PROFITABILITY ANALYSIS OF TOMATO PRODUCTION IN SOME SELECTED AREAS OF JAMALPUR DISTRICT

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CERTIFICATE

This is to certify that the thesis entitled "**PROFITABILITY ANALYSIS OF TOMATO PRODUCTION IN SOME SELECTED AREAS OF JAMALPUR DISTRICT**" submitted to the Department of Development and Poverty studies, Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of **MASTER OF SCIENCE (MS) in DEVELOPMENT AND POVERTY STUDIES**, embodies the result of a piece of bona fide research work carried out by **MD. HEDAYTUR RAHMAN**, Registration No. **14-06108** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

Dated:

Dhaka, Bangladesh

(Prof. Dr. Ashoke Kumar Ghosh)
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DEDICATED
TO
MY BELOVED PARENTS

ABSTRACT

To calculate the profit of tomato production and the farmers socioeconomic situation in order to identify and assess the profitability analysis of tomato production. Primary data collection was carried out at three villages of Jamalpur Sadar upzilla under Jamalpur district. The study was based on primary data, collected from 70 farmers, selected using a simple random sampling technique. Cobb-Douglas production function was applied to determine the effects of inputs on tomato production. Land preparation cost, seedling cost, labor cost, fertilizer cost had significant impact on tomato production.The average yield per hectare of tomato was 15354.12 kilograms. The average Selling price was BDT 40 per kilogram. Per hectare of gross return, gross margin, and net profit of tomato production were BDT 6,14,164.80 , BDT 3,72,930.10 and BDT 3,50,736 respectively . Per hectare Benefit Cost Ratio was estimated at 2.33. Increase of only managerial skills result in a substantial increase of output for tomato. Farmers faced a lot of problems in producing tomato. The problems were financial and technical. Lack of quality seed was one of the most important limitations of producing tomato in the study area. Lack of adequate knowledge, high input cost, high transport cost, low output price, lack of storage facility were the major problems faced by farmers. These were the major constraints for the producers of tomato in the study areas.

ACKNOWLEDGEMENT

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ABBREVIATIONS AND ACRONYMS

BRRI	: Bangladesh Rice Research Institute
BBS	: Bangladesh Bureau of Statistic
BCR	: Benefit Cost Ratio
BDT	: Bangladeshi Taka
BER	: Bangladesh Economic Review
DAE	: Department of Agricultural Extension
et al.	: and others (at elli)
GR	: Gross Return
gm	: Gram
ha	: Hectare
HIES	: Household Income and Expenditure Survey
HYV	: High Yielding Variety
IOC	: Interest on Operating Capital
kg	: Kilogram
MoP	: Muriate of Potash
mt	: Metric Ton
NGO	: Non-Government Organization
SRC	: Spices Research Center
t	: Ton
TC	: Total Cost
TFC	: Total Fixed Cost
Tk.	: Taka
TSP	: Triple Super Phosphate
TVC	: Total Variable Cost
US	: United States
USDA	: United States Department of Agriculture
$	: Dollar

CHAPTER I
INTRODUCTION

1.1 Background of the Study

Tomato is one of the most famous, versatile, and broadly grown vegetable all through the world and in nearly every domestic garden. Vegetable production in the world has executed great boom in last 20 years because of new generation adoptions like current manufacturing practices, new variety seeds and mechanization of farming. Vegetable production is ready 290.13 million heaps in 2016 (FAOSTAT, 2018). Among distinct veggies, tomato captures about 60% of total fresh vegetables produced in the global. Tomato may be extremely good supply of different vitamins that lessen the risk of sicknesses like gastritis, prostate, carcinoma, skin erythema and coronary heart condition (Levy and Sharoni, 2005). Aside from its dietary importance, huge productivity of tomato is that the blessing for landless farmers, laborers, distressed of developing nations as it assists to boom income and reduce inequality (Mitra and Yunus, 2018).

Bangladesh, a growing has witnessed approximately 6.5 instances increase in tomato manufacturing after its independence. Tomato is one a few of the predominant greens produced in Bangladesh that occupies approximately 25% of overall sparkling vegetables produced in Bangladesh. Farming machine is transferring from huge to industrial stage this is answerable for increasing tomato productivity (Mitra and Prodhan, 2018). Although tomato is understood as a wintry weather vegetable, it is also available in summer season due to the occasion of cutting-edge sorts by means of Bangladesh Agricultural Research Institute (BARI) and Bangladesh Institute of Nuclear Agriculture (BINA). Tomato is the second one maximum vital vegetable export commodity after potato. It is found that other veggies have restrained call for as they're consumed solely most effective by using the urban affluent/elite elegance,so the tomato is familiar, it is consumed by means of each affluent/elite and poor training. Tomato is appeared due to the fact the vegetable of the in large part negative masses (Adepetu 2005). The notably perishable nature of tomato makes it tough to domesticate by means of many farmers at commercial level in Bangladesh; no matter its numerous demand and significance in the vitamins of the humans. This is regularly

seemingly due to the fact the producers of the crop are usually small-scale farmers who nevertheless perform inside the frame paintings of traditional agriculture. In view of the possibility which this crop holds for the agro-allied industries and domestic intake in Bangladesh, that there may be a transparent need for the behavior of research on profitability evaluation of seasonal tomato production. Tomato is a essential vegetable that is fed on all of the year spherical.

Tomatoes are labeled into two categories consistent with its manufacturing season. These are rabi tomato and summer tomato. Tomatoes are produced all of the year spherical however its high season during December to March. There are few studies associated with tomato administered in Bangladesh. Zaman et al. (2006) studied approximately manufacturing potentiality of summer season tomato in Jamalpur place. Vegetables sub-region plays an crucial function for the improvement of Bangladesh. Vegetables are a herbaceous plant whose culmination, seeds, roots, tubers, leaves and so forth., are used as food. Vegetables can be counted as a less expensive but maximum crucial dietary supply. Here it might be stated that veggies can be grown in a small region of land, even within the domicile or inside the rooftops. Another benefit of vegetable cultivation is that huge variety of greens may be produced all the year round .In addition, vegetable quarter is hard work intensive and it offers the county a considerable and huge street for generating rural employment possibilities substantially. Our fertile land gives our countrymen to grow diverse forms of veggies in a big amount spherical the 12 months but iciness weather is maximum appropriate for growing veggies. Previous researches were highlighted the profitability of tomato manufacturing and find out the primary problems of tomato production in distinct regions of Bangladesh. The gift look at has emphasized no longer only the prices and returns of tomato manufacturing however also mounted the relationship between socioeconomic characteristics and troubles faced by using the tomato farmers. This observe cautiously investigates the foremost problems of tomato farmers inside the decided on districts. The findings of the research will be beneficial to the coverage maker to formulate an effective guiding principle for the tomato cultivators' days beforehand.

1.2 Importance of Vegetable Production

Human nutrients is very vital as a way to develop a state in all appreciate. Vegetables may additionally play a critical position in this factor. In current years, the fee of

veggies has been recognized as an important item of day by day human food plan all around the global. They have been gambling a completely important function in our day by day weight-reduction plan presenting vitamins, minerals, flavor, palatability, variability and boom appetite. Generally greens are the main component of human meals that supplies proteins, carbohydrates, fat, vitamins and minerals. Majority of the population in Bangladesh be afflicted by extreme malnutrition, which has a terrible impact at the improvement of the physical and intellectual growth. Vegetable production provides a promising monetary opportunity for reducing rural poverty and unemployment in developing nations and is a key component of farm diversification techniques. Vegetables are mankind's most low cost supply of nutrients and minerals needed for true fitness. Vegetables are essential in lots of approaches, inclusive of changing food conduct of people and so their meals baskets, increasing consciousness of humans in the direction of balanced diet and concept of dietary protection. Vegetables produce more biomass in line with unit place and fetch greater expenses consistent with unit manufacturing so are greater economical to grow. They may be edible as root, stem, leaf, fruit and seed. Each institution contributes to diet in its own manner. Fleshy roots are excessive in electricity fee and top resources of diet B. Seeds are extraordinarily high in carbohydrates and proteins. Leaves, stem and end result are superb resources of minerals.

1.3 Background Information on Tomato

The tomato, or nightshade own family (Solanaceae), consists of about eighty five genera and a pair of 300 species. The place under tomato farming has accelerated through the years. The production of tomato has also extended from approximately 415490 metric heaps in 2019-20 to about 447,815 metric heaps in 2020-21 (BBS, 2021).

1.4 Status of tomato Production

Tomato is one of the vital veggies for boom and renovation of fitness of human beings. In the month of December to March sorts of tomatoes are all through Bangladesh. But within the relaxation part of the year human being frequently confront first rate shortage of tomatoes. Bangladesh is pre-dominantly an agricultural country with rich soil situation and climate. Numerous kinds of vegetables could also be grown over right here in April to November. It is an issue of regret that when four

decades of independence we could not produce sufficient veggies for the human being. Current vegetable production in Bangladesh is appreciably underneath domestic call for.

At present, vegetable production is around 1.8 million MT, whilst demand is envisioned to be 10 million MT (BBS, 2010). This demand-supply gap is probably to amplify with the increase of population and boom in line with capita income. Tomatoes in Bangladesh is generally grown small farmers that is (42%) in comparison to medium (40%) and big farmers (16%).Annual Production of Tomato in the Country from 2018-2019 to 2020-2021

Table name 1.4: Annual Production of Tomato in this Country in 2019-2021

Year	Area(Acres)	Production(M. Tones)
2018-2019	69697	387653
2019-2020	70460	415494
2020-2021	72878.64	447815.43

Source: BBS 2021

1.5 Objectives of the Study

1. To ascertain the socio-economic characteristics of tomato producers in the study area.
2. To analyze the profitability of tomato production.
3. Factors affecting returns from tomato production.
4. To identify the problems of tomato production.

1.6 Justifications of the Study

More than 50% of the agricultural families in Bangladesh are land less. They can gain from vegetable production with given era and inputs. In the context of Bangladesh potato, tomato and cauliflower are grown in limited regions for consumption and industrial reason. But the call for those veggies exists all around .These greens play very important role to increase vegetable manufacturing in Bangladesh. They are taken into consideration as one of the maximum vital companies of meals vegetation having capabilities of excessive nutritive price, profits generating exertions-extensive,

especially higher yield and better fiscal gain. They are taken into consideration as a cheap natural supply of supplementary food and may be grown in a brief duration, In addition to assisting this most important finding of the earlier studies, this have a look at has generated critical new statistics. There are several interrelated and constituent attributes that represent someone and those profoundly have an effect on development behavior. So, to get a whole and correct situation of veggies growers of a selected location, it's far calls for to recognize socio-financial characteristics. Potato, tomato and cauliflower is very critical, worthwhile vegetable and play very crucial position to growth vegetable production in Bangladesh. Farmers of Bangladesh are historically willing to rice production, even though the agro climatic situation of Bangladesh is pretty suitable for vegetable cultivation. The growth in the production of cereal crops will no longer be sufficient to fulfill the meals requirement of the growing population of Bangladesh. Besides, the human beings of Bangladesh are suffering from malnutrition. The humans are accomplishing self-sufficiency by way of growing more vegetables. Thus, the government of Bangladesh has placed a lot emphasis on vegetable production all the year round to satisfy dietary want of the growing populace and for increasing employment opportunities and income of the farmer. Increased vicinity allocation for veggies like tomato might also fulfill the authorities target. Therefore, giving out policy alternatives on growing tomato manufacturing, relevant and good enough records on tomato production in farm degree is required. Some monetary investigations on tomato have been undertaken by way of non-public organizations in order to provide the remarks to coverage makers, research personnel's, extension workers and farmers which, had been now not good enough. This examine will help diagnose the problems and replace farmer's expertise regarding tomato production era, which will assist them in decision making with regard to resource allocation. The findings of the examine will generate basic financial information at the production practices of tomato. From the prevailing findings of this look at the tomato manufacturers would be well aware about the performance of their manufacture and advertisement. All those information would help them in selection making to understand and control their respective farms most effectively. Moreover, the existing take a look at can even offer precious data to the researchers who will behavior similarly research of the similar nature. Thus, the present observe may be capable of pick out some primary production and marketing troubles of tomato cultivation and also to offer measures for likely answer. If the involved agencies, humans and policy

makers take proper measures on the premise of recommendations then it will help to boom manufacture and advertisement of tomato for this reason help to improve advertisement and marketing efficiency. Consequently the consumers may be capable of have nice product in time at affordable price, Finally, it'll be useful to the planners and coverage makers in formulating micro or macro stage policy for the development of tomato production .

1.7 Limitation of the Study

Almost all research studies have some limitations in respect of time, financial assist, and different resources of the researchers. The gift have a look at doesn't always an exception to that. This research explored the prevailing advertising and marketing device of tomato organization, its challenges and constraints in jamalpur district. Since the vicinity coverage is restricted for the studies website with very small size of pattern producers, the inferences drawn from the research might not be taken as generalization for other regions. Data amassed on do not forget foundation can also result in some response mistakes. The length of the sample taken won't be adequate due to resources and time constraints. It became tough to touch farmers due to peak season of tomato transplanting. Most of the manufacturers and buyers of tomato do no longer hold any facts in their cost and return. As a result, the accuracy and reliability of records completely depend on their reminiscence and sincerity. The findings from this examine might be useful for all stakeholders involved in tomato agency and in formula of policies associated with tomato production and advertisement for the study areas and different similar areas.

CHAPTER II
REVIEW OF LITERATURE

Review of related literature in any research is necessary in the sense that it provides a scope for reviewing the stock of knowledge and information relevant to the proposed research. This knowledge and information give a guideline in designing the future research problem and validating the new findings. With this end in view, literature and research of major past works in connection with the present study, were searched in various library and institute. A lot of works related to the present study had been in the context of Bangladesh. It is also necessary to mention that costs, returns and resource use efficiency of production might vary from time to time, place to place, farm to farm and so on.

Devaraja (1998) conducted a study in Hassan district on channels and price spread in potato marketing, he selected 200 farmers from 30 village and 40 market intermediaries indexing 15 commission agent, 15 retailer vendors and 10 cart vendors. The study identified 3 supply chain, first chain included commission agent and retailer for the movement of produce from producer and consumer in the nearby market of Hassan. Second chain included commission agent and retailer for the movement of produce from producer and consumer but distant market of Bangalore and third chain included commission agent and cart vendor from producer to consumer. The price spread analysis revealed that producers got the net price of 48.57, 51.15 and 52.32 per cent of the consumers' rupee in first, second and third supply chain respectively. In third chain representing distant market Bangalore, the consumer's rupee was the highest.

Haque et al. (2001) conducted an experiment at Hajee Mohammad Danesh Agricultural College, Dinajpur during 1998-1999 to study the influence of planting time and application of kinetin on the yield and yield components of tomato. The experiment was conducted in a randomized complete block design with 3 replications, There planting times viz. 15 November, 30 November, and 15 December and four kinetin concentrations viz. 0, 50, 100, and 200 ppm were used in the experiment, planting time and kinetin had significant influence on the yield and yield components of tomato. The highest (62.56 t/ha) and the lowest (45.45 t/ha) yield was obtained from 15 November and 15 December planting. Application of 100 ppm kinetin produced

maximum fruit yield (63.97 t/ha), whereas minimum yield was observed in control plot (18.98 t/ha). The combined effect of planting time and kinetin application was not significant on the fruit yield.

Haque et al. (2012) studied about adoption and profitability of BARI winter tomato in different districts in Bangladesh. They found that Raton and BARI hybrid tomato-5 variety were profitable than its competing crops potato, lentil and mustard. They investigate different problems of farmers. Non-availability of BARI tomato variety seed at proper time, lack of technical knowledge, lack of storage facilities, infestation of insects and diseases were the major constraints of BARI tomato cultivation.

Hugar (1980) in his study on marketing of vegetables in Belgaum city found that marketing cost incurred by producer - sellers for cabbage, brinjal and tomato was Rs. 7.73, Rs. 8.62 and Rs. 8.17 per quintal respectively in the supply chain of producer to consumer with the involvement of wholesalers and retailers. But, in the supply chain of producer to consumer with involvement of cooperative society and retailers the marketing cost was Rs. 6.65, Rs. 7.40 and Rs. 9.00 per quintal of cabbage, brinjal and tomato respectively. The cost incurred by producer seller in the cooperative supply chain was lower as compared to traditional supply chain. This was mainly due to lower rate of commission charged by cooperative society as compared to wholesaler or commission agents. This suggested that relatively more efficient performance of cooperative supply chain over traditional supply chain.

Ibrahim (2008) investigated economic analysis of irrigated tomato production among small scale farmers in Niger State.The study employed the use of descriptive statistics, gross margin, production function and resource-use efficiencies for the data analysis. The result revealed that irrigated tomato production is profitable in the area with gross margin of 67, 792.00 per year and 87,610.58 per hectare. The result further revealed that farm size, quantity of seed, labour and agrochemicals are significant factors influencing output level of irrigated tomatoes. Efficiency ratio shows that resources used were not efficiently utilized

Islam (2005) found that land area for tomato cultivation has been extended day by day as a result of the increasing demand for domestic consumption. Compared with other

field crops tomato is known as a profitable, less risky, labor-intensive, and relatively short duration life cycles cash crop.

Kalash Ram Chaudhary (2010) conducted a study which was carried out to analyze the marketing system of tomato in Lalitpur district of Nepal during the year 2010. Specifically, this study was intended to identify marketing channels, to estimate gross margin, marketing margin and producer share, to find out the situation of market information and to identify constraints related to production and marketing of vegetables, especially tomato. Accordingly, a representative sample size of 20 tomato growers comprising 10 each from Lamatar and Lubhu village development committees were purposively selected. Similarly, 10 wholesalers from Kalimati fruits and vegetables wholesale market and 10 retailers from Lagankhel vegetable market were purposively selected. The required information was obtained by interviewing with semi structured questionnaire. This was supplemented with information from group discussion with farmer groups and key informants; and observation. The research showed that tomato growing is a profitable and potential agricultural enterprise in the research area.

Karim et al,(2009) Considering the growing demand and importance of tomato, Bangladesh Agricultural Research Institute (BARI) has taken initiative to develop off-season summer and rainy season tomatoes. So far BARI has developed and released 3 hybrid tomato varieties i.e. BARI Hybrid Tomato-3, BARI Hybrid Tomato-4 and BARI Hybrid Tomato-8 which can be grown during summer and rainy season under poly tunnel. The average yield of BARI Hybrid Tomato was 32.78 t/ha in the Jessore district.

Khatun et al. (2012) studied at post-harvest loss assessment of tomato in some selected areas of Bangladesh. They found that absence of proper storage and marketing facilities, farmers are forced to sell their produces at throw away prices. Lack of storage facility, low price of tomato and unfavorable transportation system were the major problems at the farmers and traders level.

Kiresur et al. (1993) conducted a study of the costs and returns of vegetable growing were carried out in Dharwad and Hubli taluks in Dharwad district, Andhra Pradesh, India. The sample included 81 tomato growers, 69 aubergine cultivators, 55 onion

producers and 83 potato farmers. Data were collected for 1985-86. The costs of production were highest for potatoes followed by onions, tomatoes and aubergines..

Mitra and Pradhan (2018) found that among various vegetables, tomato production in 2016 has reached 177042 thousand tons which hold about 60% of total world fresh vegetable production.

Narayana Reddy (2004) reported that most (61per cent) of the retailers get their requirements from wholesalers, 15 per cent from the large and other retailers. Over 17 per cent of the selected retailers get their goods from more than one source, but a small percentage of retailers get some of their requirements from producers. From the side of the terms of supply 67 per cent of retailers get their requirement by paying cash. Only 13 per cent of the retailers get their requirements on credit and 19 per cent get credit partly from the suppliers. Apart from this, the study also shows that the organized retailers and super markets get wholesalers margin plus concession as they buy in Duik.

Venkataramana et al. (1996) conducted a survey on economics of tomato production in Kolar district of Karnataka. The paper computes the costs and returns of tomato production, estimates labor requirements and examines the problems encountered by farmers in producing and marketing tomatoes. A sample of 100 farmers who grew tomatoes during 1990-91 was selected from Kolar, Srinivaspur and Chintamani taluks of Kolar district, Karnataka state, India. The total cost of production was Rs 36 611.51, of which variable costs were Rs 15 648.26. fixed costs Rs 2556.48 and marketing costs Rs 18 406.77. Though the net return obtained is high compared to many other crops, the high costs of production, perishable nature was also collected. The data was analyzed using descriptive statistics. Also, the study specifically estimated the distribution of net margins among the various marketing agents: wholesaler and retailer.

Weldeslassie (2007) identified eleven lines of marketing channels of tomato were in a market oriented policy and programs linking with production in order to enhance production and marketing efficiency in the study area, in particular. Ganesh et al. (2004) conducted the study of economics of production and marketing of vegetables. The study was conducted at Maccapaha and Calicut of the south Andaman island of Andaman district. It estimated that the marketing cost and margin of middlemen for

vegetables at different level i.e., wholesalers and retailers level and found out that, marketing cost was found to be highest for cabbage, followed by tomato, snake gourd. The main reason for the high marketing cost of certain vegetables was due to the fact that they are transported from far off islands to the main consumption point where they were located. The margin to both the wholesaler and the retailer was highest in ginger (Rs. 14.10 and Rs. 32.50 per kg respectively) and lowest in basal and Marsa (Rs. 0.90 and Rs. 2.00 per kg respectively.

CHAPTER III
METHODOLOGY

3.1. Introduction

The validity of farm control research is contingent upon the have a look at's approach. Appropriate method is a precondition for doing sound studies. The design of every survey is largely governed by using the examines nature, cause, and dreams. Additionally, it's miles contingent upon the availability of required resources, elements, and time. There is an expansion of facts series techniques to be had for farm control studies. A farm commercial enterprise studies frequently includes the gathering of records from character farmers; facts collection for farm business analysis requires the analyst to use judgement in selecting records amassing techniques in the constraints given with the aid of the to be had sources for the assignment (Dillon and Hardaker 1993). The "survey approach" became used on these studies often for two motives: i. It lets in rapid evaluation of a big variety of instances; and ii. Its conclusions have a broader software. The number one downside of this method is that the investigator should depend on the farmers' recollection. To cope with this problem, frequent trips to the studies place have been performed to gather facts, and within the occasion of any omission or contradiction, farmers were contacted to get the 'missing and/or accurate information. The following tiers were used in designing the survey for this investigation.

3.2. Selection of the Study Area

Selection of the study area is a crucial stage for farm management research. The area chosen suited both the study's specific objective and the possibility of cooperating with the farmer. This research was undertaken in certain chosen regions of Jamalpur district to analyze the Profitability of Tomato production. Although Tomato is cultivated across Bangladesh, Jamalpur district is one of the country's main Tomato producing areas. Jamalpur district is divided into five upazilas. Thus, Jamalpur sadar upazila and three villages, lokkhir chor, alkir chor and Rayer chor in Jamalpurr district were purposefully choosen for the research due to their significant Tomato output concentration.

The following were the primary reasons for choosing the research area:

a) When data gathering began, respondents cooperated.

b) These villages had some physical traits, such as topography, soil   composition,and climate conditions conducive to tomato cultivation.

c) Access to these settlements was anticipated to be easy, as were communication facilities; and respondents' cooperation was expected to be strong, in order to acquire trustworthy data.

d) No study of this type was conducted previously in this area

Figure 3.2.1: Map of Jamalpur District
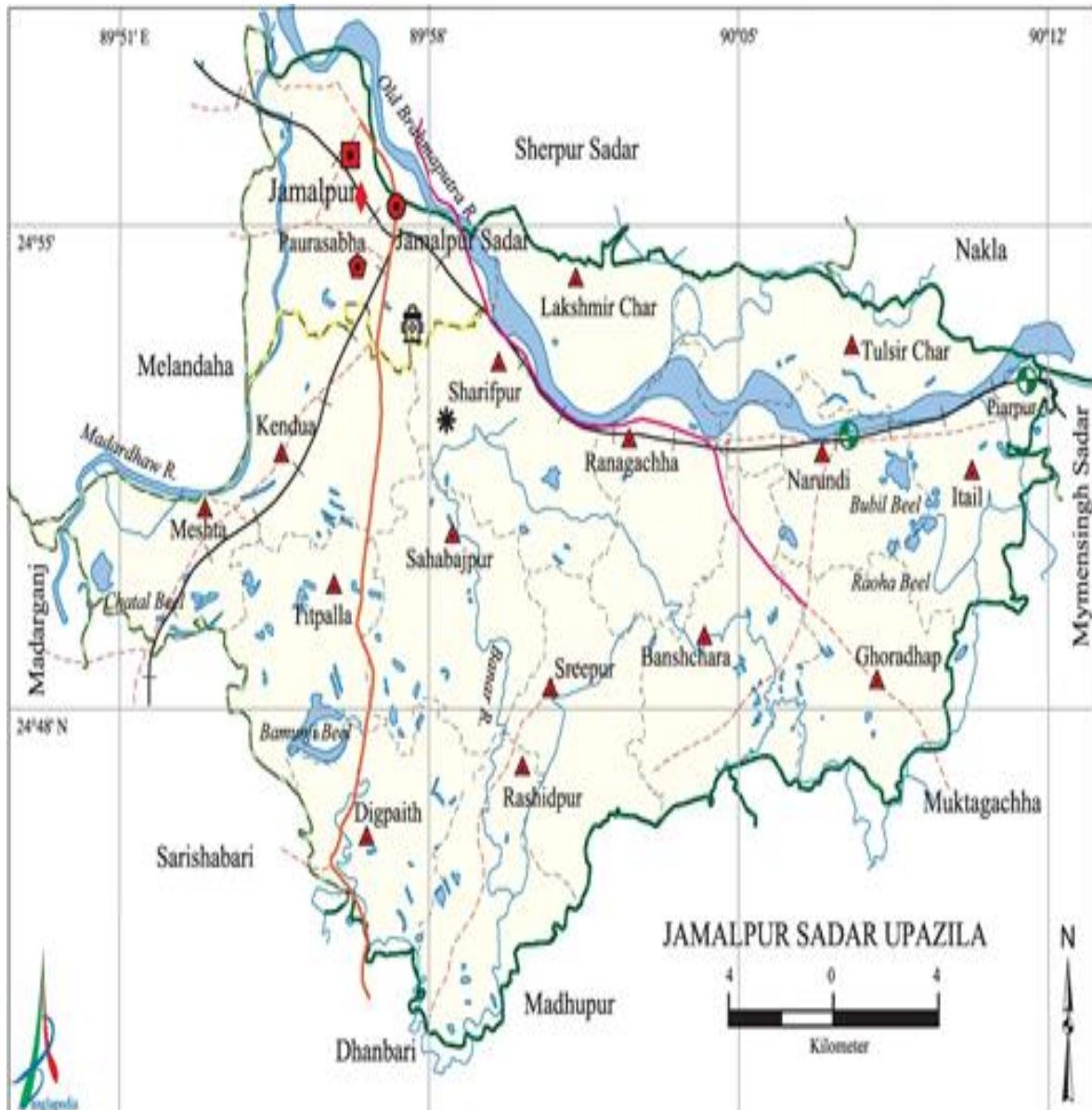
Figure3.2.2: Map of Jamalpur sadar upazila

3.3. Sampling Technique and Sample Size

Two criteria must be considered even as selecting samples for a research. The pattern lengths need to be as massive as viable at the same time as but offering enough ranges of freedom for statistical evaluation. On the other hand, field research management, fact processing, and evaluation must be achievable within the constraints of bodily, human, and monetary resources. However, due to the style of the technological and human environments, it is needed to pattern a representative pattern of the populace before drawing any conclusions. Due to time, economic, and manpower constraints, it become now not feasible to sign up all the study location's farmers. A total of 70

farmers had been selected at random. The modern-day studies used a functional random pattern approach to keep costs and time and to accomplish the take a look at's final objectives.

3.4 Data Collection

Due to the widespread have an impact on information accumulating has on the great of survey findings, its miles diagnosed as a important element of a survey. Considering its significance, the following tactics were taken all through the improvement of the questionnaire used to acquire records:

3.4.1. Questionnaire Design

A questionnaire is a very effective assessment tool that allows the accumulating of records thru multi-dimensional questions. A questionnaire created without a clear goal and goal might usually ignore important subjects and waste the time of each enumerators and respondents via asking and responding to beside the point questions. All of those factors have been taken into consideration to the degree possible at the same time as constructing the survey questionnaire

3.4.2. Pre-Testing the Questionnaire

The questionnaire became pre-tested to determine the period of time required to complete the i.e. Whether or not the information obtained through it turned into connected to the survey's universal aim and the months of March and April 2021. I picked randomly a few farmers to be responders.

3.4.3. Finalization of the Questionnaire & Method of Data Collection

After resolving all the modifications advised by the pre-check, the questionnaire turned into introduced to my supervisor. My supervisor also contributed considerably to the questionnaire. Eventually, I received permission to making specific questionnaire. A face-to-face interview became carried out in response to the questionnaire.

3.4.4. Data Enhancing and Coding

Editing and Coding of Data Other crucial aspects of the survey covered records editing and coding, which have been required for statistics processing. It should be achieved previous to the processing of information. Coding changed into finished simultaneously with questionnaire advent so as for the enumerator to sincerely and well mark an appropriate responses. The term "statistics editing" refers to the system of verifying and cleaning previously acquired data from the discipline.

3.5. Data Processing

Data processing included several procedures that were critical since they had an effect on the survey's findings. The following actions were conducted during data processing.

♦ Data entry

♦ Appending and merging files

♦ Data validation (further computer checking, editing, and imputation)

♦ Final decision on errors

♦ Completion of data processing and generation of data files

♦ Final documentations

♦ Conversion of data files to another software

♦ Storage of all files

3.6. Processing, Tabulation and Analysis of Data

Manual enhancing and coding of the collected information befell. The acquired information turned into then meticulously compiled and analyzed. Additionally, information input becomes carried out electronically, and analyses have been performed using the correct equipment, Microsoft Excel and STATA. It ought to be remembered that statistics turned into first accumulated in neighborhood gadgets. After required assessments, it was converted to international preferred devices.

3.7 Problems Faced During Data Collection

The researcher encountered a few difficulties when gathering data. These issues are summarized below:

i. The majority of respondents expressed hesitation in responding to the question, seeing that they'd in no way encountered this form of thinking earlier than. To clear up this trouble, a great deal effort was spent organising rapport.

ii. It turned into hard to persuade respondents of the observe's use because of the reality that most of the people of respondents have been illiterate and uninformed.

iii. The respondents did not hold music in their business's economic transactions. As a result, it became rather hard for individuals to consider pertinent facts from their reminiscence the usage of the recall approach

iv. The respondents consistently avoided supplying correct data approximately the volume of their holdings and sales from tomato, believing that providing accurate statistics might result in accelerated taxes being imposed on them.

3.8 Estimation of Costs and Returns:

Present study envisioned the prices concerned and internet value of the produce. Variable prices like tunnel practice fee, land training fee, seed fee, seedling transplantation value, fertilization fee, hoeing price, pesticides price, earthling up cost, irrigation cost, choosing price and advertising and marketing value have been calculated. Tunnel value includes price of iron pipes or bamboos bought for setting up tunnel shape, iron cord value, string cost, nut bolt fee, polythene sheet price, cost of sheet for mulching, transportation fee for tunnel cloth and labor charges for tunnel preparation. Iron pipes, bamboos and iron wire used for multiple year because of their long existence. So, the depreciation cost turned into calculated for each material, that is used for more than one year as defined by means of Mwangi (2012). However, depreciation for low season tomato became calculated for 8 month due to the fact the common lifestyles span of low season tomato become eight months on common. Mwangi (2012) calculated the hobby on general preliminary funding fee and total variable fee. Therefore, interest on general initial investment price and total variable price become calculated at 8% hobby rate. Gross margin, net profits and advantage-

value ratio had been calculated through the usage of formulation used by Usman et al. (2013) expressed as:

Gross Margin

GM=TR-VC

Where,

GM=Gross Margin

TR=Total Revenue

VC=Variable Cost

Net Income

NI=TR – TC

Where,

NI=Net Income

TR=Total Revenue

TC= Total Cost

Net income turned into calculated with the aid of subtracting overall value from general revenue. Total cost turned into a mixture of variable value and fixed cost like land hire and abyana(canal water costs). Water fees for tube properly water are a part of variable value however canal water expenses (abyana) is taken into consideration as constant fee because it's miles accrued with the aid of the authorities at a set charge from every farmer regardless of water use. Noonariet al. (2015) also taken into consideration water expenses as constant fee.

Benefit Cost Ratio (BCR): Benefit-Cost is the ratio of overall sales with total value. It is interpreted because the return received at the expenses of one rupee. The mathematical formulation for computing BCR was given below:

BCR=TR/TC

Econometric Model Specification:

In the analysis of agricultural manufacturing, the first preference is to use Cobb-Douglas version because of its purposeful form. The important elements at the back of

the use of Cobb-Douglas model have been its simplicity of computation, interpretation and mathematical homes (Heady and Dillon,1961, referred to in Usman and Ashfaq, 2013). The logarithmic transformation of Cobb-Douglas model into linear shape make the estimation of coefficient greater easy and easy (Beattie and Taylor, 1985). The practical shape of Cobb- Douglas production model become linearized by way of taking double logarithmic to make it useful for sensible purposes,

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \beta_9 \ln X_9 + u_i$$

Where,

Y = Gross return (Tk./ha)

X_1 = Cost of Human labor (Tk./ha)

X_2 = Cost of seed (Tk./ha),

X_3 = Cost of Urea (Tk./ha)

X_4 = Cost of TSP (Tk/ha)

X_5 = Cost of MoP (Tk./ha)

X_6 = Cost of DAP (Tk./ha)

X_7 = Cost of Material Input (Tk./ha)

X_8 = Cost of Irrigation (Tk./ha)

X_9 = Cost of Pesticide (Tk./ha)

$\beta_0, \beta_1, ..., \beta_9$ = Co-efficient of respected independent variables

u_i = error term

CHAPTER IV
SOCIO-ECONOMIC PROFILE OF TOMATO GROWERS

4.1 Introduction

Providing a high-level overview of the socioeconomic characteristics of tomato farmers is the goal of the following section. It is possible to interpret the socioeconomic position of farmers in a number of ways, based on factors such as their style of living, the financial condition in which they live, as well as the kind and depth of the growers' support for national advancement efforts. Due to time and asset restrictions, it was impossible to gather complete information on the financial characteristics of the sample farmers. However, some information was obtained. The financial situation of the example farmers is critical in the event of study planning because there are several interconnected and component aspects that identify a person and have a significant impact on the development of his or her behavior and character, and the financial situation of the farmers is one of these aspects. Individuals have a variety of financial perspectives that vary from one another. Nonetheless, for the sake of this research, a few of the financial aspects have been taken into account for swapping purposes.

4.2 Age

Total 70 samples were collected from three villages, Rayer chor, Lokkhir chor, and Alkir chor, representing the whole population. In Rayer ach village, 32% of the sample population was between the ages of 20 and 40, 44% between the ages of 40 and 60, and 24% were above 60. In Lokkhir chor village, 16% of the sample population was between the ages of 20 and 40, 80% were between the ages of 40 and 60, and 4% were above 60. In Alkir chol village, 10% of the sample population was between the ages of 20 and 40, 85% between the ages of 40 and 60, and 5% were beyond the age of 60. (See Figure 4.1.) The majority of people in each neighborhood were between the ages of 40 and 60, as we discovered.
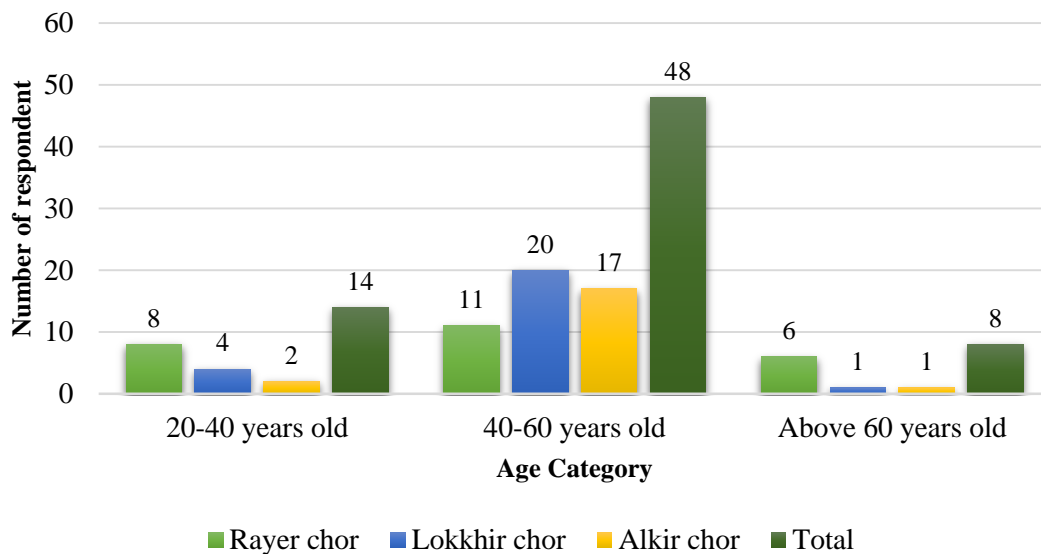
Figure 4.1: Age of the respondent by Study Area

4.3 Composition of the Family Size

In this study, a family was defined as the total number of people who lived in the same kitchen and ate meals under the direction of a single family head, as described by the researchers. Families include the spouse, children, an unmarried young girl, the father, mother, sister and numerous other relatives who live with the family on a permanent basis, as well as extended family members who visit. The average family size of Rayer chor, Lokkhir chor and Alkir chor village was 5.15, 5.57 and 5.40, respectively.

Table 4.1: Average Family Size and Distribution of Members According to Sex of the Sample Farmers

Particulars	Rayer chor village		Lokkhir chor village		Alkir chor village		All Farmers		National Average Family Size
	Number	%	Number	%	Number	%	Number	%	
Male	3.02	58.64	3.12	56.01	3.23	59.81	3.12	58.10	
Female	2.13	41.36	2.45	43.99	2.17	40.19	2.25	41.90	4.06
Total	5.15	100.0	5.57	100.0	5.40	100.0	5.37	100.0	

4.4 Education

According to Figure 4.2, around 36% of the farmers had no education, roughly 13% had primary level education, approximately 52% had secondary level education, and no one finished higher level education in Rayer chor. In Lokkhir chor village, about 16% of the people had no education, 4% had primary level education, 56% had secondary level education, and 24% had higher level education. In Alkir chor village, around 25% had no education, 10% had primary level education, 55% had secondary level education, and 10% had finished higher level education.
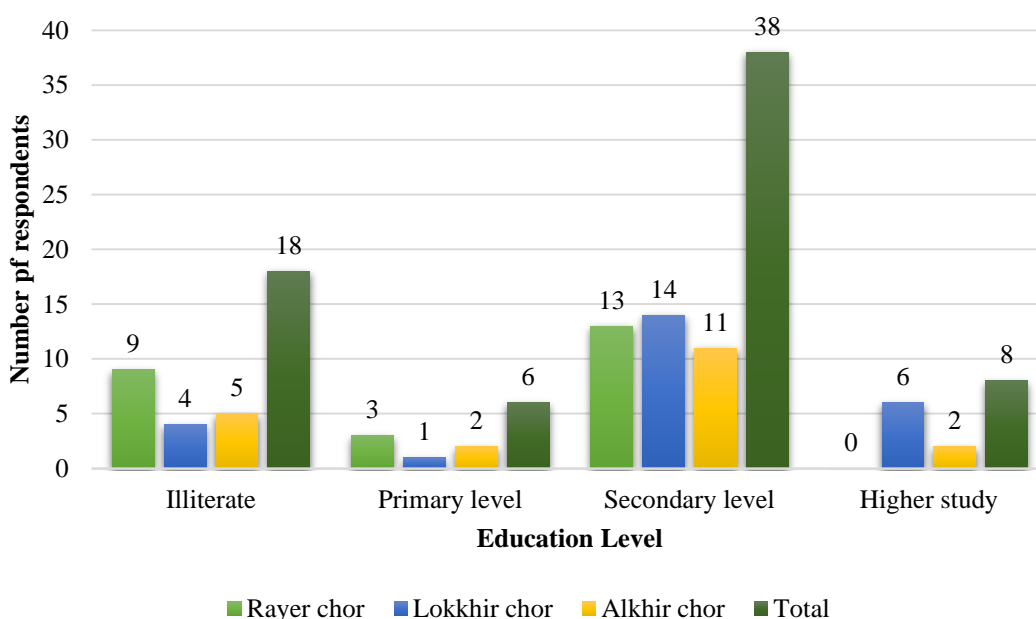
Source: Field survey, 2021

Figure 4.2: Education of the Respondents by Study Area

4.5. Annual Family income

a) Agricultural work

Crops, poultry, livestock, and fisheries are the principal sources of agricultural income in the sample population. Agricultural production accounts for the bulk of framers income. Crop farming was the principal source of income for these people, who earned an average of Tk. 23000.00 each year from crop cultivation on a year-to-year basis. Today, the research area includes a poultry, livestock, and fish farm, in addition to the original study site. Farmers get Tk. 6333.33, Tk. 77254.90, and Tk. 36444.44 from poultry, livestock, and fisheries, respectively, in a year's worth of work. Agriculture contributed an annual household income of Tk 143032.70 on average per family.

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Table 4.2: Agricultural Work

Sector	Average annual Income	Total Average Annual Income from Agriculture
Crops	23000.00	143032.70
Poultry	6333.33	
Livestock	77254.90	
Fisheries	36444.44	

Source: Field survey, 2021

b) Non-Agriculture work

Among the non-agricultural activities were day labor, vehicle and truck driving, domestic work, small business, international remittances, and service. According to findings, the yearly average earnings from non-agricultural sources is Tk. 64540.00 each year.

Total annual average income in the study was calculated by adding agricultural and non-agricultural income which was Tk. 207572.70.

4.6 Annual Family Expenditure

According to the findings, the average annual expenditure of a sample farmer is Tk. 125349.88. Dietary expenses accounted for the vast bulk of family expenditures. Education, clothing, medicine, transportation, festival participation, and entrainment were all substantial expenditures for a kid, as were the costs involved with his or her upbringing. The average annual family savings was calculated (Total Income – Total Expenditure) to be Tk. 82222.8.
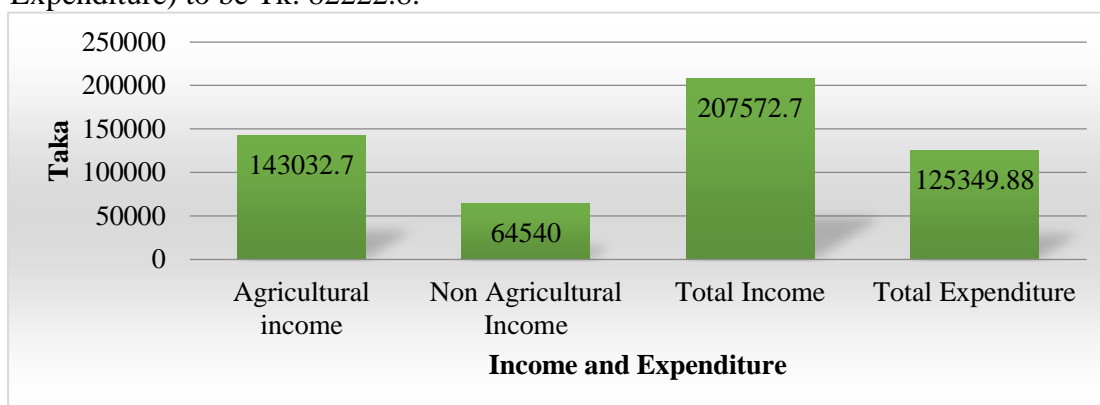
Source: Field Survey, 2021

Figure 4.3: Annual Family Income and Expenditure by Study Area

4.7 Agricultural Training

In Rayer chor village, 68 percent of responding farmers got instruction in tomato growing, compared to 72 percent in Lokkhir chor village and 65 percent in Alkir chor village (Table 4.3). These training sessions broadened their views on a variety of issues, including correct seed handling, the use of resistant cultivars, the application of pesticides and herbicides, and adequate water management, among others. The vast majority of DAE's and BINA's.

Table 4.3: Agricultural Training of the Respondent by Study Area

Training Received	Rayer chor Village		Lokkhir chor Village		Alkir chor Village	
	Number	%	Number	%	Number	%
Yes	17	68	18	72	13	65
No	8	32	7	28	7	35
Total	25	100	25	100	20	100

Source: Field survey, 2021

4.8 Membership of Any Social Organization

On average, 52% of tomato farmers in Rayer chor village are members of various non-governmental organizations (NGOs) and/or farmers' organizations, whereas 40% of tomato farmers in Lokkhir chor village are members of various NGOs and/or farmers' organizations, while 45% of tomato farmers in Alkir chor village are members of various social organizations (Table 4.4).

Table 4.4: Membership in Any Organization of the Respondent by Study Area

Membership	Rayer chor Village		Lokkhir chor Village		Alkir chor Village	
	Number	%	Number	%	Number	%
Yes	13	52	10	40	9	45
No	12	48	15	60	11	55
Total	25	100	25	100	20	100

Source: Field survey, 2021

CHAPTER V
PROFITABILITY OF TOMATO CULTIVATION

5.1 Introduction

The major goal of this chapter is to examine the costs, returns, and profitability of tomato production. This is accomplished via a series of case studies. Profitability is a significant consideration when deciding whether or not to plant a certain crop on a small farm. It may be defined in terms of net return, gross margin, and return on total cost, among other metrics. The total cost of production was calculated by adding up the expenditures for all of the items. The crop returns have been estimated based on the values of the main products and by-products produced in the field.

5.2 Profitability of Tomato Cultivation

5.2.1 Variable Costs

Cost of Land Preparation

The preparation of the land is the most critical step in the manufacturing process. Land preparation efforts included plowing, laddering, and other tasks necessary to prepare the land for tomato agriculture. Thus, the average cost of land preparation for tomato cultivation was determined to be Tk. 8012.68 per hectare, or 3.04% of the overall cost (Table 5.1).

Cost of Hired Human Labor

Human labor is a significant cost component of the manufacturing process. It is a critical and widely utilized input in the cultivation of Tomato. It is often needed for a variety of tasks including land preparation, seeding, weeding, fertilizer and pesticide treatment, irrigation, harvesting and hauling, threshing, cleaning, drying, and storage. The average amount of hired human labor utilized in tomato cultivation was determined to be around 140 man-days per hectare, with an average wage of Tk. 400 per man-day. As a result, the entire cost of contracted human labor was determined to be Tk. 56000, or 21.26% of the overall cost (Table 5.1).

Cost of Seed

Seed prices vary significantly according on its quality and availability. Farmers used an average of 83.21 kg seed per acre. The overall cost of sucker per hectare for tomato

cultivation was calculated to be Tk. 4327.13, or 1.64 percent of the total cost (Table 5.1).

Cost of Urea

In the study area, farmers used different types of fertilizers. On an average, farmers used urea 554.58 kg per hectare. Per hectare cost of urea was Tk. 9427.81, which represents 3.58 percent of the total cost (Table 5.1).

Cost of TSP

Among the different kinds of fertilizers used, the rate of application of TSP was 442.56 kg. The average cost of TSP was Tk. 15047.15 which representing 5.71 percent of the total cost (Table 5.1).

Cost of MoP

The application of MoP per hectare was 269.58 kg. Per hectare cost of MoP was found Tk. 4043.69, which represents 1.54 percent of the total cost (Table 5.1).

Cost of DAP

The application of DAP per hectare was 369.95 kg. Per hectare cost of DAP was found Tk. 5919.21, which represents 2.25 percent of the total cost (Table 5.1).

Cost of Sulphate

The application of Sulphate per hectare was 185.21 kg. Per hectare cost of Sulphate was found Tk. 27781.42, which represents 10.55 percent of the total cost (Table 5.1).

Cost of Material Cost

Material Cost is a significant cost component of the manufacturing process. It is often needed for a variety of tasks including polythene, nilon twist, bamboo cost and others cost. The average material cost for Tomato cultivation was found to be Tk. 78793.94 which was 29.91 percent of the total cost (Table 5.1).

Table 5.1: Per Hectare Costs of Tomato Cultivation

Cost Items	Quantity (Kg/ha)	Price Per Unit (Tk.)	Costs/Returns (Tk./ha)	% of total
A. Gross Return				
Main product	15354.12	40	**614164.80**	100.00
Total return			**614164.80**	**100.00**
B. Gross Cost				
C. Variable Cost				
Land Preparation Cost			8012.68	3.04
Hired labor (man Days)	140	400	56000.00	21.26
Seed	83.21	52	4327.13	1.64
Urea	554.58	17	9427.81	3.58
TSP	442.56	34	15047.15	5.71
MOP	269.58	15	4043.69	1.54
DAP	369.95	16	5919.21	2.25
Sulphate	185.21	150	27781.42	10.55
Cow dung	2666.37	1.5	3999.55	1.52
Material Cost			78793.94	29.91
Insecticides			17600.20	6.68
Irrigation			10281.87	3.90
Total Variable cost (TVC)			**241234.70**	**91.58**
D. Fixed Cost				
Land use cost			7958.34	3.02
Family labor	60	200	12000.00	4.56
Interest on operating capital			2235.35	0.85
Total Fixed cost (TFC)			**22193.69**	**8.42**
E. Total costs (TC)			**263428.30**	**100.00**

Source: Field survey, 2021

Cost of Insecticides

Farmers used different kinds of insecticides to keep their crop free from pests and diseases. The average cost of insecticides for Tomato cultivation was found to be Tk. 17600.20 which was 6.68 percent of the total cost (Table 5.1).

Cost of Irrigation

Irrigation is one of the most significant expenditures associated with tomato cultivation. Irrigation is critical for tomato cultivation. Irrigation costs averaged Tk. 10281.87 per heater, accounting for 3.90 percent of the overall cost (Table 5.1).

Cost of Cow dung

Farmers in the research region employed cow dung to produce their businesses. They purchased a substantial amount of cow excrement from milk producers. It was discovered that the cost per hectare is around Tk. 3999.55, which equals 1.52 percent of the overall cost (5.1)

Total Variable Cost

Therefore, from the above different cost items it was clear that the total variable cost of Tomato cultivation was Tk. 241234.70 per hectare, which was 91.58 percent of the total cost (Table 5.1).

5.2.2 Fixed Cost
Land Use Cost

The rental value of land was determined using the opportunity cost of land usage per hectare during a four-month cropping cycle. The cash rental value of land was used to calculate the cost of land usage. Land usage cost was determined to be Tk. 7958.34 per hectare using data acquired from tomato producers, accounting for 3.02 percent of the overall cost (Table 5.1).

Interest on Operating Capital

It is worth noting that interest on operating capital was determined by factoring in all operational expenditures incurred throughout Tomato's cultivation period. Interest on operating capital for tomato cultivation was approximated at 9% and Tk. 2235.35 per hectare was computed, representing 0.85% of the total cost (Table 5.1).

Cost of Family Labor

The quantity of human labor required in tomato cultivation was 60 man-days per hectare (Table 5.1). The overall cost of human labor was calculated to be Tk. 12000.00, representing 4.56 percent of the total cost of Tomato cultivation (Table 5.1).

5.2.3 Total Cost (TC) of Tomato Cultivation

Total cost was calculated by adding all the cost of variable and fixed inputs. In the present study per hectare total cost of producing Tomato was found to be Tk. 263428.30 (Table 5.1).

5.2.4 Return of Tomato Cultivation
Gross Return

The return on tomato cultivation per hectare is given in Table 5.2. The gross return per hectare was computed by multiplying the total quantity of product by the per-unit price. As a result, the total return on investment was determined to be Tk. 614164.80 per hectare (Table 5.2).

Table 5.2.4: Per Hectare Cost and Return of Tomato Cultivation

Cost Item	Cost/Returns (Tk/ha)
A. Gross Return	614164.80
B. Variable Cost	241234.70
C. Fixed Cost	22193.69
D. Total costs	263428.30
E. Gross Margin (A-B)	372930.10
F. Net Return (A-D)	350736.00
G. Undiscounted BCR (A/D)	2.33

Source: Field survey, 2021

Gross Margin

Gross margin is the gross return over variable cost. Gross margin was calculated by deducting the total variable cost from the gross return. On the basis of the data, gross margin was found to be Tk. 372930.10 per hectare (Table 5.2).

Net Return

Net return or profit was calculated by deducting the total cultivation cost from the gross return. On the basis of the data the net return was estimated as Tk. 350736.00 per hectare (Table 5.2).

5.3 Benefit Cost Ratio (Undiscounted)

Benefit Cost Ratio (BCR) is a relative measure, which is used to compare benefit per unit of cost. Benefit Cost Ratio (BCR) were found to be 2.33 which implies that one-taka investment in Tomato cultivation generated Tk. 2.33 (Table 5.2). From the above calculation it was found that Tomato cultivation is profitable in Bangladesh.

CHAPTER VI
MAJOR FACTOR AFFECTING IN TOMATO CULTIVATION

Human labor, mechanical power, sucker, urea, TSP, mop, and irrigation were the primary inputs utilized in tomato cultivation in the study area. Other important inputs were fertilizer and pesticides. In the research of the tomato cultivation function these inputs were employed as explanatory variables to help explain the results. As a consequence, it is hypothesized that these inputs are responsible for the variation in tomato yield. As a consequence, a Cobb-Douglas production function was used to determine probable connections between tomato cultivation and inputs, and the results were published in Science.

6.1 Interpretation of Cobb-Douglas Production Function

The construction of a mathematical equation for the sample data, known as the likelihood function, is the first step in the process of maximum likelihood estimation. It is defined as the probability of getting a collection of data based on the probability distribution model that has been chosen for collecting that collection of data. This phrase contains the parameters of the model that are unknown at this time. Maximum Probability Estimates, often known as MLEs, are the values of these parameters that maximize the likelihood of the sample being correct.

Table 6.1 presents the maximum likelihood estimates for the Cobb-Douglas production function model of tomato growing for all farmers as calculated using the maximum likelihood method.

Table 6.1: Estimated values of the co-efficient and related statistics of Cobb-Douglas production model

Variables	Parameter	Co-efficient	Standard Error	T-value
Intercept	β_0	8.854***	.857	10.33
Labor Cost (X_1)	β_1	0.001	0.002	0.31
Cost of Seed (X_2)	β_2	-0.044**	0.014	-2.56
Cost of Urea (X_3)	β_3	0.19**	0.053	2.04
Cost of TSP (X_4)	β_4	0.056	0.035	1.59
Cost of MoP (X_5)	β_5	0.003	0.004	0.81
Cost of DAP (X_6)	β_6	0.136**	0.052	2.60
Cost of Material Inputs (X_7)	β_7	0.22***	0.052	4.22
Irrigation Cost (X_8)	β_8	-0.006	0.005	-1.22
Pesticide Cost (X_9)	β_9	-0.008*	0.004	1.91
R^2		0.60		
F-Value		44.86***		
Returns to scale ($\sum bi$)		0.548		

Note: *** = Significant at 1% level, ** = Significant at 5% level, * = Significant at 10% level

As indicated by the F-values and R^2, the Cobb-Douglas model performed well in terms of matching the data. R^2 values of 0.60 were found for tomato producers. Tomato cultivation was shown to be 60% more variable when the explanatory variables were included. The effect of stated factors on tomato production may be seen in the regression equation estimates, which are derived from the regression equation. For tomato growers, the results show that the co-efficient of material input cost was

significant at the 1% level, the cost of seed, the cost of urea, and the cost of DAP were significant at the 5% level, and the cost of pesticide was significant at the 10% level, but the co-efficient of labor cost, the price of TSP, the price of MoP, and the price of irrigation did not have the predicted sign (Table 6.1). Aside from that, the F-value of the equation was statistically significant at the 1% level of significance. This suggests that the explanatory variables in the model account for the majority of the variation in tomato cultivation.

Labor Cost

The value of the cultivation co-efficient for human labor was 0.001 for tomato. The cultivation co-efficient was positive but not significant.

Cost of Seed

The value of cultivation co-efficient for seed was -0.044 for tomato. The cultivation co efficient was negative but not significant. The negative sign indicates that return from tomato can be increased by reducing cost of seed. The estimated co-efficient -0.044 revealed that 1% increase in cost of seed in the pre-harvesting period with other factors remaining constant, would decrease the gross return by 0.044% up to certain level.

Cost of Urea

The regression co-efficient of urea was 0.19 for tomato growers. The cultivation co-efficient was positive. The positive sign indicates that return from tomato can be increased by using urea. The estimated co-efficient revealed that 1% increase in urea in the pre-harvesting period with other factors remaining constant, would increase the gross return by 0.19% up to certain level.

Cost of TSP

The value of cultivation co-efficient for TSP was 0.056 for tomato. The cultivation co-efficient was positive but not significant.

Cost of MoP

The regression co-efficient of MP was 0.003 for tomato growers. The cultivation co-efficient was positive but not significant.

Cost of DAP

The regression co-efficient of DAP was 0.136 for tomato growers. The cultivation co-efficient was positive. The positive sign indicates that return from tomato can be increased by using DAP. The estimated co-efficient revealed that 1% increase in cost of DAP in the pre-harvesting period with other factors remaining constant, would increase the gross return by 0.136% up to certain level.

Cost of Material Inputs

The regression co-efficient of material input cost was 0.22 for tomato growers. The cultivation co-efficient was positive. The positive sign indicates that return from tomato can be increased by using material inputs. The estimated co-efficient revealed that 1% increase in cost of material inputs in the pre-harvesting period with other factors remaining constant, would increase the gross return by 0.22% up to certain level.

Irrigation Cost

The value of cultivation co-efficient for irrigation was -0.006 for tomato. The cultivation co efficient was negative but not significant.

Pesticide Cost

The value of cultivation co-efficient for pesticide cost was -0.008 for tomato. The cultivation co-efficient was negative. The negative sign indicates that return from tomato can be decreased by using pesticide. The estimated co-efficient -0.008 revealed that 1% increase in pesticide cost in the pre-harvesting period with other factors remaining constant, would decrease the gross return by 0.008% up to certain level.

Returns to scale (∑bi)

The total of all regression coefficients or production elasticity's of the estimated model provides information on the returns to scale, that is, the change in output in response to a proportionate change in all inputs. The total of all of the production coefficients in the equations for tomato growing came to 0.548. This implies that the production function in tomato cultivation has diminishing returns to scale, which means that if all of the inputs listed in the function are raised by 1%, revenue will grow by 0.548%.

CHAPTER VII
PROBLEMS AND CONSTRAINTS OF TOMATO PRODUCTION

Problems:

1. Lack of quality seed;

2. High input cost;

3. Lack of adequate knowledge;

4. High amount of pest and diseases attack;

5. High transportation cost;

6. Low output price; and

7. Storage problem.

Lack of quality seed was one of the most important limitations in producing tomato. About 70% tomato farmers reported that they were cheated by buying costly but less quality seeds from local market or seed dealers. It was evident that advanced agricultural technologies had not been properly introduced. As a result, a large number of farmers have not had adequate knowledge of applying proper doses and methods in producing tomato. Approximately 61% tomato farmers were encountered for both lack of adequate knowledge in farming and attacked by pest and diseases. In case of marketing problems, 64% farmers complained about high transportation cost as a challenge. To minimize transportation cost, farmers always try to sell their product at farm gate. At the harvesting period, large amount of tomato were sold to meet their various obligations as household expenditure and repayment of loan. Because of large amount of supply in harvesting time, they get very low selling price. 56% tomato farmers expected a fair price and storage facility at that period.

CHAPTER VIII

SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1 Summary

This study examines tomato farmer's attitudes in the direction of determinants. Most of the farmers are high threat averse. They aren't involved to take threat in tomato Production. Moreover, tomato farmer hazard mindset is prompted by using extraordinary socio economic elements. Risk choices of farmer's growth with training and schooling at the same time as danger choice decrease with age and experience. As tomato farmers are chance averse, seed advertising and marketing businesses need to be careful earlier than advertising new range seeds. Although crop insurance is not practiced in huge scale, insurance groups can formulate new regulations.

Tomato farmers can be fascinated to open a crop coverage policy. Education of tomato farmers ought to be ensured. Already authorities of Bangladesh has taken many steps to increase farmers schooling. Further steps are wanted to be taken for growing farmers training and their threat choice. Training facility for farmers have to be improved. Availability of first-class schooling for tomato farmers will increase their danger desire. Agriculture officers can encourage elderly farmers to get hold of new technology that reduces farmers threat aversion. In addition, tomato farming inside the selected vicinity of Bangladesh is worthwhile. This look at will enrich the literature of hazard aversion and help to enhance productiveness and profitability of tomato in Bangladesh For mitigating the increasing call for of vegetable in addition to high earnings, excessive nutritive price and the problems of self-employment, vegetable growers are progressively increasing.

So, it's far very important to recognize the potential and production practices observed through the vegetable growers in the socio-economy context of Bangladesh. Jamalpur district was selected purposively as a examine place. Jamalpur sadar upazilla choosen as the examine location. After preliminary visit, three villages particularly Lokkhir chor, Rayer chor and alkir chor were decided on as the examine area. Cobb - Douglas manufacturing function become used to expose the efficiency of tomato manufacturing.

A pattern number of 40 traders have been decided on for the look at from this district, categorized as petty buyers, aratdars, Wholesalers, and stores and every class consisted of 10 individuals Highest percentage of tomato growers alongside with their own family individuals were in middle aged group and lowest percentage have been in vintage aged institution of above 60 years In case of all class of farmers. Among the literate people, 55% of the respondents had been inside the secondary training institution. Lowest percentage (10 %) was within the education institution of higher education degree. In case of all institution of farmers, round 58 % of the own family members were inside the male class in jamalpur district. Highest percent of the family member of tomato grower changed into farmer, which was near about 88%. In the study area, approximately five% of the tomato growers' occupations have been business. 25 % farmers of the all farm category used BADC seed and 75 % farmers amassed seed from the market and no farmers used seed of their own. On a mean, most of the jamalpur respondents carried out 554 kg urea, 442 kg TSP, 269 kg MoP and 2666 kg of cow dung in keeping with hectare, respectively. The highest percent (44%) farmers of the all farm class used extension worker because the foremost source of agricultural related statistics accompanied by TV, NGO and acquaintances. Family hard work cost of Farmers is 26000 Tk/ha, respectively. Per hectare mechanical power value for farms become 6,976 Tk/ha. The seed cost for tomato manufacturing turned into the best (4330 Tk/ha). Stacking is one of the most crucial elements in cultivating tomato. It allows the plant to face nevertheless. The common irrigation fee of various farms for tomato cultivation was 1,466 Tk/ha and insecticide became 1,7600 Tk/ha. Per hectare common overall fee for tomato manufacturing become 2,63,424 Tk/ha. Per hectare gross return of farmers turned into 6,14,164 Tk/ha, respectively. Per hectare net return of farmers became 3,50,736 Tk/ha, respectively. Per hectare Benefit price ratio of farm changed into 2.33, respectively.

Factors affecting the yield and profitability of Cobb – Douglas production feature of tomato. The outcomes of the manufacturing feature show that some of the selected variables, variables namely, price of cloth enter (Tk/ ha) and F value had been huge at 1% level. While .DAP price (Tk/ ha), Urea price (Tk/ha) and seed cost (Tk/ha) had been significant at 5% stage of significance. Pesticide cost(Tk/ha) became substantial at 10% degree of significance. Wastage price became the primary fee item for the wholesalers, while the delivery fee became the fundamental fee items for the stores.

Tomato farmers commonly offered their produce to all of the intermediaries both on the farm yards or within the markets.

8.2 Conclusion

Based on the findings of the study the subsequent conclusions had been drawn. Tomato is one of the major vegetables. It has been cultivated in Bangladesh all over the year.

i. Most of the sample farmers are between 40-60 years.
ii. Agriculture is the main occupation of most of the farmers.
iii. Among the cost items highest cost incurred for human labor. Production cost is higher for large farmers compare to small and medium farmers.
iv. Tomato production is profitable in the study area.
v. BCR is found optimal on the study area.
vi. Most of the inputs had positive effect on the yield of Tomato.

Cultivation of tomato has been located notably profitable for all form of farmers. In this location net return and benefit cost ratio were found maximum in case of small farmers followed by means of medium and large farmers although in a few instances, costs were discovered to be higher in case of small farmers along with family hard work cost. Retailers had the highest interest earnings observed via petty investors, aratdars and wholesalers. The producers and numerous intermediaries have been dropping their interest in commercial tomato cultivation and buying and selling due to low marketplace fee, insufficient facilities inside the marketplace, loss of credit, lack of storage centers, low output rate, lack of financial institution mortgage, lack of processing industry and so forth. The major actors of fresh produce value chain of tomato are identified as tomato producers, local market middlemen/foria, city wholesalers/Arotdar, market retailers and consumers.

8.3 Recommendations

On the basis of the salient findings of the study, certain broad implications that can be derived for policy makers and extension personnel to design suitable development strategy for increasing the tomato production in the study area are indicated here:

a) Fair Price Should be ensured to encourage farmers.

b) Intermediaries involved in marketing should be decreased.

c) Storage facility should be improved.

d) Transportation facility needed.

e) Training facility needed.

f) Farmers should be encouraged to use balanced dose of fertilizers and allocate their resources optimally and timely for increasing tomato yield.

g) To reduce losses, tomatoes have to be transported in plastic casing. Furthermore, plastic casing should be handled carefully to avoid bruising loss.

h) For long transport by track bulk loading must be avoided to minimize the total average loss of tomato.

i) For easy preservation, fresh tomatoes can be processed into pulp that can reduce the losses of fresh tomatoes in peak harvest.

j) For better value addition and flow of benefits to producers, processing of fresh tomatoes would be encouraged.

Further detail study is needed to identify the appropriate practices for loss reduction in handling, transportation, storage and processing of fresh tomatoes in the value chain.

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INTERVIEW QUESTIONS

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An Interview Schedule for the Study Entitled

PROFITABILITY ANALYSIS OF TOMATO CULTIVATION IN SELECTED AREA OF JAMALPUR DISTRICT .

Identification of Respondent:

Name: Village:

Upazilla/Thana: District:

1. Socio-economic Characteristics of Respondent:

Age (Years)	
Main Occupation	
Others Occupation	
Experience in Tomato Cultivation (Years)	

2. Level of education

     Please mention your level of education.

   a) I can't read and write

    b) I can sign only

   c) I have passed… .... class.

3. Family Structure:

Number of Family Member	

Gender:	Male	
	Female	
Number of Children (below 12 years)		
Members involved in agriculture		

Gender code: 1= male, 2= female

4. Land holding and tenancy:

Category of land	Area (acres)
a) Homestead	
b) Own land	
c) Land under sharecropping	
d) Leased out land	
e) Leased in land	
f) Total Tomato cultivated area	
g) Others (specify):	

1 katha= -----------------acres, 1 bigha= ---------------acres, 1 kani=   acres,
1 hactare= -----------------acres, 1 acre= ----------------acres, 1 paki=   acres.

5. Information about annual income from Tomato cultivation:

Items	Quantity (mounds)	Price (Tk/mound)	Total income (Tk.)
Value of Tomato			

6. Availability of cash capital for farming operation: **Yes/ No**

7. If loan is needed, institutional loan is available: Yes/ No

8. Sources of seed:

Owned source seed (kg.)	
Purchased seed (kg.)	
Amount of seeds/seedlings (number/kg/decimal)	
Price of seeds/seedlings (Tk./decimal/kg.)	

9. Inputs use patterns of Tomato cultivation:

    A. Labor cost:

Sl. No.	Items	Family labor (man-days)	Hired labor (man-days)	Labor wage (Tk./man-days)	Total cost (Tk.)
01	Labor for land preparation				
02	Labor for fertilizer application				
03	For carrying farmyard manure and application				
04	Labor for weeding				
05	Labor for irrigation				
06	Labor for pesticide and herbicide application				
07	Labor for harvesting and carrying				
08	Labor for storage				
	Total				

 B. Irrigation cost

Items	Medium or ways (put tick mark)	Cost (Tk./plot)	Total cost (Tk.)

No. of irrigation			
Types of irrigation	STW/ DTW/ Electricity operated/ Surface irrigation		
Cost of fuel/electricity in case of own machine			

C. Fertilizer cost:

Organic fertilizers	
Amounts (Kg.)	
a) Cow dung	
b) Compost	
c) Ash	
d) Vermicompost	
e) Others (specify):	
In organic fertilizers	
Items	Amounts (Kg.)
a) Urea	
b) MoP	
c) TSP	
d) DAP	
e) Gypsum	
f) Zinc sulphate	
g) Magnesium sulphate	
h) Boric acid/Boron	
i) Others (specify):	

❖ Fertilizer price (**Tk./Kg**): Urea-------------, TSP------------, MoP-------------, DAP   , Gypsum-

-----------, Zinc sulphate-----------, Boric acid-----------, Magnesium sulphate--- -------,Compost---------

--, Vermicompost-----------, Farm yard manure --- --.

D. Other costs:

Items	Amounts (kg.) or (ml)	Price (Tk/kg) or (Tk/ml)	Total cost (Tk)
Pesticides			
Herbicides			
Others (specify):			

Name of Enumerator: --

Date: -------/-------/ -------.