FINANCIAL ANALYSIS OF PINEAPPLE CULTIVATION IN SOME SELECTED LOCATIONS OF RANGAMATI DISTRICT OF BANGLADESH

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FINANCIAL ANALYSIS OF PINEAPPLE CULTIVATION IN SOME SELECTED LOCATIONS OF RANGAMATI DISTRICT OF BANGLADESH

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CERTIFICATE

This is to certify that the thesis entitled "**FINANCIAL ANALYSIS OF PINEAPPLE CULTIVATION IN SOME SELECTED LOCATIONS OF RANGAMATI DISTRICT OF BANGLADESH**" 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 **MAHAN CHAKMA**, Registration No. **13-05438** 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:

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Dedicated

to

My Beloved Parents

ABSTRACT

The primary objective of this research was to ascertain the financial impact of pineapple farming on the socioeconomic status of farmers in certain chosen areas in Rangamati district (Naniarchar Upazila & Bandukvanga union). Additionally, the research sought to determine the link between the farmers chosen attributes and their higher revenue from the unit area. The research was undertaken in November and December of 2021. Ninety farmers were chosen at random to form the study's sample. The researcher gathered, compiled, and analyzed data in accordance with the study's objectives. The majority of respondents were of middle age, had a basic education, owned a medium-sized farm and had a modest family size. The farmers reported a high yearly income, a moderate level of organizational engagement, and a moderate level of extension contact. It was discovered that most of farmers had no instruction in pineapple farming. The majority of farmers have adequate understanding about pineapple growing and a good attitude toward it. Banana, turmeric, and ginger are the primary crops intercropped with pineapple to maximize land usage and economic return. The majority of farmers earned a good living from their pineapple growing. The farmer's level of living, housing conditions, and dietary habits have all improved significantly as a result of pineapple cultivation. Cobb-Douglas production function was used to satisfy the objectives. Per hectare variable cost and total cost of production were Tk. 251107 and Tk. 265757 respectively. The average gross return, gross margin and net return were Tk. 605000, Tk. 383893 and 339243. The Benefit Cost Ratio (BCR) for pineapple cultivation was determined 2.28. while the regression coefficients for Labour cost (X1), Urea cost (X2), MOP cost (X4), Harvesting (X6) were all positive and significant at various levels of significance, the coefficients for TSP cost (X3), Hormone cost (X5) and Sucker cost (X7) were not significant. The positive indication shows that the return on pineapple cultivation can enhanced and the negative sign suggests that the return may be decreased, as a result it was discovered that pineapple cultivation was very profitable. Additionally, this research highlighted a number of problems and constrains related with pineapple cultivation. These were classified as economic, technological, social and marketing problems and needs attention of the appropriate authority.

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I am quite appreciative to all of my honored professors for their invaluable instruction, direct and indirect guidance, encouragement, and cooperation during the duration of my studies.

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June 2021

MAHAN CHAKMA

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ACRONYMS AND ABBREVIATIONS

BARC :Bangladesh Agricultural Research Council

BB :Bangladesh Bank

BBS :Bangladesh Bureau of Statistic

BCR :Benefit Cost Ratio

BER :Bangladesh Economic Review

DAE :Department of Agricultural Extension

DoF :Department of Fisheries

EU :European Union

et al. :and others (at elli)

FFP :Fourth Fisheries Project

FRI :Fisheries Research Institute

GDP :Gross Domestic Product

GNP :Gross National Product

GR :Gross Return

IOC :Interest on Operating Capital

kg :Kilogram

MFC :Marginal Factor Cost

MPP :Marginal Physical Product

MT :Metric Ton

MVP :Marginal Value Product

MV :Modern Varieties

NGOs :Non Government Organizations

No. :Number

OC :Operating Capital

SPSS :Statistical Package for Social Sciences

SSC :Secondary School Certificate

sq. km :Square Kilometer

TC :Total Cost

TFC :Total Fixed Cost

Tk. :Taka

TVC :Total Variable Cost

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Bangladesh is mostly an agricultural country, with crop production dominating. Agriculture is the backbone of Bangladesh's economy. Bangladesh has a subtropical monsoon climate in general. Sunlight and enough and conserved soil moisture promote crop development both in the summer and winter. Indeed, crops may be observed in the field all the year. She is renowned for cultivating a diverse range of tropical crops, most notably rice, wheat, potato, jute, legumes, and oilseeds. Bangladesh, known for its pineapple, sugarcane, and tobacco, is one of the world's most densely inhabited countries, with a population of approximately 165 million (BBS 2022). The population grows at a rate of around 1.08 percent each year, and the male-female ratio is 99:100 overall (GOB 2003). Around 33.7 percent of the population lives in severe poverty, as defined by their daily calorie consumption. The nation has a land area of 147.570 square kilometers. Due to population growth, the available farm land area per capita is around 0.052 hectare (BBS 2021).

While agriculture is the country's primary industry, it does not provide enough food to feed the enormous population or generate enough foreign money to pay for the purchase of other necessities. As a result, it is clear that Bangladesh's agricultural sector need growth in order for the country's inhabitants to live a better life. Bangladesh has an area of about 14.29 million hectares, of which 59.8 percent is farmed, 13.8% is forest, and the remaining 18 percent is covered by homesteads, rivers, tidal creeks, lakes, ponds, and highways, among other things (BBS 2021). As a result, there is minimal room for increasing agricultural production via the addition of additional land to cultivation. Increased agricultural production, however, is possible with the use of High Yielding Varieties (HYV) and enhanced cultivated management methods.

Pineapple (Ananas comosus L.) Merr.) belongs to the family Bromeliaceae. It is known as the queen of fruits because of its excellent flavor and taste. According to Ubi et al. (2005), the pineapple plants are drought tolerant and well adapted to the tropical sandy soils with pH ranging from 4.5 to 6.5. The plants are propagated from suckers or from the crowns, which grow on top of the fruit. It is one of the most important commercial fruit crops in the world available throughout the year.

Fruits play a vital role in the overall economic performance of Bangladesh. The production of fruits including pineapple is increasing day by day in Bangladesh. Among all the fruits produced in the country, pineapple ranks 3rd in terms of total cropping area and production. During 2018-19, total production of pineapple in the country was 217439 metric tons which was decreased to 208141 metric tons during 2020-21 (BBS 2021).

1.2 Pineapple as A Human Diet

In Bangladesh, ripe pineapple is often enjoyed as a dessert. Additionally, green pineapple is used to make pickles. However, the majority of pineapple consumed worldwide is processed. After extracting the juice, the residue is utilized as cattle feed, as are the sensitive leaves. Numerous culinary products such as squash, syrup, and jelly are made from pineapple, as are vinegar, alcohol, citric acid, and calcium citrate. Additionally, pineapple is indicated as a medicinal diet for some ill individuals. Apart from these, canned pineapple is available. The fruit core is used to make confectionery, while the leaves contain 2-3% of strong white silky threads that measure 38-39 cm in length and are used to make a fine fabric called pina cloth.

1.3 Composition of Pineapple

Pineapple is a readily available source of several dietary elements and minerals. It is an excellent source of vitamins A, B, and C. It is calcium, iron, and phosphorus fortified. A ripe pineapple has 13% sugar and 6% citric acid. Bromelin is a proteolytic enzyme found in fresh pineapple. Chlorophyll is abundant in pineapple leaves. Its nutritional content may vary according to variety, cultivation location, and growing season. The nutrients contained in a typical fruit per 100 g of edible part are listed in (Table 1.1)

Table 1:1 Average Nutrients Per 100gm of Edible Portion of Pineapple

Name of ingredient	**Amount**
Food energy (k.cl)	39.00
Moisture (gm)	89.00
Protein (gm)	0.60
Lipid (gm)	9.60
Fiber (gm)	0.50
Ash (gm)	0.40
Calcium (gm)	13.00
Phosphorus (gm)	17.00
Iron (gm)	0.80
Sodium (gm)	2.00

Potassium (gm)	200.00
Thiamine (gm)	0.60
Riboflabin (gm)	0.03
Niacin (gm)	0.30
Ascorbic acid (gm)	12.00
Minerals (gm)	0.4-.06
Carbohydrate(gm)	1.5-12.5
Vit-A (IU)	59-61
Vit-B (gm)	120-121
Vit-C (gm)	62-64

Source: BBS 2020

1.4 Pineapple Production in Bangladesh

Although Bangladesh is not a tropical country, but the climate conditions and the soil of many parts of Bangladesh are suitable for pineapple production. It is widely cultivated in the districts of Sylhet, Moulvibazar, Chittagong hill tracts, Dhaka and Tangail.

Table 1:2 Area and Production of Pineapple of Bangladesh And Rangamati District

Year	**Bangladesh**			**Rangamati**		
	Area (ha)	**Yield per hectare (kg)**	**Production (MT)**	**Area (ha)**	**Yield per hectare (kg)**	**Production (MT)**
2018-19	14892.43	5909	217439	1346.80	7583	25235
2019-20	15047.02	5864	218048	1337.89	7613	25170
2020-21	13859.13	6077.73	208141.88	1341.13	7592	25160

Source: BBS 2021

1.5 Variables of Pineapple

At least ninety varieties of pineapple are cultivated in the World. In Bangladesh however, there are only three varieties of pineapple are grown. The three varieties are Giant Kew, Honey Queen and Ghorasal. In the study area, mainly giant Kew variety of pineapple has intensively been cultivating by the farmers for the last few years. Apart from this variety, one local variety is available: its name is ‘Asshina’ which is by a few farmers of the study area.

1.5.1 Giant kew

This variety is grown intensively and is suitable for canning industry. It is a late fruiting variety. It may be noted here that, it is locally called 'Bilati. The size of fruits is quite large with an average weight varies from 2.0 to 4.0 kg. The color of fruits when unripe is dark blackish green, but orange yellow with some green mottling when ripe. The shape is cylindrical with slight tapering at the crown. eyes brood and shallow.

1.5.2 Honey queen

This is an outstanding variety. This variety is mainly cultivated in the hilly areas of Chittagong hill tracts, Moulovi Bazar, Sylhlet, Hobiganj and Comilla district. The plant, fruits and shoots of this variety are smaller than Gaint Kew. The size of the fruit is small with average weight of 1.25 kg and range varying from 1.0 to 2.0 kg, Fruits are almost cylindrical, fruit lets are smaller, and the center or nipple is elevated. The color of ripe fruit shell is golden. It contains relatively less juice than that of the Giant Kew. The sugar and acid contents are slightly lower than that of the Giant Kew. This variety is widely in the study area.

1.5.3 Ghorashal

It is a mid-season variety and fruits are of medium size on an average weight of 1.50 kg. In this variety, there are two types of pineapple, one is yellow and another is one red skin to look at. The eyes of the fruit are comparatively flattening. The skin of the fruit is reddish orange in color and he fruit shell is whitish yellow. The taste of the fruit is poorer than Honey Queen and Giant Kew. This variety is mainly cultivated at Ghorashal and other nearer areas.

1.6 Justification of the Study

In Bangladesh, where the average farm size is quite small in terms of acreage, it is possible to achieve high return from small acreage. An acre of land that may not produce cereals worth Tk. 5000.00 may bring Tk. 30000.00 through the production of pineapple (Uddin 2014). If a farmer has enough money to invest and his land is for pineapple cultivation, he can grow pineapple without any hesitation Pineapple is a delicious nutritious fruit. Pineapple is extensively produced in Bangladesh but mostly without proper care. In this country, the pineapple however is grown in limited area on commercial basis. However, there is a demand for pineapples almost all over the country. Production is, therefore, very important for pineapple to reach from primary producers to ultimate consumers. Unfortunately, no special program has taken by the Government of Bangladesh in this regard.

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1.7 Objectives of the Study

The specific objectives of the Study are:

a. To identify some socio-economic characteristics of pineapple growing farmers
b. To analyze the profitability of pineapple cultivation in the study area
c. To determine the major factors affecting the gross return of pineapple cultivation
d. To identify the major problems of the cultivation of pineapple in the study area

1.8 Organization of the Study

The background, origin and production of pineapple in the World and Bangladesh, varieties of pineapple and objectives of the study are described in Chapter one. The second Chapter the review of literature. The third Chapter covers the research methodology. Chapter four describes the socio-economic characteristics of the farmers. Chapter five comprises the profitability of pineapple cultivation. Chapter six major factor affecting in the pineapple cultivation. Chapter seven describes the problems constraints of pineapple cultivation. Chapter eight contains summary, conclusion and recommendations of the study.

CHAPTER II

REVIEW OF LITERATURE

The number of small-scale commercial pineapple farmers has been declining in recent years in various regions of Bangladesh. Historically, pineapple was planted in homestead areas, with some farmers farming pineapple as a field crop. However, farmers are no longer planting pineapples on a wide scale because they are unwilling to take a risk, and selling pineapple is particularly difficult due to perishability. This nation has undertaken just a few economic researches on pineapple cultivation to date. However, this chapter makes an effort to evaluate some of the research relevant to the current topic.

Akter (2020) found that the estimated technical efficiencies of the sampled farmers' range from 61.61% to 99.95% with the mean technical efficiency of 91.14%. The result suggests that, on an average, farmers in the study area can potentially increase their productivity by 8.86% through more efficient use of inputs. The estimated stochastic production frontier model indicates that input variables such as area, tillage cost, seedling cost and human labour cost were statistically significant variables to increase the quantity of pineapple production.

Baruwa (2013) indicated that majority of the farmers were males, aged 53.7 years on average and engaged full time in pineapple production. The modal level of farmer's education was primary. The average period of experience in pineapple farming was 13.5 years. The gross margin and net profits in Naira (Nigerian currency) were N182 725 and N162 045, respectively. The questionnaire in the study contained the most serious problems confronting pineapple farmers: limited availability of high-quality planting materials, high fruit perishability, low fruit prices, low access to credits and plant diseases. Availability of high yielding pineapple varieties, establishment of cold storages to reduce fruit perishability, agricultural price support programs, easier access to credit from formal sources and farmers' education were considered essential to improve productivity and profitability of pineapple production in Nigeria.

Baten (1992) found that net return per acre of producing pineapple per year was TK. 9683.28 and cost was TK. 9121.00. The study identified various problems like transportation, bad communication system, lack of capital and lack of storage and marketing facilities.

Esobhawan et al. (2014) found that the pineapple production was profitable for the genders, with a mean net income of N503,140.94 and N664,154.55 per hectare accruing to the male and female farmers respectively. It was revealed that the business was quite feasible for the genders with the males, having net returns on investment of 272.44% and the females having 196.80% as the net returns on investment. The productivity analysis showed that hired labour, miscellaneous operating expenses and marketing cost were the main productive resources for the males while family labour, hired labour and marketing cost were the main productive factors for the females.

Hoque (2019) revealed that sole pineapple, pineapple-papaya and pineapple-banana-arum cultivation in the study areas were profitable, among which, pineapple-papaya cultivation was relatively more profitable than the two other patterns. It was evident from Cobb-Douglas type production function that seed, human labour, fertilizer, insecticide, power tiller, and manure had a significant impact on gross return from sole pineapple, pineapple-papaya, pineapple-banana-arum production.

Kahinde et al. (2021) found that pineapple production was profitable with a Benefit-Cost Ratio (BCR) of 2.31. The study also revealed that the costs of transportation, labor, fertilizer, and pesticides significantly influenced the production profit at a 1% probability level.

Nishat et al. (2021) revealed that per acre total cost were estimated Tk. 16,5477 and Tk.16,4285.66, respectively for non-adopters and adopters of chemical free pineapple production. The per acre gross returns of pineapple were determined in this study at Tk. 31,7995.2 for non-adopters and Tk. 40,2986 for adopters of chemical-free pineapple producing technology. Gross margin per acre was estimated Tk. 16,1518.2 for non-adopters and Tk. 24,6700.35for adopters, respectively. Thus, the net return per acre were Tk. 15,2518.2 for non-adopters and Tk. 23,8700.34 for adopters of chemical free technology of pineapple production. The undiscounted Benefit Cost Ratio on the basis of total cost was 1.92 for non-adopters implying that Tk. 1.92 would be earned by investing every Tk. 1.00 in conventional pineapple production and BCR was estimated 2.45 for adopters implying that Tk. 2.45 would be earned by investing every Tk. 1.00 in chemical free pineapple production. Binary Logit regression estimate suggest that ethnicity and gross margin had a substantial impact on the adoption of this chemical-free technology. The majority of the farmers had a relatively good attitude toward chemical-free pineapple cultivation, according to the results. Extension agents must

increase their contact with farmers in order to effectively disseminate information about chemical-free pineapple farming.

Rahman (1994) found that per acre cost of production per year was TK. 4596.00 per acre net return for the pineapple producer was to be TK. 13,332.00.

Saha (1989) found that the net income per hectare was TK. 27,001.00 for producing pineapple. The net margin of Beparis was Tk. 52.00 per hundred pineapples, whereas retailers net margin was Tk. 100.00 per hundred pineapples. The study identified various problems in the production and marketing of pineapple. Majority of the producers sold their product before harvest. The advanced selling was caused by pressing need for cash to maintain their family. Majority farmers did not follow grading practices. Due to lack of adequate transport, storage and processing facilities, a large volume of the products was destroyed causing huge loss to the producers.

Sarker (1996) observed that, on average income from fruit was TK. 18159.80 per acre per year, and average net return per year of the producing pineapple was TK. 10183.44. He identified some production problems such as lack of capital, high price of inputs and inadequate supply of fertilizer, lack of scientific knowledge regarding the production of pineapple technology and sufficient management of farms.

Sultan et al. (2018) showed that total cost incurred for producing Pineapple mono crop, Pineapple+Papaya and Pineapple+Banana+Aroid were Tk.312849.72, Tk.395894.01 and Tk.377013.25 per hectare respectively. Per hectare net return for Pineapple + Papaya and Pineapple + Banana + Aroid production were Tk.492111.00 and Tk.195704.75 which were higher than that of Pineapple mono crop (Tk.157675.28). On the other hand, BCR for Pineapple + Papaya and Pineapple + Banana + Aroid production were 2.24 and 1.52 which were higher than that of Pineapple mono crop (1.50). It represents that both pineapple mono-crop and pineapple inter-crops production are profitable among them Pineapple-inter crops cropping pattern is more profitable then Pineapple-mono crop. About 80% of pineapple growers grow papaya, banana, zinger, turmeric and aroids as intercrops with pineapple. The study identified some crucial problems and probable solutions suggested by the farmer.

Uddin et al. (2022) revealed that the pineapple production was profitable and the total value added by the stakeholders to a piece of pineapple was Tk. 38. Among the market actors, wholesalers added the highest value of Tk. 13 per piece (34.2% of total value

addition). He also identified six significant factors, namely, income, farming experience, credit access, market price, labor availability, and lower production of paddy having positive influence on farmers' decision to adopt pineapple production. He also found higher price of inputs, lack of preservation and processing facilities, and lack of operating capital as the major problems for production, value addition, and marketing of pineapple, respectively.

A general survey of the relevant literature reveals that a few studies on pineapple cultivation have been conducted in different areas of Bangladesh but not specifically in Rangamati district. Therefore, the present study attempts to analyze the financial analysis of pineapple cultivation in some selected areas of Rangamati district. It is also found that almost half of the total sample farmers are illiterate and have primary level of education, hence most of the farmers does not have scientific knowledge regarding pineapple cultivation which led to decrease productivity and net return per hectare of land.

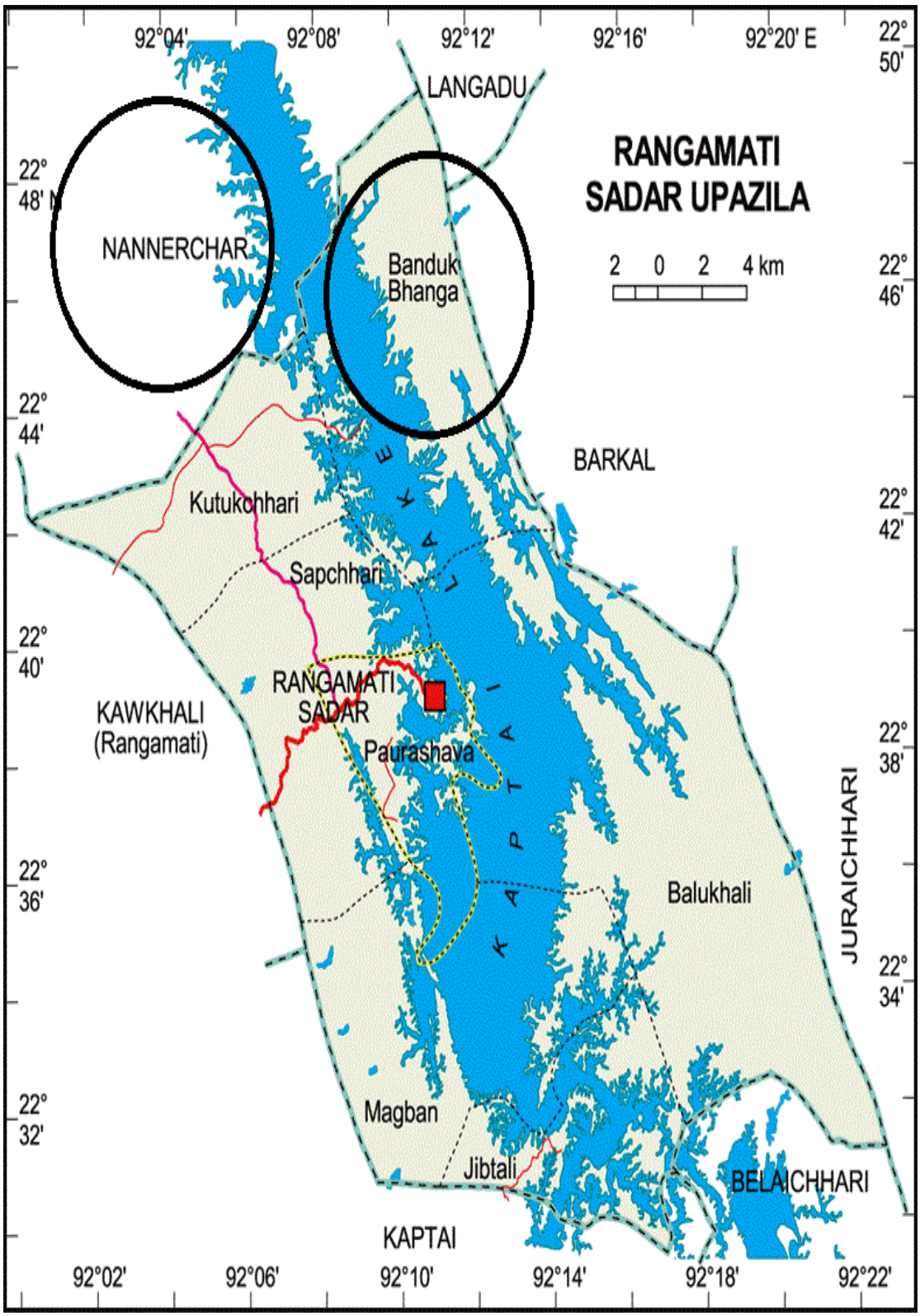
CHAPTER III

METHODOLOGY

To attain the objectives of the study, methodology is very essential. The purpose of this chapter is to describe the study area, research design and the procedures used to collect and analyze the data for answering the research questions. The study was conducted based on primary data collected through farm survey by using a suitable pre-tested questionnaire from Rangamati in Bangladesh during December 2021.

3.1 Location of the Study Area

Selection of the study area is very important to fulfil the study objectives. Pineapple is extensively cultivated in most part of Chittagong Hill Tracts as Rangamati, Khagrachari and Bandorban. So Rangamati district was selected purposively as the study area. Nainachar upazila and Bandukvanga union of Rangamati district was the main study area. Two unions of Naniarchar upazila Burighat and Ghilachari and ten villages from each of the two unions namely Islampur, Bogachari, Sikolpara, Soridashpara, Ramhoripara, Hatimara, Patachari, Hajachari, Boradam, Shoileschari and another location Bandukvanga union villages are Tingojje para, Kuramara, Mog para, Uluchari etc. were selected as the locale of the study. For further clarity about the locale of the study, a map of Naniarchar upazila and Bandukvanga union showing the study area has been presented in (Figure 3.1).



Source: Internet

Figure 3.1 Map of Naniarchar upazila and Bandukvanga union under Rangamati Sadar upazila showing a part of the study area

3.2 The Main Criteria Behind the Selection of the Location were as Follows:

1. The selected upazila and union was a good pineapple producing area.
2. The topography, soil, and climatic conditions of these four villages of Naniarchar upazila and Bandukvanga union were somehow identical.
3. There was a reasonably good communication system in the area, which facilitated easy movement for the purpose of conducting personal interviews with the sample farmers.
4. Cooperation from the respondents are expected to be high and therefore reliable data are expected to be obtained.
5. The researcher is familiar with the language, living, beliefs and other socioeconomic characteristics of the villages.
6. Previously such type of study was not conducted in this area.

3.3 Selection of Sample and Sampling Technique

It was not possible to interview all the pineapple producing farmers due to limitation of time and funds. For this reason, a reasonable size of sample farmers was chosen. Before collecting data, a list of the pineapple producers was collected from the local Block Supervisor (BS). After this, 90 farmers from that list were selected by using simple random sampling technique to fit the objectives of the study.

3.4 Preparation of the Survey Schedule

The survey schedule was planned in accordance with the objectives of the study. At first, a draft schedule was developed before preparing the final one. Since the outcome of survey largely depends on the preparation of the survey schedule, highest care was taken in designing the interview schedule. Before finalization, some of the items in draft interview schedule were improved, rearranged, and modified in the light of practical experience and interaction with the farmers. After necessary adjustment of the interview schedule, a final schedule was developed in a logical sequence. The schedule was developed in a simple manner so that as much as possible accurate information could be obtained. The final survey schedule included the following information:

1. Identification of sample farmers.
2. Farm size and farming experience of the sample farmers.

3. Family size and composition, availabilities and use of family labour and occupation of the sample farmers.
4. Use of materials inputs for pineapple cultivation.
5. Yield, cost and return of pineapple cultivation.
6. Problems faced by the farmers in pineapple cultivation

3.5 Methods of Data Collection

A farm management research involves collection of information from individual farmer. Generally, most of the farmers in Bangladesh do not keep annual or daily transaction of their activities. Hence, it was very difficult to collect actual data and the researcher had to rely completely on the memory of the farmers. To overcome this problem, all possible efforts were made by the researcher himself to ensure the collection of reasonably accurate information from the field. The direct interview method was applied for collection of data. Interviews were normally conducted in farmer houses and markets in their leisure time. Before going to make an actual interview, a brief introduction of the aims and objectives of the study were explained to each farmer. At the time of interview the researcher asked questions systematically and explained whenever necessary in a simple manner and recorded information on the interview schedule. After completion of each interview, the schedule was checked and verified to be sure that every item in the schedule was answered. In order to minimize errors, data were collected in local units, which later were converted into international unit.

3.6 Analytical Techniques

Data were analyzed with a view to achieving the objectives of the study. Several analytical methods were employed in the present study. Tabular method was used for a substantial part of data analysis. This technique is intensively used for its inherent quality of purporting the true picture of the farm economy in the simplest form. Relatively simple statistical techniques such as percentage and arithmetic mean or average were employed to analyze data and to describe socioeconomic characteristics of pineapple growers, input use, costs and returns of pineapple production and to calculate undiscounted benefit cost ratio (BCR). Cobb-Douglas type stochastic frontier production function was used in the present study.

3.7 Profitability Analysis

The net returns of pineapple were estimated using the set of financial prices. The financial prices were market prices actually received by farmers for outputs and paid for purchased inputs during the period under consideration in this study. The cost items identified for the study were as follows-

- ✓ Human labor
- ✓ Fertilizer cost
- ✓ Seedlings/ sucker cost
- ✓ Hormone cost
- ✓ Land use
- ✓ Harvesting, carrying and grading

The returns from the crops were estimated based on the value of main products. In this study variable cost, fixed cost and total cost had been described. Total variable cost (TVC) included human labor, seedlings, organic manure, urea, TSP, MOP, hormone cost, harvesting cost, carrying and grading. Fixed cost (FC) included only rental value of land. Total cost (TC) included total variable cost and fixed cost.

3.7.1 Cost of human labour

Human labor was an important and largely used input for the production of pineapple in the study area. The cost of human labor was measured on the basis of the actual payment made to the labors for working a period of 8 hours in a day. There were two different categories of human labor: (a) family labor for which no cash payment was made and (b) hired labor for which farmers had to pay in cash. Family labor includes the operators own labor and other members of his family, i.e., his brother, children, etc. The labor of women and children has been converted into man equivalent hours by representing a ratio of 2 children hours=1.5 women hour=1 adult male equivalent hour (Miah 1987). In pricing the labor, no distinction was made between the family and hired labor. Family labor was priced at the prevailing wage rate in cash to hired labor. In the study area, wage rate varied with the type of work and working seasons.

In producing pineapple human labor were used for the following operations:

- Land preparation
- Sucker carrying
- Fertilizer carrying
- Transplanting
- Fertilizer, weeding and mulching
- Hormone application
- Harvesting, carrying and grading

Cost of material inputs

The material input costs for pineapple production were specified which is following:

- Cost of sucker
- Cost of fertilizer
- Cost of hormone

3.7.2 Cost of sucker

The most samples used home supplied suckers but, in some cases, the farmers for producing pineapple also used purchased suckers. The cost of purchased suckers was calculated based on actual price paid by the farmers and home supplied suckers were priced at the same rate. It was observed from the field survey that there was a slight variation in the actual price paid by the farmers for sucker.

3.7.3 Cost of fertilizer

It is very important for pineapple cultivation to use the fertilizer in recommended dose. In the study area farmers mainly used three types of chemical fertilizer namely Urea, Triple Super Phosphate (TSP), Muriate of Potash (MP) and Cowdung for growing pineapple production. Fertilizer cost was calculated according to the actual price paid by the farmers.

3.7.4 Land use cost

It is very important for pineapple cultivation to use the fertilizer in recommended dose. In the study area farmers mainly used three types of chemical fertilizer namely Urea,

Triple Super Phosphate (TSP), Muriate of Potash (MP) and Cowdung for growing pineapple production. Fertilizer cost was calculated according to the actual price paid by the farmers.

3.7.5 Interest on operating capital

The cost of land use for different plots was different depending on the location. topography and fertility of the plots. Cost of land use estimated in one of the following three alternatives

i) Foreign incomes from alternative use

ii) Interest on the value of land and

iii) Valuation of land as its rental price

For this study, the third method was used for finding the cost of land, i.e., by taking into account the rental value of land. Land use cost for pineapple cultivation was estimated considering land use over a cultivation period for one year.

3.8 Procedure of Evaluating Costs of Items

Gross Return

Per hectare gross return was calculated by multiplying the total amount of product and by-product by their respective per unit prices.

Gross Return= Quantity of the product * Average price of the product + Value of by-product.

Gross Margin

Gross margin is defined as the difference between gross return and variable costs. Generally, farmers want maximum return over variable cost of production. The argument for using the gross margin analysis is that the farmers are interested to get returns over variable cost. Gross margin was calculated on TVC basis.

Per hectare gross margin was obtained by subtracting variable costs from gross return. That is,

Gross margin = Gross return – Variable cost

Net Return

Net return or profit was calculated by deducting the total production cost from the total

return or gross return. That is,

Net return = Total return – Total production cost.

3.9 Undiscounted Benefit Cost Ratio (BCR)

Average return to each taka spent on production is an important criterion for measuring profitability. Undiscounted BCR was estimated as the ratio of total return to total cost per acre.

BCR = Total return (Gross return)/ Total cost

3.10 Functional Analysis

There is no one function that can be used to describe agricultural productivity under all environmental situations. The algebraic shape and magnitude of the function will change depending on the soil, the kind and variety of crops, the size of other inputs in 'fixed quantities' for the farm, and so on. As a result, a challenge in each investigation is determining the right algebraic form of the function. This is compatible with the observed occurrences. To assess the influence of major factors on pineapple production, the Cobb-Douglas cultivation function was employed. The Cobb-Douglas model's double log form was shown to be the better choice on theoretical and econometric grounds.

The specification of the Cobb-Douglas cultivation function model was as follows:

$$Y_i = \alpha X_{1i}^{\beta 1}\, X_{2i}^{\beta 2}\, X_{3i}^{\beta 3}\, X_{4i}^{\beta 4}\, X_{5i}^{\beta 5}\, X_{6i}^{\beta 6}\, X_{7i}^{\beta 7}\; e^{ui}$$

Where Y is the frontier output, X is physical input, b the elasticity of Y with respect to X, a is intercept and Ɛ = V-U is a composed error term as defined earlier. For simplicity, we have ignored the subscript.

By taking log on both sides, the Cobb-Douglas cultivation function was transformed in to the following logarithmic form because it could be solved by the ordinary least squares (OLS) method.

$$\text{In } Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_s \ln X_5 + U_i$$

The above function is linearized double-log form:

Y = Return per hectare (Tk./ha);

In a = Intercept of the function;

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

X_2 = Cost of Urea (Tk./ha);

X_3 = Cost of TSP (Tk./ha);

X_4 = Cost of MoP (Tk./ha);

X_5 = Cost of Hormone (Tk./ha);

X_6 = Cost of Harvesting (Tk./ha);

X_7 = Cost of Suckers (Tk./ha);

b_1, b_2 ..... b_7= Coefficients of the respective input to be estimated; and

Ui = Error term.

CHAPTER IV

SOCIO-ECONOMIC CHARACTERISTICS OF THE FARMERS

This section deals with the socio-economic characteristics of the sample farmers. To get a complete and accurate scenario of pineapple producing farmers of a particular area, it is required to know these socio-economic characteristics. An effort has, therefore, been made in this chapter to describe briefly some of the basic socioeconomic characteristics of the sample farmers of the study area because people differ from one to another in many respects. Decision making behavior of an individual is determined by his socio-economic characteristics. There are numerous interrelated and constituent attributes that characterize a person and these profoundly influence development behavior. Socio economic characteristics of the producers affect their production process and technology use. It is, however, not an easy task to collect all the relevant information regarding the socio-economic characteristics of the sample farmers due to limitation of time and resources.

4.1 Age Category and Farm Size of the Sample Farmers

The selected pineapple growers of the study area were categorized into three groups according to their age. The young group included the farmers of 25 to 35years. The middle-aged group included the farmers of 36 to 50 years and the old aged group included the farmers of above 50 years. On an average, the highest portion (50%) of the sample farmers were in the middle-aged group (36 to 50 years) followed by 6.67% old aged (above 50 years) and 43.33% young group (25 to 35 years) (Table 4.1).

Table 4:1 Age Distribution of the Sample Farmers

Particulars	**No. of respondents**	**% of respondents**
<35	22	43.33
36-50	56	50.00
>50	12	6.67
Total	**90**	**100.00**

Source: Field Study 2021

4.2 Distribution of Family Members According to Gender

Women in our nation are the most underprivileged one however at today this scenario is changing. About half of the population of our nation is women. So, without their growth, the whole social economic development of our nation is not conceivable. In the current research, involvements of men and women are pineapple farming. It is obvious from the table 4.2 that 70 percent male farmers, 30 percent women farmers have been working for pineapple cultivation.

Table 4:2 Distribution of Family Members According to Gender Group

Particulars	**No. of respondent**	**% of respondent**
Male	60	70
Female	30	30
Total	**90**	**100**

Source: Field Study 2021

4.3 Educational Status of the Respondents

Education is typically viewed as an indication of social betterment of a society. It has a crucially significant role in decreasing poverty and inequality, increasing health and facilitating the application of information. Education means efficiency. Education of farmers helps to boost skill and production as well. Education has a significant function in speeding the pace of agricultural growth and it considerably impacts the degree of acceptance of new technology and increases scientific understanding about farming. It is evident from Table 4.3 that out of 90 sample farmers, 39.17 percent farmers can't read and sign, 28.33 percent farmers can sign only, 15 percent farmers had primary education, 10.83 percent farmers had completed Secondary education, 4.17 percent farmers had completed higher secondary, 2.5 percent farmers had completed their higher education.

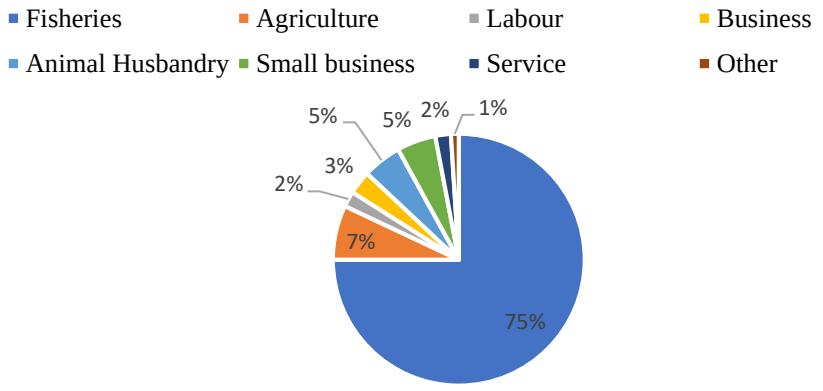
Table 4:3 Distribution of the Sample Farmers According to the Level of Education

Category	**No. of respondent**	**% of respondent**
Can't read and sign	40	39.17
Can sign only	20	28.33
Primary education	10	15.00
Secondary education	13	10.83
Higher secondary	5	4.17
Above higher secondary	2	2.50
Total	**90**	**100.00**

Source: Field Survey 2021

4.4 Occupational Distribution of the Sample Farmers

The job in which a man was engaged more or less throughout the year was recognized as the profession of the individual. The distribution of principal occupation is intriguing since it changes substantially depending on how much they are engaged and what degree of money is made from the current employment. In the current research, the chosen farmers were involved with different sorts of profession along with pineapple cultivation. It was noted that, on the premise of major revenue generating, pineapple farming was the principal profession for pineapple cultivation farmers. Some of them had opportunities to be involved in other pursuits. Occupational status of the sample farmers is indicated in the following figure 1. It is obvious from the data that 75 percent farmers were engaged in pineapple cultivation as a principal vocation. After then agriculture was their second most significant activity. Very few of them were also interested in livestock husbandry, small business and service etc.



Source: Field Study 2021

Figure 4.1 Distribution of the Farmers Based on Main Occupation

4.5 Involvement of Family Members in Pineapple Cultivation

In the present study, involvements of family member in pineapple production were categorized into three categories on the basis of level of engagement of family worker in pineapple farming dignities: 1 worker in pineapple production activity, 2-person workers in pineapple activity and 3-person workers\ in pineapple activity. It is evident from the table 4.5 that 63.33 percent farmers used 3 workers in their farm, 26.67 percent farmers used 2 workers in their farm and only 10 percent farmers used 1worker in their farm. So, the result implies that involvement of family member in pineapple production activities were very high.

Table 4:5 Distribution of the Farmers Based on Family Members Engaged in Pineapple Cultivation Activities

Category	**No. of respondent**	**% of respondent**
1 member in pineapple activity	12	10.00
2 members in pineapple activity	32	26.67
3 or more members in pineapple activity	46	63.33
Total	**90**	**100.00**

Source: Field Survey 2021

4.6 Annual Income of Pineapple Growing Farmers

Level of income of an individual family determines socio-economic status in a society. There are various sources of income. Pineapple farmers were not dependent on pineapple producing alone, rather pineapple producing is simultaneously practiced along with overall producing system such as rice production, pulse production, livestock rearing, poultry rearing, fish farming, fruits production, vegetables cultivation, servicing and business dealing income generating activities. The overall average annual income of the selected pineapple producing household was estimated to

be Tk. 87793 and was compared of 41.76 percent from pineapple production, 9.55%from rice production, 5.73 percent from pulse, 3.19 percent from livestock, 3.01 percent from poultry, 2.86 percent from fisheries, 6.03 percent from fruits, 5.41 percent from vegetables. 8.89 percent from services and 13.53 percent from business. Magnitude of income from pineapple sources across farm categories ranged from a minimum of 36.88 percent in medium farm to a maximum of 45.68 percent in small farm (Table 4.6). Much Frequency of small farm was likely to contribute more as compared to others.

Table 4:6 Average Annual Income of Sample Pineapple Farmers

Income sources	**Amount (Taka)**	**Percentage (%)**
Pineapple	36666	41.76
Rice	8389	9.55
Vegetables	4754	5.41
Livestock	2805	3.19
Poultry	2645	3.01
Fisheries	2513	2.86
Business	11883	13.53
Pulses	5033	5.73
Fruits	5296	6.03
Services	7809	8.89
Total	**87793**	**100.00**

Source: Field Survey 2021

4.7 Sources of Sucker

The highest percentage of medium and small farmers collected their sucker from market but large farmers used their sucker from own source (Table 4.7). Small farmers used 45% of their required sucker from market and 30% from own. Medium farmers used 58% of required sucker from market and 21% from own. Large farmers used 29% of their required sucker from market and 42% from own. On an average 50% of all pineapple producers collected their sucker from market and 27% from own. Therefore, market was the main source of suckers in the study area expected large farmers.

Table 4:7 Distribution of Sample Farmers According to Sources of Sucker

Sources of sucker	**Farm size**						**All farm**	
	small		**Medium**		**Large**			
	Count	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Own	15	30	5	16.7	6	60	26	28.88
Neighbor	9	18	6	20	1	10	16	17.77
Market	23	46	17	56.7	3	30	43	47.77
NGOs	3	6	2	6.7	0	0	5	5.55
Group total	**50**	**100.00**	**30**	**100.00**	**10**	**100.00**	**90**	**100.00**

Source: Field Survey 2021

4.8 Farming Experience of the Sample Farmers

Table (4.8) reveals that three categories of the farming experience of pineapple farmer was low experience farmers, medium experience farmers and high experience farmers were 22, 47 and 21 farmers. Their observed range were 3 to 25 years, mean 8.65 and standard deviation 55.61. So, we can say that the highest farmers were medium experienced.

Table 4:8 Farmers Experience of the Sample Farmers

Categories	**No. of farmers**	**Observed range**	**Mean**	**Standard deviation**
Low Experience (up to 5 years)	22	3-25	8.65	55.61
Medium Experience (6 to 10 years)	47			
High Experience (Above 11 years)	21			
Total	**90**			

Source: Field Survey 2021

CHAPTER V

PROFITABILITY ANALYSIS OF PINEAPPLE CULTIVATION

The main purpose of this chapter is to assess the costs, returns and profitability of growing Pineapple cultivation. Profitability is a major criterion to make decision for producing any crop at farm level. It can be measured based on net return, gross margin and ratio of return to total cost. The costs of all items were calculated to identify the total cost of production. The returns from the crops have been estimated based on the value of main products (pineapple fruit).

5.1 Variable Cost

5.1.1 Cost of human labour

Human labour is one of the most significant variable inputs in the manufacturing process. Human labour is needed for numerous tasks and administration of the chosen farms such as- farm preparation, raising dike, weeding, sorting, grading, harvesting etc. Human work was divided into: (a) hired labour and (b) family labour. It is straightforward to determine hired labour expenses. To assess the cost of family labour, the opportunity cost approach was adopted.

In this research, the opportunity cost of family labour was considered to be as pay rate per man i.e., the wage rate, which the farmers actually paid to the hired labour for working a man-day. The work of women and children was translated into man-equivalent day by proposing a ratio of 2 children day = 1.5 women days = 1-man equivalent day (Miah, 1987). In this research a man-day was deemed to equal 8 hours of labour. For eliminating complication, average rate has been taken into consideration. Labour pay rate fluctuates with regard to various seasons. In the research region it ranged from 200 to 300 Tk. per man-days. Thus, the estimated average rate was Tk. 250 per man-days for pineapple cultivation. On an average per hectare human labour cost was TK. 9250 for all farm categories (Table 5.1).

5.1.2 Cost of sucker/seedlings

The most samples used home supplied suckers but, in some cases, the farmers for producing pineapple also used purchased suckers. The cost of purchased suckers was calculated based on actual price paid by the farmers and home supplied suckers were priced at the same rate. It was observed from the field survey that there was a slight

variation in the actual price paid by the farmers for sucker. The per unit price of sucker is 1 taka only and sometimes below 1 taka or above 1 taka varies on different locations. One-hectare land need 86380 seedlings/suckers. On an average, per hectare sucker cost was Tk 86380 (Table 5.1).

5.1.3 Cost of fertilizer

It is very important for pineapple cultivation to use the fertilizer in recommended dose. In the study area, farmers mainly used types of chemical fertilizer namely Urea, Triple super Phosphate (TSP). Muriate of Potash (MP) and Cowdung for growing pineapple. Fertilizer costs was actual price paid by the farmers. Fertilizer cost was calculated according to the actual price paid by the farmers. The price of urea is 850 Tk per 50 kg (1 bag), so per hectare land needs 1851 kg (per kg 16 Tk) and urea using for 2 times in this selected area for pineapple cultivation. Triple Super Phosphate (TSP) need 925 kg per hectare of pineapple cultivation. The per unit price of TSP was 23 Tk. So, per hectare pineapple cultivation need 21275 Tk. Murate of Potash (MoP) using 35 gm for each seedling and for 1-hectare land (86380 seedlings) need 3023 kg (per kg 18 Tk). Cowdung needs 300gm per seedlings and per hectare land (86380 seedlings) 25914 kg (per kg 1 Tk). Above all, per unit cost of Urea, Triple Super Phosphate (TSP), Muriate of Potash (MOP) and Cowdung is 16 Tk, 23 Tk, 18 Tk and 1.00 Tk. So, per hectare pineapple cultivation fertilizer cost Urea 29616 Tk, Triple Super Phosphate 21275 Tk, Muriate of Potash 54414 Tk and Cowdung 25914 Tk (Table 5.1).

5.1.4 Cost of hormone

In the study area, sample farmers used in hormone for develop of pineapple. Farmers of the study area used hormone for develop pineapple. The value of hormone was calculated at the prevailing market price, which the farmers actually paid. Many farmers however did not have appropriate knowledge about the exact quantity to be applied and brands name of the hormone. Most of the farmers are using Raiphane and Crop care for quick growth and ripening. Crop care price per liter 1000 Tk and Raiphane price is half liter 500 Tk. And Per hectare pineapple cultivable land needs 5758-liter Raiphane. So, cost of hormone 5758 Tk per hectare pineapple cultivation (Table 5.1).

5.1.5 Cost of harvesting, carrying and grading

Harvesting cost are almost same as human labor cost when seedling was planting in the first time. But the carrying and grading cost are different in different locations. In the

location of Naniarchar Upazila, farmers need not go to market for sell their pineapples because of buyers are directly going to field for pineapple fruits. So, the same labors are using for harvesting and carrying pineapple on direct transport activities. The harvesting and carrying cost 250 to 300 Tk per person-days of pineapple cultivation. Another location of Bandukvanga Union, farmers need to go market for selling their productions. They using Boat as a transportation, Tk 1200 per 1500/2000 pineapple fruits. So, in that area harvesting cost, carrying cost need 250 to 500 Tk per person-days of pineapple cultivation. And the cost of harvesting, carrying and grading cost is 18500 Tk per hectare pineapple cultivation (Table 5.1).

5.1.6 Land use cost

Some of the example farmers leased in land for one year and they had to pay a particular amount of money per acre. Other farmers produced pineapple on their own property. Land use cost of pond was assessed at the rate of current cash value of per acre cultivation land in the research region. Some of the example farmers leased in land for one year and they had to pay a particular amount of money per acre. Other farmers produced pineapples on their own property. Land use cost of pineapple cultivation was assessed at the rate of current cash value of per hectare land in the research region. The average cost of land use at full cost was Tk. 9000 and 3.39 percent of total cost (Table 5.1).

5.1.7 Interest on operating capital

It is worth nothing that interest on operating capital was determined by factoring in all operational expenditures incurred throughout pineapple cultivation period. Interest on operating capital for pineapple cultivation was approximated at 9% and Tk. 5650 per hectare was computed, representing 2.13% of the total cost (Table 5.1).

Table 5:1 Average Per Hectare Cost of Pineapple Cultivation

Cost Items	**Quantity**	**Price Per Unit (Tk.)**	**Costs/Returns (Tk ha-1)**	**% of total**
A. Gross Return				
Main product (pineapple)	60000	10	600000	99.17
By-product (sucker)	5000	1	5000	0.83
Total return			**605000**	100.00
B. Variable Cost				
Human labour	37	250	9250	3.48
Seedling/ sucker	86380	1	86380	32.50
Urea	1851	16	29616	11.14
TSP	925	23	21275	8.01
MoP	3023	18	54414	20.48
Cowdung	25914	1	25914	9.75
Hormone			5758	2.17
Harvesting, Carrying & Transportation	37	500	18500	6.96
Total Variable cost (TVC)			**251107**	94.49
C. Fixed Cost				
Land use cost			9000	3.39
Interest on operating capital @ 9%			5650	2.13
Total Fixed cost (TFC)			14650	
D. Total costs (TC)			**265757**	100.00

Source: Field Study 2021

5.1.8 Total cost

In the study area, the total costs varied from year to year. It was observed that the average total pineapple production cost per hectare was Tk. 265757 (Table 5.1).

5.2 Estimation of Returns of Pineapple Cultivation

5.2.1 Total return

Per hectare total return of pineapple production under farms are shown in the (Table 5.1) Total return consisted of the value of main product and by product (sucker). Per hectare total return was calculated by multiplying the total amount of main products and by products by their respective average market price. The average market price of pineapple was Tk 10 per piece and average market price of sucker was Tk 1.00 per piece. Considering all farms total return from pineapple was Tk 605000/hectare. And suckers are selling large farmers whom have above 3/4 hectare of land, they earning profit from those products.

5.2.2 Net return/profit

In general net return/profit is described as entrepreneur's income. To measure the profitability of pineapple cultivation, net return is a significant component. Net return is the difference between total return and total expenses. Per hectare pineapple production net return was calculated at Tk. 339243 which demonstrates that pineapple cultivation is successful business for the pineapple farmers (Table 5.2).

5.3 Benefit Cost Ratio (Undiscounted)

Benefit cost ratio was derived by dividing entire return by total cost or whole cost. It signifies return per taka invested. It helps to assess financial efficiency of the farm. It was obvious from the research that the benefit cost ratio of pineapple cultivation was calculated for 2.28 meaning that 1 Tk investment in pineapple cultivation generated Tk 2.28. So, the pineapple cultivation was proved to be beneficial for farmers (Table 5.2).

Table 5:2 Average Returns of Pineapple Cultivation and BCR (Benefit Cost Ratio)

Cost Item	**Cost/Returns (Tk./ha)**
A. Gross Return	605000.00
B. Variable Cost	251107.00
C. Fixed Cost	14650.00
D. Total Costs	265757.00
E. Gross Margin (A-B)	353893.00
F. Net Return (A-D)	339243.00
G. Undiscounted BCR on full Cost basis (A/D)	2.28
H. BCR on cash cost basis (A/B)	2.41

Source: Field Study 2021

5.4 Concluding Remarks

From the above discussion it is easy to understand about the different cost items and their application doses of farmers, yields and returns per hectare of pineapple cultivation. Pineapple production is a labor-intensive enterprise. It is most essential to use modern inputs such as seeds, fertilizers, human labor, proper use of hormone and irrigation efficiently. Timely and efficient use of these inputs are the most important to increase production and profitability. On the basis of above discussions, it could cautiously be concluded here that cultivation of Pineapple is a profitable. Cultivation of Pineapple would help farmers to increase their income earnings.

CHAPTER VI

MAJOR FACTOR AFFECTING IN PINEAPPLE CULTIVATION

Human labour, cost of urea, cost of TSP, cost of MoP, cost of hormone, cost of harvesting, cost of sucker were the major inputs used in pineapple cultivation in the research region. These inputs were used as explanatory factors in the pineapple cultivation function study to help explain the findings. So, it is theorized that these inputs were responsible for pineapple cultivation variance. As a result, a Cobb-Douglas production function was used to estimate likely relationships between pineapple output and inputs, with the findings reported in study.

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 pineapple 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	Coefficients	T value
Stochastic Frontier:			
Constant (X_0)	β_0	4.011	8.969
Human Labor (X_1)	β_1	0.072*	2.334
Urea (X_2)	β_2	0.183**	3.422
TSP (X_3)	β_3	0.245	1.586
MoP (X_4)	β_4	0.067*	1.92
Hormone (X_5)	β_5	-0.34089	0.456
Harvesting (X_6)	B_6	0.7727*	2.36
Sucker (X_7)	B_7	0.008	0.095
R^2		0.64	
F-value		25.64**	

Source: Field Study 2021 (own estimation)

Note: ** and * indicates significant at 1 and 5 percent level respectively.

6.2 Interpretation the Result of Pineapple Cultivation

The value of the cultivation co-efficient for human labour was 0.072 for pineapple. The production co-efficient was positive. The positive sign indicates that return from pineapple can be increased by increasing human labour. The estimated co-efficient 0.072 revealed that 1% increase in human labour in the pre-harvesting period with other factors remaining constant, would increase the gross return by 0.072% up to certain level (Table 6.1).

Urea (X2)

The regression co-efficient of urea was 0.183 for pineapple growers. The cultivation co-efficient was positive. The positive sign indicates the return from pineapple 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 0.183% up to certain level (Table 6.1).

TSP (X3)

The regression coefficients of Triple Super Phosphate (TSP) cost (X3) was 0.245 not significant. The cultivation co-efficient was positive but not significant (Table 6.1).

MOP (X4)

The regression coefficient of Muriate of Potash (MOP) cost (X4) 0.067 for pineapple growers. The cultivation co-efficient was positive. The positive sign indicates that return from pineapple can be increased by using MOP. The estimated co-efficient revealed that 1% increase in MOP in the pre-harvesting period with other factors remaining constant, would increase the gross return by 0.067% up to certain level (Table 6.1).

HORMONE (X5)

The regression coefficients of Hormone cost (X5) was not significant.

HARVESTING (X6)

The regression coefficient of Hormone cost (X6) of hybrid pineapple cultivation was positive and significant at 5 percent level of significance, which implied that if the expenditure on Hormone was increased by 1 percent then the yield of Pineapple would be increased by 0.7727 percent, other factors remaining constant (Table 6.1).

SUCKER (X7)

The regression coefficient of Sucker cost (X7) was 0.008 for pineapple. The cultivation co-efficient was positive but not significant (Table 6.1).

6.3 Concluding Remarks

From the above discussion it is easy to understand about the different cost items and their application doses of farmers, yields and returns per hectare of pineapple cultivation. Pineapple production is a seed and labor-intensive enterprise. It is most essential to use modern inputs such as seeds, fertilizers, human labour, proper use of hormone, and irrigation efficiently. Timely and efficient use of these inputs are the most important to increase cultivation and profitability. On the basis of above discussions, it could cautiously be concluded here that cultivation of pineapple is a profitable. Cultivation of pineapple would help farmers to increase their income earnings.

CHAPTER VII

PROBLEMS OF PINEAPPLE CULTIVATION

Bangladesh has an economy mainly dependent on agriculture. But this agricultural sector is negligible still now. Various problems are associated with this sector. Experience has shown that farmers in Bangladesh seldom get the required quantity of sucker, adequate capital, fertilizers, hormone, technical support and finally the remunerative price of their produces. They are economically not very capable of investing the required fund for producing crops due to their low capital base and scarcity of cash fund. Farmers generally complain of receiving insufficient support from government agencies. In this chapter an attempt is made to identify some major problems of pineapple production.

7.1 Low Output Price

Most of the farmers were forced to sold their products just after harvesting at very low price to maintain their household expenditures, pay labor cost etc. The conscious farmers identified the price of their products as very low in relation to the production cost. In the study a rea, low output price was the first severe problem among the farmers (Table 7.1).

7.2 High Rate of Input Price

Different kinds of inputs such as labor. sucker, fertilizer and hormone were used to produce pineapple. But sorry to say that most of the farmers had to pay high market price than the reasonable. In the study area, high rate of input price was the second severe problem among the sample farmers (Table 7.1).

7.3 Lack of Adequate Capital

In the study area, most of the farmers reported that they did not have adequate amount of operating capital. Most of them failed to receive the institutional credit. Asa result, financial inability and pressing need for cash money force them to borrow money from non-institutional sources and they have to pay high interest rate. In the study area, lack of adequate capital was the third most severe problem (Table 7.1).

7.4 Lack of Quality Sucker

In the study area, most of the farmers could not collect quality sucker from their own

farm due to natural adversities and lack of their proper knowledge. So, they had to depend on others sucker. Even they had to pay illogically very high price. In the study area, lack of quality sucker was the fourth severe problem among the farmers (Table 7.1).

7.5 Lack of Fertilizer

Fertilizer is the most important input for producing pineapple. They usually use Urea, TSP and MoP. For the better production farmers had used fertilizer several times in their field. Fertilizer crisis is a common subject in the production period in our country. Some traders made artificial crisis of fertilizers for higher price. In the study area, lack of fertilizer was the five problem (Table 7.1).

7.6 Storage Problem

Storage problem of pineapple was also reported as a constraint in the study area. Most of the products were sold after harvest at low prices due to the lack of proper storage facilities. In addition, a great deal of spoilage occurs during the harvest period. However, the problem was not found in case of small farmers and it was extremely found in case of large and medium farmers. It was sixth constraint problem in the study area (Table 7.1).

7.7 Lack of Government Attention

During investigation, most of the farmers complained that they did not get enough support from the government. Only large farmers were benefited from the government institution. Input price should be reduced, proper and appropriate training should be provided to the farmers. In the study area, lack of government attention was the seventh problem among the sample farmers (Table 7.1).

7.8 Lack of Cooperation from The Block Supervisor

During the investigation, most of the farmers complained that they did not get any cooperation from the Block Supervisor. They claimed that only the large farmers were benefited from the Block Supervisor for their financial solvency and good social status and other categories of farmers were negligible in the study area. So, it was the last constraint problem among the sample farmers in the study area (Table 7.1).

7.9 Damages by the Foxes and Monkeys

Since pineapple is a good feed for the foxes and monkey's ripe pineapple are often eaten or damaged by harvesting period. In the study area damages by foxes and monkeys was the last problem among the sample farmers. It was no doubt that pineapple can play a vital role in the economy of Bangladesh. But it was observed that the farmers were facing some acute problems in producing pineapple. It can therefore, be conducted that the hectarage as well as the production could possibly be increased to a large extent if the above mention problems can be solved immediately Table (7.1).

Table 7:1 Major Problems Faced by the Pineapple Cultivators

Problems	Value obtained out of 10	Rank
Low output price	9.93	1
High rate of input price	8.75	2
Lack of adequate capital	8.45	3
Lack of quality sucker	7.89	4
Lack of fertilizer	7.27	5
Storage problem	7.11	6
Lack of government attention	6.41	7
Lack of cooperation from the Block Supervisor	5.79	8
Damaged by foxes and monkeys	5.63	9

Source: Field Survey 2021

7.10 Suggestions Given by the Farmers to Overcome the Problems in Cultivation of Pineapple

From the study we observed that various problems were associated with pineapple production. In the study area, the farmers were given freedom to give their suggestion for overcoming the existing problems related to the pineapple production. They suggested various measures. These suggestions are discussed below:

Credit facilities

Although, low output price was the first problem of the sample farmers, they strongly suggested about the credit facility which was the first suggestions of the farmers, because, most of the farmers who have no available fund to cultivate pineapple in the study area in cultivation period.

Reasonable output price

The farmers thought that the output price at the harvesting period was too low compared to the production cost. So, they urged for a reasonable and guaranteed output price. So, the reasonable output price was the second suggestion of farmers.

To reduce input price

According to the sample farmers, high rate of input cost in another problem. So, the price of input should be cheaper which was the third suggestion of farmers. Through input subsidy government can reduce input price.

To reduce input price

According to the sample farmers, high rate of input cost in another problem. So, the price of input should be cheaper which was the fourth ranked suggestion of farmers. Through input subsidy government can reduce input price.

Ensuring easy of quality sucker

Quality sucker ensure expected production. In the study area farmers faced quality sucker crisis in the planting period. Most of the farmers suggested for it because they could not collect quality sucker from the dealer and they had to collected poor sucker from the local market. So quality sucker has to provide to farmers thorough different Channels.

CHAPTER VIII

SUMMARY, CONCLUSION AND RECOMMENDATION

8.1 Summary

Bangladesh is famous for growing large variety of tropical crops particularly rice, wheat, potato, jute, pulses, oilseeds, pineapple, sugarcane and tobacco. The production of fruits is increasing day by day in our country as well as pineapple production. Bangladesh produces 1.23% of the total world production of pineapple. Generally, the ripen pineapple is consumed dessert in Bangladesh. Green pineapple is also used for making pickle. But most of the pineapple of the world is processed. Various food items like squash, syrup, jelly, etc. are produced from pineapple and vinegar, alcohol, citric acid, calcium citrate etc. also produced from it. Pineapple is also recommended as medical diet for some diseased persons. In Bangladesh, pineapple is widely cultivated in the districts of Sylhet, Moulvibazar, Chittagong Hill Tracts, Dhaka and Tangail. Rangamati is the largest pineapple producing district in Bangladesh. In Bangladesh, three varieties of pineapple are grown namely: Giant Kew. Honey Queen and Ghorasal. In the study area (Rangamati), mainly Honey Queen variety of pineapple has intensively been cultivated.

The research area consisted of one upazila and one union. Nainachar upazila and Bandukvanga union of Rangamati district was the main study area. Two unions of Naniarchar upazila Burighat and Ghilachari and ten villages from each of the two unions namely Islampur, Bogachari, Sikolpara, Soridashpara, Ramhoripara, Hatimara, Patachari, Hajachari, Boradam, Shoileschari and another location Bandukvanga union villages are Tingojje para, Kuramara, Mog para, Uluchari etc. were selected as the locale of the study. In terms of sample selection, a total of 90 pineapple cultivators were chosen for the research.

Primary and secondary sources of data were consulted. Primary data were gathered from respondents through in-depth interviews. The survey was done by the researcher during November and December of 2021. Additionally, secondary data is required for the investigation. Secondary data sources included pertinent books, journals and other Bangladesh Bureau of Statistics publications. The study's results were reported in straightforward language such as count, percentage, mean, and standard error of mean. The statistical approach STATA is utilized to determine the study's regression

coefficient.

The costs of manufacturing were calculated for analytical purposes using gross margin analysis. Analysis of net margins, benefit-cost ratios, and functional analysis. To assess the influence of major factors on pineapple cultivation, the Cobb-Douglas cultivation function was employed. The Cobb-Douglas model's double log form was shown to be the better choice on theoretical and econometric grounds.

According to the socio-economic study, the majority of persons in the study area were between the ages of 36 and 50. Overall most household members had 6 to 12 years of schooling in study area. The average family size was 5.4. The average yearly income was determined to be Tk. 301544.3, the average annual expenditure was determined to be Tk. 215374.4 and the average annual family savings was determined to be Tk. 86165.9. About 22% of the farmers received agricultural training in the study area. Most of farmers (70%) were the members of social/agricultural organization.

Economic profitability is a critical factor in determining whether to produce any crop at the farm level. It may be quantified in terms of net return, gross margin and net return on total cost. The amount of human labour utilized in pineapple cultivation was estimated to be around 37 man-days per hectare, with an average wage of Tk. 250 per man-day. As a result, the entire cost of human labour was determined to be Tk. 9250. Sucker cost per hectare was calculated to be Tk. 86380 for pineapple cultivation. Farmers used an average of 1851 kg of urea, 925 kg of TSP, 3023 kg of MoP and 25914 kg of cowdung per hectare. Also using hormone for quick growth and ripening for early cultivation as cost Tk. 5758 per hectare. And the harvesting, carrying and transportation cost 18500 as 37 labour need Tk 500 per man-day for per hectare pineapple cultivation. Total variable cost Tk. 251107 per hectare.

Pineapple cultivation had an average gross return of Tk. 605000.00. The gross margin and net return per hectare were determined to be Tk. 353893.00, Tk. 339243.00. The Benefit Cost Ratio (BCR) was determined to be 2.28, implying that a single taka investment in pineapple cultivation yielded Tk. 2.28.

Cobb-Douglas production function model was used to determine the effects some important inputs of output from pineapple cultivation. Human Labor (X_1), Urea (X_2), TSP (X_3), MoP (X_4), Hormone (X_5), Sucker (X_7) and Harvesting (X_6) were the independent variables. While the regression coefficients for Human Labor (X_1), Urea

(X_2), TSP (X_3), MoP (X_4), Sucker (X_7) and Harvesting (X_6) were al positive, the coefficient for Hormone (X_5) were negative and significant at 1% and 5% levels of significance. The cost of TSP (X_3), Hormone (X_5), Sucker (X_7) were determined to be insignificant in relation to the return on pineapple cultivation. The positive indication shows that return on pineapples can be enhanced by raising labour cost, urea cost, MoP cost, harvesting cost, while the negative sign suggests that the return on pineapples may be decreased by hormone cost.

Farmers had several difficulties while growing pineapples. The issues social and cultural in nature, as well as financial and technological in nature. Inadequate capital was identified as one of the most significant constrains to cultivating Pineapple in the research. Farmers faced several challenges including high input costs, lack of adequate capital, lack of quality sucker, lack of fertilizer, storage problem, lack of Government facilities, lack of cooperation from the Block Supervisor, damages by foxes and monkeys. These are the primary restrictions for pineapple farmers in the research region. Public and commercial actions should be conducted to mitigate or remove these issues in order to improve pineapple output.

8.2 Conclusions

The following conclusions are drawn from the findings of this study and its interpretation in light of other relevant factors:

a) The Benefit Cost Ratio (BCR) was 2.28, implying that a single taka investment in pineapple cultivation yielded Tk. 2.28.

b) Cost of TSP, cost of Hormone had no significant contribution to gross return in terms of pineapple cultivation.

c) Human labour cost, cost of Urea, cost of MoP, cost of Harvesting, cost of Sucker had positive significant contribution to gross return in terms of pineapple cultivation. This implies that increasing the labour cost, Urea, MoP, harvesting and sucker will increase the gross return in terms of pineapple cultivation.

d) Hormone cost had negative significant contribution to gross return in terms of pineapple cultivation. Hence, we can say that reducing the cost of hormone will increase the gross return in terms of pineapple cultivation.

e) High input costs, a scarcity of high-quality produce, poor output price,

a lack of technical expertise, storage issues, disease and insect infestation, theft issues, natural disaster issues, transportation issues, shortage of fertilizer and damages of foxes & monkeys like problems faced by the farmers in pineapple cultivation.

8.3 Recommendations

The following recommendations may be made based on the outcomes of this research and feedback from operational farmers:

a) Hormone cost had negative significant contribution to gross return in terms of pineapple cultivation, so, it is recommended that the price of mechanical should be minimized and reasonable.

b) Proper training should be provided by the respected authorities.

c) This research was conducted only two locations of Rangamati district. To justify the findings of the current study, it is important to make scope for more research in other regions.

d) The study was based on the profitability of pineapple cultivation. Further studies may be conducted on the impact of pineapple cultivation on poverty reduction.

e) In this study the investigations explore only 7 selected variables affecting the gross return in terms of pineapple cultivation. Other factors like age, experience, training may have influenced gross return in terms of pineapple cultivation.

8.4 Limitation of the Study

The present study bears some pertinent limitations. Almost all the research works have limitations in terms of time and money. The present study is not an expectation of all those. In spite all those, the present study has important information for pineapple farmers, consumers and policy makers as well. Some of the specific limitations of the study are observed as follows:

a) Absence of written record was the great limitation of the study. Most of the respondents did not keep any written record of their activities. So, the researcher had to depend on the memory of the respondents.

b) The study might provide more meaningful results if it covered more pineapple producing areas. But due to the limitations of money and time, the study could

not cover wider areas.

c) The price of pineapple was more flexible than other perishable commodities. So, it was very difficult to record stable prices of pineapple.

d) Initially non-cooperation of the respondents with the researcher was a problem. They thought that data would be used by government for imposing tax on their business. However, later on the problems have been overcome by explain them the objectives of the study.

Findings of the study could not be generalized for improving the whole pineapple producing system of the country due to the above limitations. In spite of the above limitations, some of the findings of the study may be cautiously used to providing important clues and information for decision-makers and other users.

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