# PROFITABILITY OF ONION CULTIVATION IN SOME SELECTED AREAS OF BANGLADESH

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## Abstract

The present study was conducted in three major onion growing districts to estimate the profitability of onion cultivation. Total of 150 onion farmers taking 50 farmers from each area were selected randomly. The cost of onion cultivation was found to be Tk 93517 per hectare on total cost basis. Seedling cost (41%) was the major cost item followed by human labour cost (24%). The yield of onion was found 9869 metric tons per hectare. The gross margin and net return were found to be Tk. 85308 and 79487 per hectare, respectively. The benefit cost ratio was found 1.85. Inputs like human labour, seedling, manures, urea, TSP, irrigation, and insecticide had positive effect on the yield of onion. The profit obtained from onion cultivation was found higher than that of other competitive crops like mustard, groundnut, and cabbage. Non-availability of HYV onion seed at proper time, lack of technical knowledge, high price and non-availability of fertilizer in time, lack of appropriate storage facility were the major problems of onion cultivation in the study areas and needs immediate attention to solve these problems.

Keywords: Onion, input use pattern, profitability

## Introduction

Onion is an important spice crop in Bangladesh. It ranks first in production (889000 MT) and second in area (125101 ha) among the spices (BBS, 2008). It covers almost 36% of the total areas under spices. The mean yield of onion in Bangladesh is very low (4 t/ha) compared to world average of 17.27 t/ha (FAO, 1998). During winter, onion is widely cultivated all over Bangladesh. Farmers generally follow traditional method for cultivating onion in Bangladesh. Area and production of onion in Bangladesh during the last five years are given below;

Although production of onion is increasing day by day, but in a land hungry country like Bangladesh it may not be possible to meet the domestic demand due to increase in population. There is an acute shortage of onion in relation to its requirement. Every year, Bangladesh has to import a big amount of onion from neighbouring and other countries to meet up its demand. Total import of onion stood at 55499 metric tons in 2005 (BBS, 2007).

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**Table 1. Area and production of onion in Bangladesh.**

| Year | Area ('000 ha) | Production ('000 MT) |
|---|---|---|
| 2003-04 | 52.0 | 272.2 |
| 2004-05 | 86.4 | 589.4 |
| 2005-06 | 115.6 | 768.6 |
| 2006-07 | 129 | 894 |
| 2007-08 | 125 | 889 |

The high demand of onion can only be met by increasing its production vertically. Efficient use of resources can provide the farmers to have higher production from the available resources. The situation is particularly critical in a country like Bangladesh where per hectare recommended amount is seldom used in production (Jabbar and Alam, 1979; Jabbar and Islam, 1981). As a result, farm level yield of onion is very low compared to their recommended yield. Farmers in the study areas also follow different levels of management depending upon their infrastructural facility and socio-economic conditions which ultimately results variability in yields. Few studies (Awal *et al.,* 2004; Saha and Elias, 1990) have been conducted on onion cultivation. But the information on production and input use pattern in onion cultivation is still scarce. Lack of farm level information on onion cultivation frequently prevents researcher from undertaking priority research areas. Keeping in view the above related facts, the present study was undertaken with the following objectives:

(i) To know the existing agronomic practices of onion cultivation;

(ii) To estimate the profitability from onion cultivation;

(iii) To measure the relative profitability of onion cultivation with major competing crops; and

iv) To find out the socio-economic constraints to its higher yield.

**Materials and Method**

**Study area**

The present study was conducted in three districts, namely Magura, Faridpur, and Rajshahi of Bangladesh. From each district, one upazila i.e, Shalikha Upazila under Magura district, Nogarkanda Upazila under Faridpur district, and Bagmara Upazila under Rajshahi district were purposively selected for the study based on the extensive onion cultivation area. From each Upazila, two villages were selected purposively for collecting cross sectional data and information from the sample farmers.

**Sample size**

A total of 150 onion growers taking 50 farmers from each upazila were selected by random sampling technique for the study.

**Data collection and analytical technique**

Data were collected by survey method with the help of pre-designed and pre-tested interview schedule during April to May 2009. The collected data were edited, summarized, tabulated, and analyzed to fulfill the objectives of the study.

Tabular method of analysis using different statistical tools was used in presenting the results of the study. Profitability of onion production was examined on the basis of gross margin, net return, and benefit cost analysis.

*Functional analysis*

Cob-Douglas production function was used to estimate the contribution of factors to onion cultivation. The functional form of the Cobb-Douglas production function model is given below:

$$Y = AX_1^{b1}X_2^{b2}\text{-------------------------} X_n^{bn}e^{ui}$$

The production function was linearized by transforming it into the following logarithmic form:

$$\text{Log } Y = \text{Log } a + b_1\text{Log } X_1 + \text{.....................} + b_n \text{ Log } X_n + U_i$$

The empirical production function was the following:

$$\text{Log } Y = \text{Log } a + b_1 \text{LogX}_1 + b_2 \text{LogX}_2 + b_3 \text{LogX}_3 + b_4 \text{LogX}_4 + b_5 \text{LogX}_5 + b_6 \text{LogX}_6 + b_7 \text{LogX}_7 + b_8 \text{LogX}_8 + b_9 \text{LogX}_9 + U_i.$$

Where,

$Y$ = Yield of onion (kg/ha)

$X_1$ = Human Labor (Man-days/ha)

$X_2$ = Land preparation cost (Tk./ha)

$X_3$ = Seedling (kg/ha)

$X_4$ = Manure (kg/ha)

$X_5$ = Urea (kg/ha)

$X_6$ = TSP (kg/ha)

$X_7$ = MP (kg/ha)

$X_8$ = Cost of insecticide (Tk./ha)

$A$ = Intercept

$b_1, b_2$ ------------------ $b_8$ = Coefficients of the respective variables to be estimated.

$U_i$ = Error term.

**Results and Discussion**

**Agronomic practices**

It was revealed from Table 2 that the average number of ploughings per farm was 4.9 and laddering was 2.9. In the study areas, cent percent farmers planted onion seed in line. The planting time of onion ranged from 1$^{st}$ week of December to 4$^{st}$ week of January. The planting time varied from area to area. The average number of weedings, urea top dressing, spraying insecticides, and irrigation per farm was 2.27, 2.33, 0.75, and 2.88, respectively. The harvesting time was started from 3$^{rd}$ week of March and continued up to 3$^{rd}$ week of April. The farmers in the study areas used different varieties of onion seed, such as Faridpuri, Taherpuri, and local. On an average, 55% farmers used Taherpuri, 12% used Faridpuri and 33% farmers used local varieties of onion seed.

**Table 2. Agronomic practices of onion production in different study areas.**

| Items | Magura | Faridpur | Rajshahi | All areas |
|---|---|---|---|---|
| Ploughing (no./farm) | 4.5 | 4.9 | 5.4 | 4.9 |
| Laddering(no./farm) | 4.4 | 1.7 | 2.8 | 2.9 |
| Planting method (% of farmer) | | | | |
| Line | 100 | 100 | 100 | 100 |
| Planting time | 1$^{st}$ week of Dec. to 4$^{th}$ week of Dec. | 1$^{st}$ week of Dec. to 4$^{th}$ week of Dec. | 3$^{rd}$ week of Dec. to 4$^{th}$ week of Jan. | 1$^{st}$ week of Dec. to 4$^{th}$ week of Jan. |
| Weeding (no./farm) | 2.16 | 1.96 | 2.70 | 2.27 |
| Urea top dressing (no./farm) | 2.0 | 2.0 | 3.0 | 2.33 |
| Spraying insecticides (no./farm) | 0.60 | 0.70 | 0.96 | 0.75 |
| Irrigation (no./farm) | 2.3 | 2.7 | 3.63 | 2.88 |
| Harvesting time | 3$^{rd}$ week of March. to 2$^{nd}$ week of April | 4$^{th}$ week of March to 2$^{nd}$ week of April | 4$^{th}$ week of March to 3$^{rd}$ week of April | 3$^{rd}$ week of March to 3$^{rd}$ week of April |
| Variety used (% of farmer) | | | | |
| Faridpuri | 23 | 13 | - | 12 |
| Taherpuri | - | 67 | 97 | 55 |
| Local | 77 | 20 | 3 | 33 |
| Total | 100 | 100 | 100 | 100 |

**Input use pattern**

It was found from Table 3 that on an average, 183 man days/ha of human labour were used for producing onion in which 45% were family supplied. The use of human labour was found higher in Rajshahi (190 man-days/ha) followed by

Magura (186 man-days /ha). Farmers in the study areas used 1874 kg seedling per hectare. Highest 6250 kg per hectare of manures was applied by the farmers of Rajshahi district. The farmers in the study areas used chemical fertilizers like urea, TSP, and MP at the rate of 162 kg/ha, 120 kg/ha, and 97 kg/ha, respectively. The recommended dose of Urea, MP, and TSP were 201-265 kg/ha, 202-267 kg/ha and 102-132 kg/ha, respectively (Anon., 2005). Farmers in the study areas use lower amount of Urea and MP compared to the recommended dose.

**Table 3. Input use pattern of onion production in different study areas.**

| Items | Magura | Faridpur | Rajshahi | All areas |
|---|---|---|---|---|
| Human labor (man days/ha) | 186 (100) | 174 (100) | 190 (100) | 183 (100) |
| Family | 90 (48) | 75 (43) | 85 (45) | 83 (45) |
| Hired | 96 (52) | 99 (57) | 105 (55) | 100 (55) |
| Seedling (kg/ha) | 1799 | 1966 | 1856 | 1874 |
| Manures(kg/ha) | 4950 | 2300 | 6250 | 4500 |
| Fertilizers (kg/ha) | | | | |
| Urea | 159 | 166 | 160 | 162 |
| TSP | 114 | 123 | 140 | 120 |
| MP | 96 | 103 | 92 | 97 |

Figures within the parentheses indicate percentage of total cost

## Cost of onion cultivation

The cost of onion cultivation included different variable and fixed costs. The cost of human labour, land preparation, seed, cow dung, fertilizers, insecticides, irrigation, interest on operating capital and land use, etc. were calculated on per hectare basis. The total cost of onion cultivation was found to be Tk. 93517 per hectare in the study areas. The average variable and fixed cost was estimated at Tk. 87696 and Tk. 5821, respectively, for all the areas. The cost of seedling (Tk. 38251/ha) was the major cost item of onion cultivation followed by human labour cost (Tk. 22890/ha). The cost of onion cultivation at Rajshahi was found higher compared to Faridpur and Magura due to higher cost of manures, fertilizer, and insecticides (Table 4).

## Return from onion cultivation

The average yield of onion was found 9869 kg per hectare which was much lower than the potential yield (16 t/ha) (BARC, 2005). The yield of onion was found higher in Rajshahi (12376 kg/ha) compared to Faridpur (9216 kg/ha) and Magura (8013 kg/ha) due to better land preparation, good soil condition, and quality seed. Awal *et al.* (2004) found the yield of onion 6.03 t/ha and it was lower compared to the yield of present study probably due to low management practices. Gross return and gross margin from onion cultivation was found Tk.

173004 and Tk. 85308 per hectare in the study areas. Gross margin was found higher in Rajshahi followed by that of Faridpur and Magura district. The net return of onion cultivation was Tk. 79487 per hectare. It was found highest in Rajshahi (Tk. 153788/ha) followed by Faridpur (Tk. 58632/ha) due to higher gross return. The benefit cost ratio was also higher in Rajshahi (2.59) compared to Faridpur and Magura.

**Table 4. Cost of onion production in different study areas (Tk/ha).**

| Items | Magura | Faridpur | Rajshahi | All areas |
|---|---|---|---|---|
| Variable cost | | | | |
| Human labour | 23250 (25) | 22620 (25) | 22800 (24) | 22890 (24) |
| Family | 11250 | 9750 | 10200 | 10400 |
| Hired | 12000 | 12870 | 12600 | 12490 |
| Land preparation cost | 8 121(9) | 5090 (6) | 7405 (8) | 6872 (7) |
| Seedling | 34486 (38) | 42406 (46) | 37862 (39) | 38251 (41) |
| Organic manures | 2970 (3) | 1150(1) | 3125 (3) | 2415 (3) |
| Chemical fertilizers: | 6488 (7) | 6602 (7) | 8000 (8) | 7030 (8) |
| Urea | 1022 | 996 | 1000 | 1006 |
| TSP | 3332 | 3391 | 4480 | 3734 |
| MP | 2134 | 2215 | 2520 | 2290 |
| Insecticides | 1116(1) | 1263 (1) | 1847 (2) | 1409 (2) |
| Irrigation | 6065 (7) | 5442 (6) | 6340 (7) | 5949 (6) |
| Interest on operating capital | 2731(3) | 2947 (3) | 2962 (3) | 2880 (3) |
| A. Total variable cost | 85227 | 87520 | 90341 | 87696 |
| Fixed costs | | | | |
| Land use cost | 6237 (7) | 4990 (5) | 6237 (6) | 5821 (6) |
| B. Total fixed cost | 6237 | 4990 | 6237 | 5821 |
| Total cost(A+B) | 91464 (100) | 92510 (100) | 96578 (100) | 93517 (100) |

Figures within the parentheses indicates percentage of total cost

**Table 5. Return from onion cultivation in different study areas.**

| Items | Magura | Faridpur | Rajshahi | All areas |
|---|---|---|---|---|
| Total cost (Tk./ha) | 91464 | 92510 | 96578 | 93517 |
| Total variable cost (Tk./ha) | 85227 | 87520 | 90341 | 87696 |
| Yield (kg/ha) | 8013 | 9216 | 12376 | 9869 |
| Average price (Tk./kg) | 15.97 | 16.40 | 20.23 | 17.53 |
| Gross return (Tk./ha) | 127968 | 151142 | 250366 | 173004 |
| Gross margin (Tk./ha) | 42741 | 63622 | 160025 | 85308 |
| Net return (Tk./ha) | 36504 | 58632 | 153788 | 79487 |
| Benefit cost ratio | 1.40 | 1.63 | 2.59 | 1.85 |
| Unit cost of production (Tk./kg) | 11 | 10 | 8 | 9 |

### Factors affecting onion yield

In order to determine the contribution of some inputs like human labour, manures, seed, urea, TSP, MP, irrigation, and insecticides Cobb-Douglas production function was constructed. The estimated values of co-efficients and related statistics of Cobb- Douglas production function were presented in Table 6. It is clear from the model that the co-efficient of human labour, seedling, TSP, and insecticides were positive and significant, which indicated that 1% increases in the use of human labour, seedling, TSP, and insecticides, keeping other factors constant would increase the yield by 0.01%, 0.01%, .005%, and .002%, respectively. The co-efficient of manures, urea, and MP were found negative and significant which indicated inefficient use of these inputs. Farmers in the study area use lower amount of manure, urea, and TSP compared to recommended dose but their coefficient was found negative. This may be for the fact that respective plots of the respondents are already enriched with the ingredients of these inputs or these plots are getting the ingredients from other sources which are not considered for the study.

The value of the coefficient of determination ($R^2$) was 0.79, which indicated that around 79% of the variation in yield was explained by the independent variables included in the model. The F-value was found 34.08 which was significant at 1% level implying that the variation of yield mainly depends on the explanatory variables included in the model.

**Table 6. Estimated coefficients and their statistics of production function for onion.**

| Explanatory Variables | Co-efficient | t-values |
|---|---|---|
| Intercept | 0.98*** | 217.53 |
| Human labor ($X_1$) | 0.01*** | 2.03 |
| Land preparation cost ($X_2$) | 0.003ns | 0.86 |
| Seedling ($X_3$) | 0.0I*** | 3.96 |
| Manure ($X_4$) | 0.0007*** | -4.17 |
| Urea ($X_5$) | 0.002*** | -4.88 |
| TSP ($X_6$) | 0.005*** | 339 |
| MP ($X_7$) | 0.003** | -2.2.08 |
| Insecticides ($X_8$) | 0.002*** | 10.84 |
| $R^2$ | 0.79 | |
| F value | 34.68*** | |

Note: *** and ** indicate significant at 1% and 5% level, respectively.

**Comparative profitability of onion with other competitive crops**

An attempt was made to compare the profitability of onion with other competitive crops in different study areas. The competitive crops in these study areas were mustard, groundnut, mungbean, cabbage, cauliflower, wheat, and maize. In this study, three major competitive crops, such as mustard, groundnut, and cabbage were taken into consideration. The average cost, return, and benefit cost ratio of four different crops are shown in Table 6. The gross return was found higher from onion cultivation than that of mustard, groundnut, and cabbage. Although total cost of production was higher for onion but gross margin was found higher for onion (Tk. 85308) compared to mustard (Tk. 47935), ground nut (Tk. 34721), and cabbage (Tk. 82109).

**Table 7. Comparative economic performance of onion with other competitive crops.**
*(Figure in Tk/ha)*

| Items | Onion | Mustard | % higher | Ground nut | % higher | Cabbage | % higher |
|---|---|---|---|---|---|---|---|
| **A. Gross return** | 173004 | 64778 | 62.56 | 55496 | 67.92 | 119558 | 30.89 |
| B.Totalvariablecost | 87696 | 16843 | -80.79 | 20775 | -76.31 | 37449 | -57.29 |
| C.Total cost | 93517 | 29102 | -68.88 | 32275 | -65.48 | 63012 | -32.61 |
| **Gross margin (A-B)** | 85304 | 47935 | 43.81 | 34721 | 59.30 | 82109 | 3.75 |
| Net return (A-C) | 79487 | 35676 | 55.12 | 23221 | 70.79 | 56545 | 28.86 |
| **Benefit cost ratio** | 1.85 | 2.23 | -20.54 | 1.72 | 7.02 | 1.90 | -2.70 |

**Problems of onion production**

The farmers in the study areas encountered different problems during onion cultivation. The problems were ranked based on their priority. First problem was non-availability of HYV seed at proper time followed by lack of technical knowledge, high price, and non- availability of fertilizer in time, infestation of insects and diseases, low market price, and lack of storage facility. The nature of problems slightly varied from area to area (Table 8).

**Table 8. Constraints to onion cultivation in different study areas.**

| Constraints | Rank value | | | |
|---|---|---|---|---|
| | Magura | Faridpur | Rajshahi | All areas |
| 1. Non- availability of HYV onion seed at proper time | 1 | 1 | 2 | 1 |
| 2. Lack of technical knowledge | 3 | 2 | 1 | 2 |
| 3. High price and non-availability of fertilizer in time | 2 | 3 | 3 | 3 |
| 4. Infestation of insects and diseases | 4 | 5 | 4 | 4 |
| 5. Low market price | 6 | 4 | 5 | 5 |
| 6. Lack of storage facilities | 5 | 6 | 6 | 6 |

**Conclusions and Recommendations**

The onion cultivation is found profitable in the study areas although the yield is lower than the potential yield. Human labour, seedling, TSP, and insecticide had positive and significant effect on the yield of onion, while Urea and MP had negative effect on the yield of onion in the study areas. Among the competitive crops like mustard, groundnut, and cabbage, the highest profit was obtained from onion. Non-availability of HYV onion seed at proper time was mentioned as a major problem of onion cultivation in the study areas followed by lack of technical knowledge and high price of fertilizer. Based on the findings of the study, the following recommendations can be made;

- HYV onion seed should be made available to the farmers at proper time to increase the production of onion.

- Training on onion cultivation should be organized by government and non-government organizations to develop technical knowledge of the farmers, which will help the farmers to use the inputs in efficient way.

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