

Profitability of Sugarcane Cultivation in Some Selected Char Lands of Sirajganj District

M.S. Islam^{1*}, S. Khatun¹, M. Kamruzzaman¹, S.M.R. Karim² and M.R. Islam³

¹Agricultural Economics Division, ²Training and Technology Transfer Division

³On-Farm Research Division

Bangladesh Sugarcrop Research Institute, Ishurdi-6620, Pabna, Bangladesh

ABSTRACT

The study was undertaken to examine the financial analysis of sugarcane cultivation in char areas of Sirajganj districts of Bangladesh. Main objectives of the study were to explore socio-economic characteristics, profitability of sugarcane cultivation in char lands, factors affecting sugarcane cultivation and constraints of sugarcane cultivation in char areas of Sirajganj district. Data were randomly collected from 50 farmers in the study area. A pre-tested interview schedule was used to collect data. Tabular and functional analyses both were applied in this study. Per hectare cost of sugarcane cultivation in char areas of Sirajganj was Tk. 1,14,132. Share of cost of major inputs for sugarcane cultivation in char areas were human labor (40.7), seed (18.6%), fertilizer (10.5%), irrigation (6.9%), tractor/animal labor (5%) and pesticide (4.5%). Average yield of sugarcane was 56.53 t/ha¹. Per hectare net return was Tk. 41,325.5 in the study area. Average BCR over variable cost was 1.57. Human labor, tractor/animal labor, urea, TSP and irrigation were positively significant but mop and gypsum were negatively significant. Irrigation problem, lack of clean seed, lack of adequate crusher machine, infestation of disease and pests, low price of sugarcane, lack of transportation facility and lack of money were the major constraints of char sugarcane farmers in Sirajganj district.

Keyword: Socio-economic characteristics, profitability, factors affecting and constraints

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is one of the most vital cash-cum industrial crops in Bangladesh. Agriculture contributes 15.96 percent to the nation GDP. Among them, crop sector contributes 8.83 percent (BER, 2015) and sugarcane alone contributes 0.74 percent of the national economy (Pal *et al.*, 2005). Farmers are cultivating sugarcane in mill zone areas and non-mill zone areas. Sugarcane is a long duration crop which requires 12-16 months from planting to harvesting. During the period of 2012-13, our total production of sugar and *goor* is 7 lack metric tons while annual requirements of sugar/*goor* is 19.97 lack metric tons (Anon., 2014-15). Shortfall of sugar is met from importation. Shortfall in *goor* cannot be met from importation, because *goor* is not available in the international market (KA, 1996). At this moment, it is essential to increase the sugarcane area and production to meet up our national demand. Per hectare yield of sugarcane in Bangladesh is 46 t/ha (Khatun and Rahman, 2011) which is less than others country. Average cane yield in Pakistan, India, Thailand, China, and Brazil was 53.20 t/ha, 66.93 t/ha, 63.71 t/ha, 80.82 t/ha and 74.42 t/ha respectively (FAO, 2007). Its

* Corresponding author: M.S. Islam, Scientific Officer
e-mail: shafiqbau07@gmail.com

area is decreasing day by day as farmers want quick return from their crops. During the period of 2009-10, 2010-11 and 2011-12 total sugarcane area were 1.18 lacks ha, 1.16 lacks ha and 1.08 lacks ha respectively (BBS 2013). Plain lands of our country are replacing rapidly with short duration crops. It is now difficult to increase sugarcane area in plain land. But there is a scope to increase sugarcane cultivation in char lands, saline belt and hilly areas. The fifty percent of sugarcane area is located in the mill zones, where sugarcane is utilized for sugar production and remaining 50% is situated in the non-mill zone, which is used for *goor* and juice production (Alam *et al.*, 2005). Due to geographical isolation from the mainland, chars are considered most backward areas in Bangladesh. Climate disaster like flood, river erosion puts a lot of pressure especially on char dweller's whose responsibility is to remain together as family and earn subsistence in day to day life. Cultivation of sugarcane on fallow char lands is gaining popularity as the farmers are getting financially benefited through its cultivation. Hence the study was undertaken to examine the financial condition, factors affecting of sugarcane cultivation in char areas and constraints of sugarcane cultivation in char areas of Sirajganj district.

MATERIALS AND METHODS

The study was conducted in char surrounded sugarcane growing Sirajganj district during October-November, 2015. Sadar and Kamarkhondo Upazila from Sirajganj district were selected for the study. A total of 50 farmers taking 25 from each location were selected for the study. Necessary information was collected through survey method with the help of a pre-tested interview schedule. Data were collected on inputs, input costs, output, output price, yield and constraints of sugarcane cultivation in char areas of Sirajganj district. Collected data were summarized, analysed and tabulated. Functional analysis and descriptive statistics were used to analyse the data. Profitability of sugarcane cultivation in char lands of Sirajganj district was estimated on the basis of gross return, gross margin and benefit cost analysis. In calculating gross margin, all operating costs were considered as variable cost. Family labour was also included in case of calculating total cost. Constraints were identified based on the questions asked to the respondents and then data were edited and summarized to find out the problems.

Analytical Technique

Gross return (GR) was calculated by multiplying the total volume of sugarcane produced by per unit price of sugarcane plus average amount of seed sell. The following equation was used to estimate GR:

$$GR_i = \sum_{i=1}^n (Q_i P_i + S_i)$$

Where,

GR_i = Gross return from i^{th} product (Tk/ha)

Q_i = Quantity of the i^{th} product (ton)

P_i = per unit price of the i^{th} product (Tk)

S_i = Average amount of seed sell (Tk)

$i = 1, 2, 3, \dots, n$

Net return analysis considered fixed cost, cost of land rent, interest on operating capital etc. Net return was calculated by deducting all costs (variable and fixed costs) from gross return. To determine the net return following equation was used in the study:

$$\pi = P_y Y - \sum_{i=1}^n P_{xi} X_i - TFC$$

Where,

π = Net return (Tk/ha)

P_y = per unit price of the product (Tk/ton)

Y = Quantity of the production per hectare (ton)

P_{xi} = Per unit price of i^{th} inputs (Tk)

X_i = Quantity of the i^{th} inputs (unit/ha)

TFC = Total fixed cost (Tk)

$i = 1, 2, 3, \dots, n$ (number of inputs)

In this study, cost and return analysis are done on both variable and total cost basis. The following profit equation was developed to assess the profitability of sugarcane in char areas:

$$\pi = \text{Gross return} - (\text{Variable cost} + \text{Fixed cost})$$

Here,

π = Profit per hectare

Gross return = Total production $\times$ per unit price

The following Cobb-Douglas function was used to estimate the effects of variable of sugarcane cultivation in char lands of Sirajganj district:

$$Y_i = a X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} X_7^{b_7} X_8^{b_8} X_9^{b_9} X_{10}^{b_{10}} X_{11}^{b_{11}} u_i$$

In the linear form it can be written as follows:

$$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_9 + b_{10} \ln X_{10} + b_{11} \ln X_{11} + U_i$$

Where,

Y = Return (Tk./ha)

X_1 = Human labor cost (Tk./ha)

X_2 = Tractor/Animal labor cost (Tk./ha)

X_3 = Seed cost (Tk./ha)

X_4 = Urea cost (Tk./ha)

X_5 = TSP cost (Tk./ha)

X_6 = MOP cost (Tk./ha)

X_7 = Gypsum cost (Tk./ha)

X_8 = $ZnSO_4$ cost (Tk./ha)

X_9 = Organic fertilizer cost (Tk./ha)

X_{10} = Pesticides cost (Tk./ha)

X_{11} = Irrigation cost (Tk./ha)

a = Constant or intercept term

$b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8, b_9, b_{10}, b_{11}$ = production co-efficient of the respective inputs variables to be estimated

U_i = Disturbance term.

RESULTS AND DISCUSSION

Socio-economic profile of char sugarcane growing farmers

Socio-economic characteristics of farmers are very important to make judgment about present situation and further planning. Behavior and attitude of persons differ in many aspects. Age, education, occupational status, farming experience, land holding etc. reflect community passion toward agricultural practices. These types of socio-economic characteristics were recorded in the study area.

Age: Age of farmers plays a vital role in the crop production and better management. The age of char sugarcane growing farmers were examined by classifying the farmers into four groups: 20-35, 36-50, 51-65 and 66-80 years (Table 1). Highest percent (46%) of farmers were under the age group of 36-50 years and lowest percent (10%) of farmers were under the age group of 66-80 years.

Education: Education is the backbone of the nation. Char sugarcane growers are lag behind from higher study. It hampers sugarcane production as well as many aspects of their life. In the study areas 46% of the char sugarcane farmers were illiterate. 26% percent farmers stopped their education at primary level. 24% famers reached at secondary level and only 4% farmers were at higher secondary level (Table 1).

Occupation: Char sugarcane farmers were involved in various types of activities such as agriculture, business, service and others. Table 1 shows the occupational status of char sugarcane farmers of Sirajganj district. It represents that agriculture (76%) was the main occupation of char sugarcane farmers. Only a few farmers were involved in business and service besides agriculture.

Farming experience: Farm experience is a crucial factor to ensure farm productivity. In the study area it was found that 52% char sugarcane farmers in Sirajganj were in the group of 9-16 years of farming experience, 40% were in the group of 0-8 years of farming experience and only 6% char sugarcane farmers were in the group of 17-24 years of farming experience (Table 1).

Farm size: In the study area char sugarcane farmers were categorized into three classes on the basis of their average land holding. Three classes were: small farmer (average land holding 0.05-2.49 acre), medium farmer (average land holding 2.50-7.49 acre) and large farmer (average land holding above 7.50 acre) (BBS, 2013). Table 1 represents that 64% char sugarcane farmers were small in size, 30% were medium and 6% were large farmers in Sirajganj district.

Table 1. Socio-economic profile of char sugarcane growing farmers in the study area

Items	No. of Farmer responded (n=50)	% of Farmer responded (n=50)
1. Age (% of farmers)		
20-35 years	12	24
36-50 years	23	46
51-65 years	10	20
66-80 years	5	10
2. Literacy level (%)		
Illiterate	23	46
Primary (Class 1-5)	13	26
Secondary (Class 6-10)	12	24
Higher Secondary (HSC) and above	2	4
3. Occupation (%)		
Agriculture	38	76
Agriculture + Business	9	18
Service+ Agriculture	2	4
Others	1	2
4. Average length of experience (Years)		
0-8	20	40
9-16	26	52
17-24	3	6
25-32	1	2
5. Farm size on landholding basis (%)		
Small Farmers (0.05-2.49 acre)	32	64
Medium Farmers (2.50-7.49 acre)	15	30
Large farmers (above 7.50 acre)	3	6

Source: Field survey, 2015

Cost and profitability of sugarcane cultivation in char lands

The cost of production included different variable cost items like human labor, animal labor, seedlings, fertilizer, insecticides, irrigation, carrying cost etc. Both cash expenditure and family supplied inputs (labor, land) were included in the analysis. The cost of land use was calculated on the basis of lease value of land. Table 5 shows that total cost of sugarcane production in char areas of Sirajganj district was Tk.114132 per hectare of which 87.0% was variable cost and 13.0% was fixed cost. The higher cost was incurred for human labor (40.7%) followed by sett cost (18.6%), fertilizer cost (10.5%), irrigation cost (6.9%), Tractor/Animal labor cost (5.0%), insecticide cost (4.5%) and carrying cost (0.8%) (Table 2).

Table 2. Cost of sugarcane cultivation in char areas of Sirajganj district

Particulars	Quantity	Price (TK./unit)	Total cost (Tk.)	% of cost
A Variable cost			99312	(87.0)
Human Labor (man-days)	186	250	46500	40.7
Tractor/Animal labor			5752	5.0
Sett (no./ha)	4247	5	21235	18.6
Fertilizer:			11971	(10.5)
Urea (kg/ha)	214	16	3424	3.0
TSP (kg/ha)	146	22	3212	2.8
MoP (kg/ha)	98	15	1470	1.3
Gypsum (kg/ha)	24	10	240	0.2
Zinc (kg/ha)	7	160	1120	1.0
Magnesium (kg/ha)	1.5	70	105	0.1
Boron (kg/ha)	0.8	200	160	0.1
Organic (t/ha)	1.12	2000	2240	2.0
Pesticide/insecticide			5086	(4.5)
Regent (kg/ha)	7	160	1120	1.0
Furadon (kg/ha)	19	130	2470	2.2
Bavistin (kg/ha)	0.38	2200	836	0.7

Ripcord (kg/ha)	0.22	3000	660	0.6
Irrigation			7851	6.9
Carrying			917	0.8
B. Fixed Cost				
Land use cost			14820	13.0
C. Total Cost (A+B)			114132	100

Source: Field survey, 2015

The average return of sugarcane cultivation in char lands of Sirajganj district is shown in Table 3. The average yield of sugarcane cultivation was 56.53 t ha⁻¹ and per ton sugarcane average price was calculated Tk. 2,750 in the study area. The net return was Tk. 41325.5 per hectare. The benefit cost ratios (BCR) over variable cost and over total cost were calculated 1.57 and 1.36 respectively.

Table 3. Profitability of sugarcane cultivation in char areas of Sirajganj district (Tk./ha)

Particulars	Profitability
Total cost	114132
Variable cost	99312
fixed cost	14820
Yield (t/ha)	56.53
Price (Tk./t)	2750
Total Return	155457.5
Net return	41325.5
BCR over variable cost	1.57
BCR over total cost	1.36

Source: Field survey, 2015

Factors affecting sugarcane production in char areas of Sirajganj district

In order to determine the factors affecting in sugarcane production, Cobb-Douglas production function was used. Table 4 shows the estimated values of co-efficient and related statistics of Cobb-Douglas production function. The variables like human labor, Tractor/animal labor, Urea, TSP and irrigation were positively significant at 1%, 5% and 10% level indicated that 1% increase in human labor, Tractor/animal labor, Urea, TSP and irrigation would increase the return of sugarcane 0.39%, 0.27%, 0.58%, 0.07% and 0.03% respectively keeps other factors remaining constant. Variable MoP and Gypsum were negative and significant at 5% and 10% level implies that 1% increase in MoP and gypsum would decrease the return of sugarcane 0.05% and 0.02% keeping other factors constant. The value of co-efficient of determination (R^2) was 0.84 which indicates that 84% of the variation in gross return of sugarcane production in char areas of Sirajganj district was explained by the independent variables included in the model. The F-value was positive and significant at 1% level of significance implying that the regression model of production function fitted very well. Nazir et al. (2013) also reported almost similar results on factors affecting sugarcane production.

Table 4. Estimated co-efficient and their related statistics of sugarcane cultivation in char areas of Sirajganj district

Regression Variables	Regression co-efficient	Standard error	t-values	R^2	Adjusted R^2	F-value
Constant	0.513	2.288	0.224	0.84	0.73	8.28***
human labor (X_1)	0.394**	0.166	2.366			
Tractor/Animal labor (X_2)	0.270**	0.125	2.167			
Sett (X_3)	-0.029	0.183	-0.107			
Urea (X_4)	0.581***	0.128	4.542			
TSP (X_5)	0.072**	0.033	2.210			
MOP (X_6)	-0.054**	0.025	-2.157			
Gypsum (X_7)	-0.022*	0.013	-1.768			
ZnSO ₄ (X_8)	0.011	0.015	0.775			
Organic fertilizer (X_9)	-0.011	0.009	-1.257			
Pesticide (X_{10})	-0.016	0.014	-1.191			
Irrigation (X_{11})	0.033*	0.018	1.840			

***, ** and * show the values that are statistically significant at 1 percent, 5 percent and 10 percent significant levels respectively.

Source: Field survey, 2015.

Constraints of sugarcane cultivation in char areas

Char sugarcane farmers were affected in various problems during sugarcane cultivation. The constraints of sugarcane cultivation in char lands are categorized into three items: Technical constraints, marketing constraints and social constraints. Table 5 illustrates that 94% farmers in the study area faced irrigation problem and during post harvest period 96% farmers faced crusher machine problem. Lack of clean seed (90%), disease and pest problems (80%), lack of training facility (76%), lack of credit facility in pick period (80%) were major technical problems in the study areas. In case of marketing constraints, 92% farmers in char areas of Sirajganj district supposed that price of sugarcane was low. Lack of transport facility (88%), lack of communication facility (78%), large number of middlemen (74%) and outside of mill zone area (86%) were the main marketing problems of char areas. Lack of fund (96%) and animal problems (72%) were the major social constraints.

Table 5. Constraints of sugarcane cultivation in char lands of Sirajganj district

Constraints	No. of Farmer responded (n=50)	% of Farmer responded (n=50)	Rank
1. Technical Constraints (% of farmer response)			
Lack of improved sugarcane variety suitable to climate change	35	70	7
Lack of clean seed	45	90	3
Infestation of disease and pests	40	80	4
Higher cost of irrigation	47	94	2
Lack of training facility	38	76	5
Scarcity of labor	36	72	6
Lack of credit facility in pick period	40	80	4
Lack of adequate crusher machine	48	96	1
2. Marketing Constraints (% of farmer response)			
Low price of sugarcane	46	92	1
Lack of transport facility	44	88	2
Lack of communication facility	39	78	4
Large number of middlemen	37	74	5
Outside of mill zone area	43	86	3
3. Social Constraints (% of farmer response)			
Lack of fund	48	96	1
Thief problems	34	68	3
Animal problems	36	72	2
Political disorder	25	50	4

Source: Field survey, 2015

Sugarcane cultivation is now become one of most profitable crops in char areas of Bangladesh. It has been creating employment and self-employment opportunities for the unprivileged people living in hardly reachable and remote reverie char areas round the years to improve their life and livelihood. A lot of works should be done to improve the yield of sugarcane in char areas of Sirajganj district. High yielding sugarcane varieties should be introduced in char areas. Literacy rate and average farm size of char farmers should be increased as they are important factors in sugarcane cultivation. Dissemination of clean seed should be increased as both have significant effect on production. Cost of production should be minimized for getting more profit. Mechanization should be introduced to cultivate sugarcane in char areas. Proper training on modern production technology should be increased in char areas. Sugar mill zone area should be extended to the char areas so that farmers can easily supply their sugarcane to the mill authority. Price of sugarcane should be increased to enhance the interest of the farmers toward sugarcane cultivation. Crusher machine should be provided to the char sugarcane farmers at installment basis with low interest rate to reduce the oppression of owner of crusher machine. Above all awareness among char sugarcane farmers should be developed to minimize various constraints.

REFERENCES

- Alam, M. M.; Haque, M. I. and Alam, G. M. M. 2005. Economics of Sugar Industries Performance in Bangladesh, *Bangladesh J. Sugarcane*, **24-27**: 28-34.
- Anonymous, 2014-15. BSRI annual research programme, 2014-15. Bangladesh Sugarcane Research Institute, Ishurdi, Pabna, Bangladesh, annual research programme, 2014-15. pp. 231.
- BBS 2013. Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics, Planning Division, Ministry of Planning, Bangladesh.
- BER 2015. Bangladesh Economic Review 2013, Ministry of Finance, Bangladesh.
- FAO 2007. Food and Agricultural Organization, Rome, Italy.
- KA, 1996. Bench Mark Survey on Sugarcane, Kranti Associates, Dhaka, Bangladesh.
- Kabir M. H. and Alam M. M. 2000. Sugarcane cultivation practices: Input-output relationship of sugarcane and its intercropping of Bangladesh, BSRI-BARI contract research project under ARMP.
- Khatun S. and Rahman M. H. 2011. Economic Efficiency of Sugarcane Production in Northern Region of Bangladesh, *Bangladesh J. Sugarcane*, **32**: 98-107.
- Nazir A.; Jariko G. A. and Junejo M. A. 2013. Factors Affecting Sugarcane Production in Pakistan, *Pakistan Journal of Commerce and Social Science*, **7(1)**: 128-140.
- Pal S. K.; Rahman M. K. and Chowdhury A. T. M. S. 2005. Ikhu Utpadaner Unnata Projukti (A Bengali Manual), Bangla