that was 75.73%.88% farmers occupation was agriculture.43.6% farmers had their own land. Family size of the farmer was medium (65.05%).56.3% farmers had medim experience. Media exposure pf the farmer 65.05% (8-16 scores).

8.3.2 Profitability analysis of cucumber and gourd cultivation

The cost item were identified as seedling, fertilizer, hired labor, insecticide, pesticide. Water supply, electricity cost and interest on operating cost etc. Pumpkin cultivation found more profitable than pointed gourd, bitter melon, and cucumber cultivation in the study area. The net return of pointed gourd, bitter melon, pumpkin and cucumber cultivation was estimated Tk. 74893.33, Tk 79650.4, Tk 97068.42 and TK. 76251.27 respectively. The benefit cost ratio (BCR) of pointed gourd, bitter melon, pumpkin and cucumber cultivation was 1.67, 1.58,1.72 and 1.54 respectively.

8.3.3Factor that influence cucumber cultivation

Cobb-Douglas production function analysis was used to determine the effect. Multicollinearity was checked with the variance inflation factor (VIF). Some important (seven independent variables) was employed to explain the gross return for cucumber cultivation. Four included variables were significant at 1% and 10% level.

the coefficient of multiple determination, R^2 was 0.99 which indicate that that 99% of return from bitter melon was explain by explanatory variable, which were include in the model and it also indicated that the exclude variable accounted 1% of the variation in bitter melon cultivation.

The F-value of the equation is 649.57 which was highly significant implying that all the included explanatory variable were important for explaining the variation of bitter melon cultivation.

8.4 Conclusions

From the results of the present study, it can be concluded that considerable scope apparently exists in the study areas to increase the productivity. In the study areas selected minor crop cultivation. The socioeconomic conditions of pointed gourd, bitter melon, pumpkin and cucumber farmers are almost observed in the study areas. However, the indicated that the pumpkin farmers followed scientific culture and management than those of pointed gourd, bitter melon, and cucumber farmers.

From the cost and returns analysis, the study shows that the major costs were incurred for human labor. All the selected safe minor crops were found to be profitable but pumpkin was relatively more profitable vegetable than those of others. Per hectare yield and gross returns of pumpkin were higher than those of others. Moreover, gross margin as well as net return of pumpkin was higher than those of others. The BCR in every stage suggest that the production of pointed gourd, bitter melon, pumpkin and cucumber were profitable in the study areas. If modern inputs and production technology could be made available to all farmers in time, production of minor crops might be increased, which could help the famers to increase their farm income and improve the livelihood.

From the results of the present study, it could be concluded that there is a considerable scope apparently exists in the study areas to increase the productivity of pointed gourd, bitter melon, pumpkin and cucumber to increase income, to increase income employment and nutritional status of the farmers.

Thus, well planned management training in accordance with their problems, needs, goals and resource base can lead to viable production practices and sustainable income from pointed gourd, bitter melon, pumpkin and cucumber cultivation in commercial scale production.

It is evident from the study that minor crops production is a profitable business. The problems related to it were solved and modern technology and other facilities can be made available to farmers in time, minor crop production can help in generating income and employment and alleviating poverty in rural areas. Expansion of vegetable production could overcome the problems of low income and unemployment of the rural people in

terms of profitability, income and employment generation. Thus, minor crops production can prove to be a potential tool for poverty alleviation and achieving food security.

8.5 Policy recommendations

The present study reveals that minor crops production are profitable. There are some opportunities to increase the productivity to pointed gourd, bitter melon, pumpkin and cucumber due to their highly nutritious value and demand in the country. Minor crops are profitable enterprises and they can generate income earnings and employment opportunity to the rural people of Bangladesh. But some problems and constraints bared to attain the above mentioned objectives. In order to a positive change the Productivity of the minor crops, the following recommendations are made on the basis of the findings of the present study:

• Policy makers and extension worker should take all possible steps to encourage farmers to introduce minor crops production where minor crop production is profitable.

• Availability of appropriate quantity of irrigation water in time of need and its management is the main factor behind the growth of agriculture. So, adequate measure should be taken to improve irrigation water management.

• To ensure quality seed availability, seed producing or importing farms should increase the productivity. The research institutes can also take steps to develop high yielding varieties.

• Farmers organization should be established which might improve the bargaining power of the farmers, enabling them to face the intermediaries and ensuring better return for their produce.

•Establishment of cold storage and food processing industries at the minor crops growing area can be helpful to the farmer to preserve and process vegetable during peak period.

• Training on post-harvest management should be ensured and establishment of cold storage for storing selected minor crops is a foremost need. Government and different NGOs must pay an attention to solve these problems.

• Government should provide all possible help to supply required inputs and other necessary support to the farmers to produce more minor crops rather than cereal crops.

8.6 Limitations of the study

The present study suffers from a number of limitations. The limitations of the study are as follows:

• For collecting data, the researcher had to depend on the memory of the farmers for collecting necessary information because many of them did not keep any written record or kept record partially.

• Inadequate fund and time availability for the study was an important limitation. Due to shortage of fund and time the study could not cover wide areas for collection of necessary information from the vegetable farmers.

• The study was conducted in three thanas like Bogura sadar, Gabtoli, Sariakandi in bogura district which might not represent other regions of the district. Moreover, the size was small, i.e., only 101 farmers were selected for the purpose of the study

Despite a few limitations, the findings of the present study may provide some valuable information for the farmers, extension workers and researchers.

8.7 Scope of further research

Although the present study provides some useful information for researchers, policy makers as well as farmers, it is not free from criticisms. The weaknesses of the present study, of course, open up scopes for further research which are outlined below:

* It could be mentioned here that the future researchers could take up a broad-based study with large samples covering different minor crops growing areas of Bangladesh;

* A further study can be undertaken by taking into account technical efficiency, arrangements, contract farming, marketing channel and export potentiality, impact on women income generation and employment opportunities and the role of credit on selected

minor crops production. Acreage response, growth and sustainability of selected minor crops production can also be studied with respect to Bangladesh as a whole.

CHAPTER IX

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Appendix -1

THE INTERVIEW SCHEDULE
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An interview schedule for the study Entitled

Title: AN ECONOMIC AND PROFITABILY ANALYSIS OF SELECTED MINOR CROPS CULTIVATION IN BOGURA DISTRICTS.

Serial No:……
Name of the respondent:…….
Village:…… Union: .....
Upazila:…….. District:……..
Mobile No:……..

(Please answer the following questions put tick wherever necessary)

1. **Age:** How old are you?. ..... years
2. **Education:** Please mention your educational status.
   (a) Can't read or write----
   (b) Can sign only----------
   (c) Read up to class -------
   (d)Others(specify).....
   ..
3. **Family size:** Please mention the members of your family members (including yourself)
   - **A.** Male ..... numbers
   - **B.** Female. ... numbers
   - **C.** Total A+B=.....
4. **Annual family income:**

Please indicate your annual income (Thousand Taka) from the following different sources

SL No.	Source of Income	Total price (Tk)
Agricultural Source		
01	Crop	
02	Livestock	
03	Poultry	
04	Fisheries	
Sub-Total (A)		
Non-agricultural source of income		
01	Business	
02	Service	
03	Labor	
04	Others (If any)	
Sub-total (B)		
Total (Sub-Total A + Sub-Total B)		

5. Income from minor crop cultivation: Please mention your annual income from minor crop cultivation.

…… (Thousand Taka)

6. Experience in minor crop cultivation: How many years have you been involved in minor crop cultivation? ..... year(s).

7. Training exposure: Have you received any training related to vegetables cultivation? Yes/No If yes, please mention the name the following ones:

SL. No.	Name of the training course	Name of the organization	Days
01			
02			
03			

8. Media exposure: Please indicate the nature of your contact with the following information media.

SL. No	Media of Sources	Nature of visit				
		Regularly	Often	Occasionally	Rarely	Not at all
01	Progressive farmers/Neighbors	More than 7-8times/ month	5-6times/ month	3-4 times/ month	1-2 times / month	
02	Input dealers	More than 4 times/ month	3 times/ month	2 times/ month	1 time/ month	
03	Sub- Assistant Agriculture Extension Officer	More than 5 times /month	4-5 times /month	2-3 times/ month	1 time /month	
04	Agriculture extension officer	More than 6 times/year	5-6times/ year	3-4 times/ year	1-2 time/ year	
05	NGO workers	More than 5 times /month	4-5 times/ year	2-3 times/ year	1 time/ year	
06	Listening vegetables production programmed in Radio	More than5 times /month	4-5 times/ month	2-3 times/ month	1 time/ month	
07	Watching vegetable production programmed in TV	More than 5 times / month	4-5 times/ month	2-3 times/ month	1 time/ month	

9. Farming Experiences

Years of Pointed gourd Production experience: _____years

Years of Bitter melon Production experience: _____years

Years of Pumkin Production experience: _____years

Years of Cucumber Production experience: _____years

10. Land holding information:

Item	Quantity of land
Homestead area	
Own land	
Land rented/shared/mortgaged in	
Land rented/shared/mortgaged out	
Area under Vegetables production	

9.Information about minor crop:

Farm size:

a) Labor Cost: Family and Hired labor

Cost Items	Pointed Gourd			Bitter Melon		
	Man-days	Unit price	Total (Tk)	Man -days	Unit price	Total (Tk)
Land preparation						
Sowing/transplanting						
Weeding						
Fertilizer, insecticide application						
Irrigation						
Harvesting						
Selling						
Others (please specify) ……						

a.1) Labor Cost: Family and Hired labor

Cost Items	Pumkin			Cucumber		
	Man-days	Unit price	Total (Tk)	Man -days	Unit price	Total (Tk)
Land preparation						
Sowing/transplanting						
Weeding						
Fertilizer, insecticide application						
Irrigation						
Harvesting						
Selling						
Others (please specify) ……						

b) Inputs cost:

Items	Unit	Pointed Gourd			Bitter Melon		
		Quantity	Unit Price (Tk)	Total (Tk)	Quantity	Unit Price (Tk	Total (tk)
Seed/seedling(kg)							
Fertilizer/pesticides							
Urea							
TSP							
MP							
Cowdung							
Vermicompost							
Thico-compost							
Insecticide							
Pesticides							
Fence							
Others……							

b.1) Inputs cost:

Items	Unit	Pumkin			Cucumber		
		Quantity	Unit Price (Tk)	Total (Tk)	Quantity	Unit Price (Tk	Total (tk)
Seed/seedling(kg)							
Fertilizer/pesticides							
Urea							
TSP							
MP							
Cowdung							
Vermicompost							
Thico-compost							
Insecticide							
Pesticides							
Fence							
Others……							

c) Equipment cost:

Items	Unit	Pointed Gourd			Bitter Melon		
		Quantity	Unit price	Total	Quantity	Unit price	Total
Tilling							
Irrigation							

c.1) Equipment cost:

Items	Unit	Pumkin			Cucumber		
		Quantity	Unit price	Total	Quantity	Unit price	Total
Tilling							
Irrigation							

f) Return from Production :

Item	Unit	Pointed Gourd			Bitter Melon		
		Quantity	Unit price	Total return	Quantity	Unit price	Total return
Main product							

f).1 Return from Production :

Item	Unit	Pumkin			Cucumber		
		Quantity	Unit price	Total return	Quantity	Unit price	Total return
Main product							

Influencing Factors of using Organic fertilizer in minor crop Production:

1. Training on Organic fertilizer (yes/no)
2. Available method of Organic fertilizer
3. Monitoring system of Extension Worker

Problems and suggestion of using Organic fertilizer minor crop Production:

Problems	Suggestion

Dated: Signature