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## **Farmer's profitability of maize cultivation at Rangpur district in the socio-economic context of Bangladesh: An empirical analysis**

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### **Abstract**

Bangladesh is primarily an agricultural country. Agriculture is the major stay of the economy of Bangladesh. Agriculture is the decisive lifestyle of Bangladesh. Agriculture bears an expectant contribution to the Gross Domestic Product (GDP) of the country prior to a greater extent than 50% of GDP. At present greater portion of Bangladesh's GDP comes from the service sector. Nevertheless this, two-thirds of the country's population is engaged in agricultural practices.

A variety of crops are cultivated in this country which categorized into two-food crops and cash crops. Maize is being dealt as leading food crop in the world in addition to Bangladesh. This study was carried on to taking close together the cost of production and profitability of Maize producers at Rangpur district. Data was gathered from 60 farmers using simple random sampling method. The Maize farmers demonstrated individual differences of opinion in their socio-economic characteristics and unconditional majority of them belonged to young age category (20-35 years) having medium family size, illiterate, medium farm size (0.34- 1.0 acre), (1- 10 years) farming experience. The study additionally denominates that the large farmers were almost profitable likened to others. Main difficulty confronted by the Maize farmers were lower price of Maize during harvesting period, stealing of maize cob, lack of good quality seed, damage caused by insects and birds, higher price of inputs and lack of government intervention etc. Appropriate measures should be necessitated by Government to figure out this problem. The findings of the study will add fundamental economic data on the production practices of Maize. Ultimately it will be supportive to the planners and policy makers in formulating micro or macro level policy for the improvement of Maize production in the country.

**Keywords:** Benefit Cost Ratio, cereal crop, production function, farming experience, Seed Cost.

### **1. Introduction**

Bangladesh is first and foremost an agricultural based country subdued by crop production. Bangladesh appreciates by and large a sub-tropical monsoon climate. Bangladesh has been notorious for growing large variety of tropical crops particularly rice, wheat, Maize, jute, pulses, oilseeds, sugarcane etc.

Maize industry is a prospective industry and its escalation is also connected with national GDP. Maize in Bangladesh is fetching a vital crop in the rice grounded cropping system. It is grown just about done with Bangladesh in all season. It has prodigious probable which can subsidize for the improvement of animal industry and can come across rural energy requirement. Maize is a multipurpose crop with high generic variability and manipulability. The land of Bangladesh is apposite for maize production. Maize is a labor intensive crop. Its economic benefit is greater than that of other crops. With the proliferation in demand from poultry and other feed industries it is anticipated that more area will be averted from Boro rice to hybrid maize in the coming years. The country is trade in a gigantic amount of maize grain to bump into the poultry feed plea. For that reason, amassed maize production is a thoughtful apprehension of the government.

Maize (*zea mays*) is the utmost extensively grown cereal crop in the world. Maize is an industrially significant money-making crop. In the middle of the world's cereal crops, maize ranks second to wheat in production. Nonetheless, amongst the developing countries maize rank first in Latin America and Africa but third after rice and wheat in Asia

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(Dowswell *et al.*, 1996) <sup>[3]</sup>, and yet quantitatively it is after wheat and rice it occupies the first position for its yield per unit area.

Maize is one of the utmost significant food grains in the world over and above in developing countries. Maize is similarly the third major cereal crop after rice and wheat in Bangladesh. It is palatable and suitable for human other than poultry, livestock and fisheries. The demand of maize is accumulative progressively because of its diversified uses. It provided human food, feed and fodder for animal, fuel for domestic use and also raw materials for use in industry. In Bangladesh, the demand for maize has greater than before in recent years as a result of spreading out of poultry and livestock industries. Top half of the plant is feed cattle as fodder and bottom half with fibrous root is used as fuel. Moreover com oil, starch and many other products can be produced from maize. It is well-known that maize is playing vital role in the agrarian economy of Bangladesh. As a result, some measures should be taken for underneath this crop hereafter.

Country's annual maize output reached the new high of 2.75 million tonnes in 2015-16 and 90 percent of the home-grown maize is feeding a burgeoning poultry and fish feed industry. With over 34 million tonnes of annual rice output, Bangladesh is now self-sufficient in the staple while the country largely depends on imports to meet over five million tonnes of yearly wheat requirements. Domestic production of wheat hovers around one to 1.3 million tonnes only, depending on weather and acreage factors. Last season's wheat crop suffered a blow due to wheat blast - a fungal attack that Bangladesh experienced for the first time. Since the inception of commercial farming of maize in Bangladesh in mid-90's, its yearly output has grown from a paltry 65,000 tonnes in 1997-98 to 2.75 million tonnes in the last fiscal year, making it the fastest expanding cereal in the country. Policy planners, breeders and market sources attributed the amazing rise in maize production to a number factors; demand from feed industry, farmers' comparative advantage in terms of profits, less irrigation requirements, availability of both home-grown and imported hybrid seeds with high yield potentials, and overall policy and research support. According to a recent US Department of Agriculture's (USDA) report, farmers in Bangladesh earn over \$2,275 by investing \$1,421 for every hectare of maize. Boro fetches them \$1,081 against an investment of \$1,319, a loss-making project, it claimed. And comparing to maize, growing wheat is less profitable too. Farmers can earn a little over \$823 from per hectare of wheat farming with an investment of \$663, stated the USDA report "Bangladesh: Grain and Feed Annual 2016". "The gross margin from maize sales, per hectare, is 2.4 times greater than that of wheat or rice. Maize also has fewer pest and disease problems," said a report of the UN Food and Agriculture Organization (FAO). It also notes, "By shifting from rice to maize during the dry season, farmers save groundwater from over-exploitation." (www.thedailystar.net, September 26, 2016).

Rangpur division has the uppermost (53.2%) land area allocation (79234.6 ha) for maize cultivation and also highest (49.5%) share (388599 ton) of total maize production in Bangladesh (BBS, 2010) <sup>[2]</sup>.

Maize has the status of being a very money-making crop with few 'evenly profitable' substitutes. Among the variety of argues mentioned by the farmers for cultivating Maize,

the profitability portion was overwhelming principal and regarded is an extremely beneficial crop.

### Review of Literature

Assessment of related literatures in any research is necessary in the good judgment that it allows for an extent for reviewing the collection of knowledge & information appropriate to the future research. This knowledge & information give an instruction in designing the potential research problem & validating the new determinations.

Haque (2009) <sup>[4]</sup> conducted a comparative economic study of hybrid maize Uttaran and 900 M cultivation in an area of Sherpur Upazilla in Bogra district. The major findings of the study revealed that per hectare average total costs were Tk 39035.49 and Tk 42,807.92 for Uttaran and 900 M maize growers, respectively. Per hectare average net returns from Uttaran and 900 M maize were Tk 48,911.40 and Tk 55,906.09 respectively. The study revealed that, 900 M maize growers earned relatively higher per hectare profits than the Uttaran maize growers.

Hasan (2008) <sup>[5]</sup> completed a study on economic efficiency and constraints of maize production in the northern region of Bangladesh. He reported that all the farmers used hybrid seeds for maize cultivation with an average yield of 6.27 tonne per hectare, which is higher in Dinajpur (6.35 tonne per hectare) compared to Panchagarh district (6.18 tonne per hectare). The returns to scale of the selected inputs were 0.72 and 0.68 for Dinajpur and Panchagarh respectively. The technical efficiency was found on an average 0.84 at Dinajpur and 0.80 at Panchagarh. It was also found that, farmers in the study area had scope to increase maize productivity by attaining full efficiency through reallocating the resources. Economic analysis of maize production and maize- based cropping pattern in comparison to Boro rice and Boro-based cropping pattern indicates the high profitability of maize production system than that of Boro rice.

Uddin (2008) <sup>[9]</sup> conducted an economic study on maize production under different farm size groups in a selected area of Bangladesh. He determined the profitability, productivity and resource use efficiency under different farm size groups. This study showed that per hectare average net returns of maize were estimated at Tk 31583, Tk 47823, and Tk 41648 for small, medium and large farmers respectively. The study revealed that selected explanatory variables had impacts on maize production of all categories of farmers. The findings of the study revealed that medium farmers earned higher profit than those of small and large farmers. Finally, some recommendations were made for the development of maize production in Bangladesh.

Ahmed and Jahan (2007) <sup>[1]</sup> conducted an experiment on maize/pea intercropping during rabi season to find out suitable planting system for higher productivity and economic return. Results revealed that pea grown as intercrop with maize is more profitable than sole maize. The result also suggested that 4 rows of BARI motorshuti-1 intercropped with maize is the most suitable intercrop combination for higher economic benefit.

Islam (2006) <sup>[6]</sup> conducted a study on impact of maize production on income and livelihood of farmers in a selected area of Lalmonirhat district. He reported that maize production has brought positive changes in different aspects of livelihood such as capital, food intake, etc. The study revealed that positive change in income took place due to

maize production. He also reported average annual income increase for maize growers was 63 percent while it was 37 percent for non-maize growers. The study suggested encouraging production of maize, irrigation facilities needed to be extended and provided post-harvest low cost technologies.

Shohag (2006) <sup>[7]</sup> conducted a study on production on marketing of maize in a selected area of Gaibandha district. The study showed that the rate of changes of area, production and yield of maize increased dramatically for the increasing of potential demand in the various sector. Gross margin and net return were also calculated at Tk 36425 and Tk 29591 respectively. He also recommended the availability of input at reasonable prices, supply of credit at low interest, supply of adequate fertilizer in the production period, supply of good quality seed, increases in market demand, improvement of storage and market facilities, availability of post-harvest technology and pesticides are important measures which can encourage maize production. Mohiuddin (2003) completed an economic study on efficiency and sustainability of maize cultivation in an area of Bangladesh. The study showed that all farmers used hybrid maize and the rate of changes of area, production and yield of maize increased dramatically after the release of hybrid varieties. The findings also showed that the farmers in the study area have failed to show their efficiency in using the resources but the farmers also often technically efficiency (98 per cent). The findings also showed that maize was more profitable than other cereal crops.

### Objectives

1. To delineate the socio-economic characteristics of Maize producers in the study area through farm size.
2. To delimitate the profitability of Maize production across farm size.
3. To ascertain the problems of Maize cultivation across farm size.
4. To put forward policy implications for improvement of Maize production in Bangladesh.

### Statement of the Problem

Agriculture is the deliverance of Bangladesh. The most important livelihood of the people of Bangladesh is associated with Agriculture. Farmers of this country at the outset produce crops what satisfies family life wants then they exemplify interest on production of cash crop such as cotton, jute, tea, Maize, coffee, and so on are mostly expected in dealing demand of home market and sell abroad in foreign currency in support of developing countries.

Maize is one of the utmost essential cereals crops and it is one of the foremost crops in the world. It is not only highly productive but also nutritious crop used as a human food, feed for poultry and fodder for livestock. Bangladesh is one of the high populous countries in the world. Maize has an abundant panorama in Bangladesh.

Maize has a substantial implication in nationalized economy. Small hard work has been completed to study the economics of the Maize production. By the way cost of production and profitability determination should be premeditated. This study will be intended at determining causes of variation and aspect of success among farms growing Maize; it is indispensable both for the farmers and planners to carry out a programme considered for eliciting agricultural production. Updating knowledge on profitability

of Maize is one rationalization of this study. It is essential to evaluate substitute profitability of this investment in terms of land and other resources keen to Maize farming.

This research possibly will endow with a number of detailed benefits to the individual farmers for efficient operation and management of the farm and also to the research personnel for supplementary studies of related natural history and to the planners and policy makers who provide the farmers centrally for Marco- level strategy assessment.

### Methodology of the Study

The survey method is probably the most widely used formal method obtaining farm management data. This chapter discusses about the selection of the study area, period of the study, sampling technique and sample size, data processing and analysis.

**Selection of the area:** Rangpur district was chosen purposively as a study area because this district is one of the renowned for Maize production in Bangladesh. Gangachara Sub-district was selected at random from the 7 Sub-district of Rangpur districts as the study area. A opening survey was carried on in some villages of Gangachara Sub-district to collect primary knowledge about the Maize production, productivity and efficiency of the Maize growers. After preliminary visit three village's namely Uttor Panapukur, Dhakshin Panapukur and Betgari were selected randomly as the study area. Most of the farmers in these villages used to produce high yielding varieties of Maize and sell their product to different middlemen. The main criteria behind the selection of the Sub-district were as follows:

1. The selected Sub-district was a good Maize producing area.
2. The researcher is well-known with the language, living, beliefs, and other socio-economic characteristics of the villages of this Sub-district.
3. Previously such type of study was not conducted in this area.

**Period of the study:** Data for the study were collected during the month of August to September in 2016.

**Selection of the sample and sampling techniques:** A random sampling technique was applied for selecting sample. Through random sampling 60 farmers were selected for the study. Among the 60 farmers, 21 were small, 26 were medium and 13 were large. Farm size was arbitrarily classified on the basis of their land where they produce Maize and other crops. Farmers having 0.01-0.33 acre considered as small, 0.34-1.00 acre as medium farmers while those having above 1.00 acre as large farmers.

**Sources of Data:** The study is involved in collection of data both from the primary and secondary sources. Different types of data and their sources are discussed under the following heads:

**Primary Data:** Primary data were collected by the researcher themselves through personal interview with the respondents. To get accuracy and reliability of data, care and caution were taken in data collection. The researcher's took all possible effort to establish a congenial relationship with the respondents do not feel hesitation or hostile to provide correct data. Prior to interviewing, the objectives of the study were explained to each and every owner of the Maize growers. As a result, they were convinced that the

study was purely an academic one and was not likely to have an adverse effect on their business. During data collection an attention was also paid to the mood of the owners of the Maize growers.

**Secondary Data:** We can't get enough secondary data for this study. The secondary sources include govt. publications; annual reports on Maize cultivation, seminar papers, journals, published and unpublished thesis, and topic relected various books, BBS, web site etc.

**Processing and analysis of data:** Collected data were scrutinized and summarized for the purpose of tabulation using the Statistical Package for Social Sciences (SPSS) and Microsoft office Excel 2013. Two techniques of analysis were used in this study, tabular and statistical. Analysis by tabular technique included socio- economic characteristics of Maize farmers, classification of size of Maize land, production practices, inputs used and returns of Maize farmers. Statistical analysis was used to show the effect of inputs used and other related factors of Maize cultivation.

**Empirical Model**

In this study, we assume that the Cobb-Douglas is the appropriate form of the frontier production function. The stochastic production function which is used for the Maize producers was specified as:

$$\ln Y_i = \beta_0 + \beta_1 \ln(X_1) + \beta_2 \ln(X_2) + \beta_3 \ln(X_3) + \beta_4 \ln(X_4) + \beta_5 \ln(X_5) + \beta_6 \ln(X_6) + \beta_7 \ln(X_7) + \beta_8 \ln(X_8)$$

Where,

ln = Natural logarithm

Y = Total Maize Production

$\beta_0$  = Constant or intercept value

$X_1$  = land value cost

$X_2$  = land preparation Cost

$X_3$  = Seed Cost

$X_4$  = Cow dung Cost

$X_5$  = Fertilizer (Urea/TSP/MP) Cost

$X_6$  = Labor Cost

$X_7$  = Insecticides/Pesticides Cost

$X_8$  = Irrigation Cost

**Results and Discussion**

**Socio-economic Characteristics of Maize Farmers:** The socio-economic background and characteristics of the farmer's influences the productions to a great extent. So, a description of the characteristics of farmer is necessary for analyzing the main objective of the present study. Socio-economic characteristics of the farmer's included their age, family size, educational status, farm size, farming experience and place of sale of the respondent. These are described below:

**Table 1:** Distribution of the Maize farmers according to their age

| Age categories         | Maize farmers |      | Mean | SD   |
|------------------------|---------------|------|------|------|
|                        | Number        | %    |      |      |
| Young ( 20-35 years )  | 27            | 45   | 1.77 | .789 |
| Middle ( 35-50 years ) | 20            | 33.3 |      |      |
| old ( Above 50 years ) | 13            | 21.7 |      |      |
| Total                  | 60            | 100  |      |      |

Source: Field survey.

Table 1: demonstrates that age of the Maize farmers ranged from 20 to above 50 years, with the mean of 1.77 years and the standard deviation 0.789. Maize farmers were classified into three categories on the basis of their age. Young farmers are mostly engaged in Maize cultivation.

**Table 2:** Distribution of the Maize farmers according to their education

| Education categories | Maize farmers |      | Mean | SD    |
|----------------------|---------------|------|------|-------|
|                      | Number        | %    |      |       |
| Illiterate           | 29            | 48.3 | 1.88 | 1.043 |
| Primary              | 16            | 26.7 |      |       |
| secondary            | 8             | 13.3 |      |       |
| Higher secondary     | 7             | 11.8 |      |       |
| Total                | 60            | 100  |      |       |

Source: Field survey.

Table 2: depicts that maximum farmers (48.3 %) are illiterate while primary (26.7) and secondary have (13.3%). Farmers having higher secondary education are (11.8 %). Maize farmers were classified into four categories on the basis of their education along with the mean of 1.88 and the standard deviation 1.043. Illiterate farmers are generally pursued in Maize cultivation.

**Table 3:** Distribution of the Maize farmers according to their Family size

| Family size      | Maize farmers |      | Mean | SD   |
|------------------|---------------|------|------|------|
|                  | Number        | %    |      |      |
| Small (1-4)      | 21            | 35   | 1.87 | .747 |
| Medium ( 5-6)    | 26            | 43.3 |      |      |
| Large ( above 7) | 13            | 21.7 |      |      |
| Total            | 60            | 100  |      |      |

Source: Field survey.

In Table 3: Family size of the Maize farmers of the study ranged from 1 to above 7 persons, with an average of 1.87 persons and standard deviation 0.747. Maize farmers were classified into three categories because of their family size. Maize farmers inducing medium family size (43.3%) are interest group in Maize cultivation.

**Table 4:** Distribution of the Maize farmers according to their Farm size

| Family size           | Maize farmers |      | Mean | SD   |
|-----------------------|---------------|------|------|------|
|                       | Number        | %    |      |      |
| Small(0.01-0.33 acre) | 21            | 35   | 1.83 | .752 |
| Medium(0.34-1.0 acre) | 25            | 41.7 |      |      |
| Large ( above 7 acre) | 14            | 23.3 |      |      |
| Total                 | 60            | 100  |      |      |

Source: Field survey.

Table 4: describes that Maize farmers were classified into three categories due to their farm size. Maximum Maize farmers are belonging to medium farm (41.7 %) with the mean of 1.83 acre and the standard deviation 0.752.

**Table 5:** Distribution of the Maize farmers according to their Farming experience

| Faming Experience | Maize farmers |      | Mean | SD   |
|-------------------|---------------|------|------|------|
|                   | Number        | %    |      |      |
| Above 20 years    | 27            | 45   | 1.72 | .739 |
| 10 - 20 years     | 23            | 38.3 |      |      |
| 1 – 10 years      | 10            | 16.7 |      |      |
| Total             | 60            | 100  |      |      |

Source: Field survey.

In Table 5: Farming experience of a respondent was determined by reason of involvement in the farming activities related to agriculture. Maize farmers placed from 1 to above 20 years, with the mean of 1.72 years and the

standard deviation .739. Maize farmers were sorted into three categories on the basis of their Farming experience. Uppermost portion of the Maize farmers (45 %) had high farming experience (Above 20 years).

**Table 6:** Per acre cost of Maize cultivation in the study areas

| Cost Head                            | Small Farmer | Medium Farmer | Large Farmer | Total   |
|--------------------------------------|--------------|---------------|--------------|---------|
| Land preparation                     | 17880        | 54870         | 59100        | 131850  |
| Seed Cost                            | 16688        | 51212         | 55160        | 123060  |
| Cow dung Cost                        | 3135         | 9620          | 10362        | 23117   |
| Fertilizer(Urea/TSP/MP/Gypsum/Borax) | 62580        | 192045        | 206850       | 461475  |
| Labor Cost                           | 32780        | 100595        | 108350       | 241725  |
| Insecticides/Pesticides              | 2265         | 6950          | 7086         | 16301   |
| Irrigation                           | 1456         | 65844         | 70920        | 138220  |
| Total variable cost                  | 156784       | 481137        | 518228       | 1156149 |
| Land value                           | 70560        | 212280        | 229200       | 512040  |
| Total fixed cost                     | 70560        | 212280        | 229200       | 512040  |
| Total cost=( Variable + Fixed) cost  | 237344       | 693417        | 747428       | 1678189 |

Source: Field survey.

\*The above table is Figured in Units BDT Taka (Currency of Bangladesh with 1USD = 78.02 BDT) In the table 6: Per acre Cost of Maize cultivation of Small, Medium and large farmers are exposed. Total variable cost

include Total cost was the summation of total variable cost and total fixed cost. Total cost was highest for large farmers (TK. 1324536.) followed by medium farmers (TK.1134342) and small farmers (TK.363813.6).

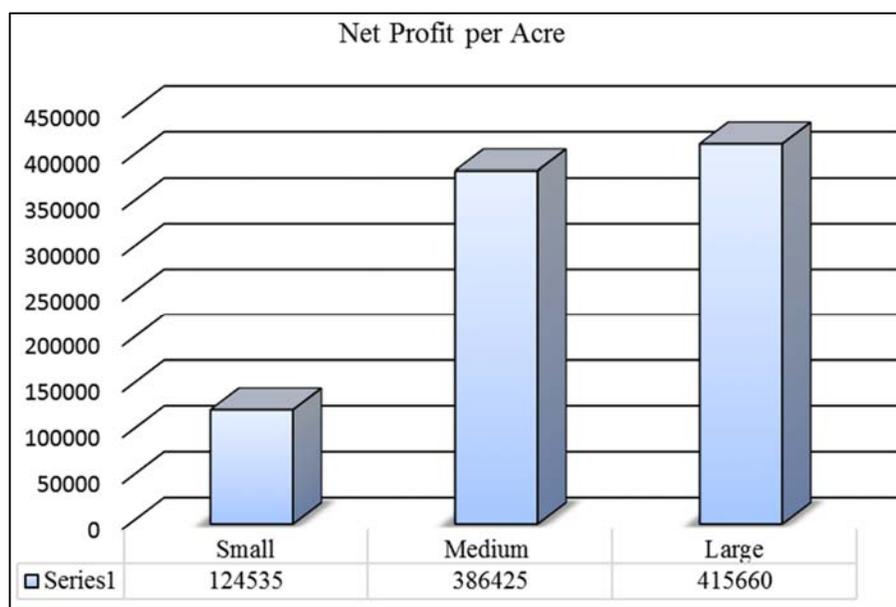
**Table 7:** Per acre Profitability and Benefit Cost Ratio of Maize cultivation in the study areas

| Item  | Small Farmer | Medium Farmer | Large Farmer | Total   |
|---|--------------|---------------|--------------|---------|
| Total land use ( acre)  | 5.96         | 18.29         | 19.7         | 43.95   |
| Maize Output (mound)  | 489          | 1500          | 1615         | 3604    |
| Maize TK per 40 kg  | 15120        | 18720         | 9360         | 43200   |
| Total revenue   | 351878       | 1079842       | 1163088      | 2594808 |
| Total cost  | 227344       | 693417        | 747428       | 1668189 |
| Net profit  | 124535       | 386425        | 415660       | 926620  |
| Benefit Cost Ratio $\frac{\text{Total Revenue}}{\text{Total Cost}}$ | 1.54         | 1.56          | 1.57         | 1.55    |

\*The above Table is Figured in mon (1 mon = 40 kg)

Table 7: points out that Productivity is highest for large farmer (549.6+274.8= 824.4 mon) followed by Medium farmer (470.64+235.32= 705.96 mon) and small farmer (150.96+75.48= 226.44 mon). Profitability is also highest

for large Farmers (TK. 397086) followed by medium farmer (TK. 329448) and small Farmer (TK. 105672). Because most of the large farmer has more land as well as more output.



Source: Field survey.

**Fig 1:** Per acre net profit of Maize cultivation in the study areas

**Table 8:** Correlations

|               | Land value | Seed     | Fertilizer | Insecticides | Irrigation | Labor    | total cost | total revenue | Land value | Seed |
|---------------|------------|----------|------------|--------------|------------|----------|------------|---------------|------------|------|
| Land value    | 1          |          |            |              |            |          |            |               |            |      |
| Seed          | .965(**)   | 1        |            |              |            |          |            |               |            |      |
| Fertilizer    | .965(**)   | 1(**)    | 1          |              |            |          |            |               |            |      |
| Insecticides  | .965(**)   | 1(**)    | 1(**)      | 1            |            |          |            |               |            |      |
| Irrigation    | .965(**)   | 1(**)    | 1(**)      | 1(**)        | 1          |          |            |               |            |      |
| Labor         | .965(**)   | 1(**)    | 1(**)      | 1(**)        | 1(**)      | 1        |            |               |            |      |
| total cost    | .983(**)   | .997(**) | .997(**)   | .997(**)     | .997(**)   | .997(**) | 1          |               |            |      |
| total revenue | .965(**)   | 1(**)    | 1(**)      | 1(**)        | 1(**)      | 1(**)    | 1(**)      | 1             |            |      |

Source: Field survey

\*\* Correlation is significant at the 0.01 level (2-tailed).

1. There is a significant positive correlation between Total cost and Labor cost. Because when Farmers uses more labor for better output, then Total cost increases.
2. There is significant positive correlation between Fertilizer cost and Seed cost. Since the Farmers use better seed for more output desire amount of output, therefore they provide better Fertilizer. As a result, Fertilizer cost increase.
3. There is significant positive correlation between Irrigation and Land value. Since the land value increases, Farmers wants to maximize profit by getting best output providing sufficient Irrigation. Consequently Irrigation cost increase.
4. There is significant positive correlation between Insecticides cost and Seed cost. As insecticides keep the seed disease free, so Insecticides cost increases when seed cost increases.
5. There is significant positive correlation between seed cost and Land value. Since the Land value increase, Farmers want to produce more output desire amount of output, therefore they provide better seed. As a result, Seed cost increase.
6. There is a significant positive correlation between Total revenue and Total cost. When Farmers Total cost increases, then Farmers Net revenue also increases.

**Table 9:** Factors affecting profitability of Maize production

| Variable  | Coefficients |       | T-Value | Sig. |
|---|--------------|-------|---------|------|
|   | B            | S.E   |         |      |
| Constants                                       | .430         | 12130 | .032    | .931 |
| Natural logarithm land value cost               | .432         | .365  | 1.143   | .251 |
| Natural logarithm land preparation Cost         | -.290        | .701  | -.401   | .705 |
| Natural logarithm Seed Cost                     | -2.731       | .630  | -4.300  | .000 |
| Natural logarithm Cow dung Cost                 | -.720        | .345  | -2.131  | .040 |
| Natural logarithm Fertilizer (Urea/TSP/MP) Cost | .152         | .110  | .318    | .065 |
| Natural logarithm Labor Cost                    | 1.127        | .345  | 3.002   | .004 |
| Natural logarithm Insecticides/Pesticides Cost  | -.407        | .218  | -1.291  | .210 |
| Natural logarithm Irrigation Cost               | 4.490        | .502  | 10.500  | .000 |

Source: Field survey

Table 9: implies that factors affecting the yield and profitability of Cobb-Douglas production function of Maize. The results of the production function depicts that among the selected variables namely Labor Cost, Irrigation Cost, Seed Cost are significant at 1% level and Cow dung Cost is significant at 5% level of significance while the other variables: land value cost, land preparation cost, Fertilizer Cost, Insecticides/Pesticides cost are not significant.

As for case in point, the coefficient of labor cost per acre is 1.127 means that if the other things remain constant, production of Maize will be increased by 1.127% for 1% increase in labor cost. In the same way Irrigation Cost also affected the production of Maize positively. The coefficient of Seed Cost per acre is 2.731 means that if the other things remain constant, Maize production will be reduced by-2.731% for 1% increasing in the use of seed. By the same way, land preparation cost, Insecticides/Pesticides cost, Cow dung Cost also affected the production of Maize negatively. Conversely, insignificant character of Irrigation cost had no significant effect on the total Maize production.

**Problems**

1. Low prices at peak harvest period
2. Stealing of maize cob

3. Damage caused by insects & Birds
4. Unavailability of quality fertilizers in time
5. Labor crisis
6. Unavailability of good quality seed
7. Lack of Government attention.
8. Syndicate of businessmen
9. Farmers did not get proper price due to improper marketing channel/system
10. Lack of farmers' knowledge on good quality seed and access to the seed.
11. Lack of linkage between farmers and exporter
12. Lack of coordination among research organizations like BARI, DAE and farmers and Agro/ Maize processing companies.
13. Health and illness is honestly being affected among Maize-cultivators through escalating smoking and leaf chewing practices in addition to through cultivation and drying of Maize leaves.

**Recommendations**

Some recommendations are given below:

1. The price of Maize should be readjusted from time to time safeguarding justice to the growers of Maize.

2. Government should reduce the pesticide and insecticide price.
3. The consciousness of the farmers needs to be increased. They may be delivered adequate training so that they can produce Maize appropriately.
4. Modern technology should be taking on for superior labor cost control.
5. Agricultural credit facilities to be ensured easily.
6. Provision for the introduction of crop insurance should be introduced. Therefore, the risk of Maize cultivation would be minimized and farmers will get more ensured environment to produced Maize.
7. In the view of actual field experiences gained so far, it is accomplished that farmers did not get fertilizers at the government rate. So public interventions might be required for ensuring the reasonable price of fertilizers. Furthermore, farmers reported that they were suffered from adulterated fertilizers. Consequently, public initiative should be taken to maintain fertilizer quality.
8. Quality seeds of improved varieties in right quantity are recognized to be one of the key elements for enhancing agricultural production. Farmers also reported that they were suffered from seed adulteration. So the DAE and other related institutions should make improved seed available to the farmers and government should take initiatives to control adulteration of seeds.
9. Steps should be taken to encourage use of maize in the fish, shrimp and poultry industries

#### Limitation of the study

1. The study was restricted to one Sub-district where Maize production was intense. Three villages under that Sub-district were selected purposively. The study might be momentous outcome if it enclosed a number of Sub-district producing Maize's.
2. Due to deficiency of time the study could not cover wide side areas for gathering obligatory information.
3. Some written records were asserted by the literate respondents, but maximum respondents had no written document. Therefore, the researcher had to depend solely on the memory of the respondents.
4. Respondents were very busy. A study that brings in interview of 60 farmers cannot conclude anything accurately and as such, it was based on miss information.
5. The largest part of the farmers in the study area contemplation that the investigator was a government officer. So, they originally hesitated to answer the questions relating to their income and expenditure. Some were afraid of imposition of new taxes.

#### Conclusions

The main reason behind cultivating Maize is the far and wide detained observation that Maize is emerging as a lucrative crop. Maize is well thought-out as the third most important cereals crops and has more multipurpose usages in Bangladesh. High production of maize depends on the spreading out of HYV and hybrid variety of seed, improved management and timely supplying of inputs. The rate of taking up of modern technology and sustainability of maize production depend largely on its economic prosperity. The situation of Maize production & its industry is extremely to a great extent competitive. The profits it begets and hope it

will help to add tax in the national economy is an immense contribution.

The findings of the study that net profit per acre (TK. 20854). This research shows medium farmers cultivate more land but net profit is highest for large farmers. Priority should be given to the development of such roads which link villages to the main roads and markets. Most of the farmers are illiterate. Dissemination of market information should be increased so that farmers can get fair price of the Maize.

After farming of maize, total household income of rural people augmented appreciably which enabled them to spend more on the basic items such as food, education, clothing, health care and housing compared to before. Maize also helps in ameliorating the nutritional status of the rural people. It designates that livelihood and standard of living of maize farmers enhanced to some extent. If modern inputs and production technology can be made available to the farmers in time, yield and production of maize may be augmented which can help the farmers to enlarge income and perk up livelihood conditions.

Government or no additional agency can the Maize farmer can put down his hands on durable ready cash the instant his produce is inclined of nothing like a good number other crops which yield proceeds as and when the Production is prepared for sale. This pretends as a most important unifying force for the farmers.

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