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PROFITABILITY AND RESOURCE USE EFFICIENCY OF MUSTARD PRODUCTION IN SIRAJGANJ DISTRICT, BANGLADESH

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ABSTRACT

The study was conducted in Sirajganj district of Bangladesh to determine the profitability and resource use efficiency of mustard production. Both descriptive statistics and functional analysis was done to achieve the objectives of the study. The findings of the study suggested that the total cost of mustard production was Tk. 51105.8 per hectare of which 52.6% was variable cost. Net return and BCR was found to be Tk. 34556.9 per hectare and 1.67 respectively. Urea and TSP had positive and significant effect on the yield of mustard. Farmers in the study area use different input inefficiently. Farmers in the study area also face some constraints like high price of inputs, non-availability of quality seed, low price of mustard etc. regarding mustard production. Financial support and crop management training are needed to farmer to increase the production of mustard in the study area.

Keywords: financial profitability, benefit cost ratio, resource use efficiency

INTRODUCTION

Mustard is one of the most important oilseed crops throughout the world after Soybean and groundnut (FAO, 2013) and also the most important crop in among all oilseed crops in Bangladesh. Worldwide total annual production of mustard is 630.40 lakh metric tons of seed from an area of 343.30 lakh hactare (FAO, 2013). It has a remarkable demand for edible oil in Bangladesh. It occupies first position of the list in respect of area and production among the oilseed crops grown in this country (BBS, 2011). In 2010-11 mustard covered 2.52 lakhs hectare land and the production was 2.46 lakhs metric tons, where as the total oilseed production was 7.30 lakhs metric tons and total area covered by oilseed crops was 3.74 lakhs hactare (BBS, 2011). This production of oil seed is one-third in compare to the total demand of the country. The average yield of the crop stands at 973 kg/ha (BBS, 2011), which is very low compared to the yield of many mustard growing countries of the world. Oil cake, the byproduct of mustard, is a nutritious food item for cattle and fish. It is a good organic fertilizer too. It is an important source of cooking oil in Bangladesh and it meets one third of the edible oil requirement of the country (Ahmed, 2008). Mostly supply of oil in the market is maintained through import from abroad at the cost of huge amount of foreign exchange (Anonymous, 2012). The government of Bangladesh has, therefore, provided priority to the agriculture sector to increase the production of oil seeds by giving subsidy to the farmers on different inputs such as fertilizer, irrigation etc. to achieve self sufficiency in oil seeds production.

The causes for the lower yield of mustard are due to low yield potential of the varieties grown from farmers own sources, susceptible to disease and insufficient precipitation when the crops are grown under rain-fed conditions with traditional crop management practices. With the rapid increase in population and urbanization, the demand for oil production has been increasing. To meet up growing demand without importing, oil area under mustard should be increased. The high demand of oil can only be met by increasing its production vertically. While making production decision, farmers consider costs of production against the yield of the crop. The rate of adoption and sustainability of any crop depend upon its economic profitability. With the importance of mustard cultivation in Bangladesh, it is necessary to find out the maximum level of mustard produced per unit of land using the existing

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level of resources. 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 dose is seldom used in production (Jabbar and Alam, 1979; Jabbar and Alam, 1981). Most of the farmers that produce mustard lack of management techniques, by not having adequate knowledge or how to combine resources efficiently in mustard production. Management and technological training is needed to the farmers to increase farm production and income from mustard cultivation (Rabbani *et al.,* 2013.). The future of mustard production in Bangladesh depends very much on the awareness of its profitability and how efficiently the farmers are using their resources. But, so far very few attempts have been made to undertaken the economic evaluation of mustard production at farm level. Keeping this in view the study was undertaken with the following specific objectives are to determine the financial profitability, resources use efficiency, factor effecting and constrains of mustard cultivation in the study area.

MATERIALS AND METHODS

The present study was conducted in Ullapara upzilla under Sirajganj district during 2012-2013. The study area was selected purposively, because a large number of farmers use to grow mustard in the area. A total of 105 farmers were selected randomly for this study. Collected data were analyzed by using both functional and descriptive statistics. Gross Return was calculated by multiplying the total volume of output of an enterprise by the average price in the harvesting period (Dillon and Hardaker, 1993). Cost and return analysis was done on both variable and total cost basis. The following profit equation was used to assess the profitability of Mustard production at the farm level:

$$\pi = P_r\ Q_r + P_b\ Q_b - \sum_{i=1}^{n}(P_{xi}.Xi) - TFC$$

Where,

Π = Profit per hectare of Mustard
P_r = Per unit price of output (Tk/ton)
Q_r = Quantity of output (ton/ha)
P_b= Per unit price of by-products (Tk/ton)
Q_b= Quantity of by-product (ton/ha)
P_{xi}= per unit price of the $_i$th (Variable) inputs
X_i = quantity of the $_i$th inputs
i = 1, 2, 3.....n and
TFC = Total fixed cost

The BCR is a relative measure, which is used to compare benefit per unit of cost. The BCR estimated as a ratio of gross returns and total costs. The formula of calculating BCR (undiscounted) is shown below:

Benefit cost ratio (BCR) = Gross return / Total cost

Functional analysis

To determine the contribution of the most important variables in the production process, the following type of Cobb-Douglas production function was used in the study.

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

By taking log in both sides the Cobb-Douglas production function was transformed into the following logarithmic form because it could be solved by the ordinary least square (OLS) method;

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_4 \ln X_5 + u_i$$

Where,

Y = Yield of mustard (Kg /ha), a = Constant or Intercept of the function, Xi = Human labor (Mandays /ha), X2 = Seed (Kg /ha), X3 = Urea (Kg /ha), X4 =TSP (Kg /ha), X5 = MoP (Kg /ha), b_i = Coefficient of respective variables, ln = Natural logarithm, ui = Error term and i = 1, 2,....n

Efficiency of Resource Allocation

In order to test the efficiency, the ratio of marginal value product (MVP) to the marginal factor cost (MFC) for each input is computed and tested for its equality to 1; MVP/MFC= 1

The marginal productivity of a particular resource represents the additional to gross returns in value term caused by an additional one unit of that resource, while other inputs are held constant. When the marginal physical product (MPP) is multiplied by the product price per unit, the MVP is obtained. The most reliable, perhaps the most useful estimate of MVP is obtained by taking resources (Xi) as well as gross return (Y) at their geometric means (Dhawan and Bansal, 1977).

In this study the MPP and the corresponding values of MVP were obtained as follows:

MPPxi*Pyi = MFC,

Where MPPxi *PYi = MVP,

But, MPP = bi*(Y/Xi)

So, MVP = bi* (Y/Xi) P_{yi}

Where,

b_i = regression coefficient per resource, Y = Mean output ,Xi = Mean value of inputs, Pyi = price of output, MFC = price of per unit of input.

Thus, when Resource-use efficiency (RUE) =1, resources are optimally utilized, When RUE < 1, resources are over utilized, When RUE > 1, resources are underutilized.

RESULTS AND DISCUSSION

Input use pattern and cost of production

Human labour was an important input in the production of mustard. It was required for different operations such as land preparation, seed sowing, fertilizer application, insecticide application and harvesting. It is revealed from Table 1 that the farmers in the study area used 56.7 man days of human labour per hectare. All the farmers in the study area used chemical fertilizer like Urea, TSP and MoP. Farmers in the study area used 233, 143.2 and 113.3 kg per hectare of Urea , TSP and MoP respectively.

The cost of mustard production included different variable and fixed costs. It is found from the Table 1 that human labour cost is the major cost item in mustard production. It is estimated at Tk. 11340 per

Table 1. Per hectare cost of mustard production

Items of cost	Quantity	Rate	Cost (Tk)	% of Total Cost
1.Human labor (man days/ha)	56.7	200.0	11340	22.2
2.Power tiller (Tk.)	--	--	1501.7	2.9
3.Seed (Kg)	13.5	70.0	945	1.8
4.Manure (Kg)	--	--	319.3	0.6
5.Urea(Kg)	233.0	20.0	4660	9.1
6.TSP (Kg)	143.2	22.0	3150.4	6.2
7. MoP (Kg)	113.3	16.0	1812.8	3.5
8.Insecticides (Tk.)	--	--	2491.4	4.9
Interest on operating capital @ of 10% for 3 months	--	--	655.5	1.3
A. Total Variable Cost (TVC)	--	--	**26876.1**	52.6
Land use cost	--	--	24229.7	47.4
B. Total Fixed cost (TFC)	--	--	**24229.7**	47.4
C. Total cost (A+B)	--	--	**51105.8**	100

hectare which is more than 22% of the total cost. Power tiller is labour saving modern tillage technology. In the study area, all the farmers used power tiller for their land preparation. Per hectare costs of power tiller is estimated at Tk. 1501.7. Fertilizer cost is second largest variable cost item in the study area. About 19% of the total cost is incurred for different fertilizers. Highest fertilizer cost per

hectare is incurred for urea (Tk.4660) followed by TSP (Tk. 3150.4). Land use cost was calculated on the basis of cash rental value of per hectare land for the cropping period of 3 months. The land use cost is found to be Tk. 24229.7 per hectare. Total cost of mustard production is found to be Tk. 51105.8 per hectare of which 52.6% is variable cost and remaining 47.4% is fixed cost.

Financial profitability of mustard production

It is evident from Table 2 that the average yield of mustard is 1627 kg/ha in the study area. Gross return is found to be Tk. 85662.7 per hectare. Gross margin and net return received by the farmers is estimated at Tk. 59442.1 and Tk. 34556.9 per hectare respectively. Gross margin is obtained by deducting total variable cost from gross return. Benefit Cost Ratio (BCR) is a relative measure, which is used to compare benefits per unit of cost. It helps analyze the financial efficiency of the farmers. Benefit cost ratio is found 1.67 which implies that one taka investment in mustard production generated Tk. 1.67.

Table 2. Per hectare profitability of mustard production

Items	Quantity	Rate	Value (Tk)
Main product (Kg)	1627	50.0	81350.0
By product value (Tk.)			4312.7
Gross Return (Tk.)			85662.7
Total variable cost (Tk)			26220.6
Total cost (Tk.)			51105.8
Gross Margin (Tk.)			59442.1
Net Return (Tk.)			34556.9
BCR (undiscounted)			1.67

Input output relationship

In order to examine the contributions of some inputs in mustard cultivation, Cobb-Douglas production function is constructed. The estimated value of the co-efficient of Cobb-Douglas production function is presented in Table 3 and 4.

Table 3. Cobb-douglas regression estimates for mustard production

Variables	Co-efficients	Stadard error	T-value
Constant	4.347***	0.246	17.59
Human labour	0.020	0.014	1.40
Seed	0.068	0.057	1.19
Urea	0.156***	0.053	2.93
TSP	0.374***	0.030	12.15
Mop	0.017	0.014	1.22
Adjusted R^2	0.72		
F value	56.98***		
Return to scale	0.635		
Observations (n)	105		

*** = Significance @ 1% level

Table 4. Estimated resource-use efficiency in mustard production

Variables	Geometric mean	MVP	MFC	MVP/MFC	Comment
Human labour	54.49	30.91	200	0.15	Over utilized
Seed	13.40	418.69	70	5.98	Under utilized
Urea	232.06	55.03	20	2.75	Under utilized
TSP	141.67	215.25	22	9.79	Under utilized
Mop	108.99	13.40	16	0.83	Over utilized

It is clear from Table 3 that Urea and TSP had positive and significant effect on mustard production. Co- efficient of Urea and TSP is positive and significant at 1% level. It indicated that the yield of mustard will increase with increased use of these variables keeping other factors remain constant. Coefficients of other variables included in the model are positive but not significant. Adjusted R^2 is found to be 0.72 implies that 54% of the total variation in yield can be explained by the variables included in the model. F-value is significant at 1% level indicates that variations in yield mainly depends on the variables included in the model. Returns to scale reflect the degree to which a proportional change in all inputs caused change in the output. The sum of the coefficients of different inputs stood at 0.635 for mustard production. This indicates that the production function exhibited a decreasing return to scale would implying that if all the inputs specified in the function are increased by 1 percent yield will increase by 0.635 percent.

The ratio of MVP and MFC is found to be higher than the unity of seed, urea and TSP implies that there is a scope of increasing the yield of mustard by applying more and more of these inputs (Table 4). Ratio of human labour and Mop implies that farmers in the study area not only using this inputs inefficiently but also over utilizing this inputs. Labour and Mop use in mustard production should thus be reduced considerably to attain efficiency.

Constraints of mustard cultivation

Although mustard was a profitable crop in the study area, there are several constrains to its higher production. It was revealed from Table 5 that high prices of fertilizer and insecticides (100%) ranked first as a problem of mustard production followed by low price of output (69%). Besides, non availability of quality seed (45%), lack of capital (42%), attack of insects and diseases (31%) and Lack of knowledge of improved technology (27%) ranked as 3rd , 4th, 5th and 6th constraints of mustard cultivation in the study area.

Table 5. Constraints to mustard cultivation as opined by the sample farmers

Items	Percentage farmers responded	Rank
High prices of fertilizer and insecticides	100	1
Low price of farm output	69	2
Non availability of quality seed	45	3
Lack of capital	42	4
Attack of insects and diseases	31	5
Lack of knowledge of improved technology	27	6

The study assesses the profitability of mustard cultivation at farm level. The study shows that the mustard cultivation at farm level is profitable. Resource use efficiency indicates that more profit can be obtained by increasing investment in crop management and application of fertilizer. Cultivation of this crop can help in increasing farm income. The management practices of mustard production in the study areas were not found efficient enough. Farmers were not known about the application of inputs in right time with right doses. The problems associated with mustard cultivation at farm level could be over come if financial support and technical assistance are made available by the government. Thus well planned, and management training in accordance with their problems and need based can lead them to increase farm production and income from mustard cultivation. Finally the government, the researcher, different agencies, and NGOs should coordinately give more emphasis to increase the production of mustard in Bangladesh.

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