

Comparative Economic study of Sugarcane grown under Conventional and Spaced Transplanting Technology

S. Ahmed, M.M. Rahman, F. Khanam, A.K.M.M. Hossain and A.K.M.M. Zaman
Hajee Mohammed Danesh Agricultural College,
Dinajpur, Bangladesh.

Received on 17.10.94

ABSTRACT

A comparative economic study of sugarcane grown under conventional and spaced transplanting methods was conducted in 1990-91 cropping season based on a sample survey of 50 sugarcane farms from Bochagonj thana of Dinajpur and sadar thana of Thakurgaon districts. It was found from the study that total cost of production were Tk. 26657.6 and 28351.8 per hectare for the conventional and STP methods respectively. The sample farms received net return Tk. 24689.6 per hectare in conventional and Tk. 40479.8 per hectare in STP method. The coefficient of dummy variables for all farms indicated that the STP method was significantly superior over conventional method.

INTRODUCTION

Sugarcane a cash-cum-industrial crop plays a significant role in economy of Bangladesh. Bangladesh stands sixteenth and twenty first amongst all countries of the world, growing sugarcane in respect to area and production (Islam, 1989). Sugarcane occupies 2.12 percent of net cropped area (BBS, 1991) but yield in unit is the lowest in the world (Hossain, 1991). Sugarcane industry is agrobased and it is very important for creating employment opportunities for the rural people. At present, a large number of people are engaged in production and marketing of sugarcane.

In Bangladesh, sugarcane growers recently follow two methods of cultivation viz. conventional and spaced transplanting (STP). Spaced transplanting method is a recently introduced technology in Bangladesh. In conventional method, sugarcane setts having three buds are directly planted in the trench, but in STP method sugarcane settings are raised either in polythene bags or in soils bed and then transplanted in the main field at a desired spacing. The introduction of STP in Bangladesh has created enthusiasm in sugarcane growers. It is reported that the STP requires high amount of money to be invested per hectare and return per hectare is remarkably higher than that of conventional method. Germination of cane in conventional method is very low and irregular, resulting in lower number of plant population and ultimately lower yield (Srivastava *et al.*, 1988). In order to minimize the requirement of seed/canes per hectare and to ensure optimum plant population spaced transplanting method was developed (Srivastava *et al.*, 1981; Rahman and Rahman, 1979). Therefore, it is imperative to know the technology, to estimate cost and return per hectare and profitability thereof. With this view this study was undertaken to identify cost and return under conventional and STP methods of sugarcane cultivation.

MATERIALS AND METHODS

Data were collected in 1990-91 cropping season from three villages such as Mushidhat, Setabgonj and Motizapur of Bochagonj thana, Dinajpur and two villages viz. Moheshpur and Madargonj of sadar thana, Thakurgaon. Farmers growing sugarcane by spaced transplanting methods of these villages were the population for this study. Total list of sample farmers, who were producing sugarcane by both conventional technology and STP method was collected from sugar mills and the North Regional Station, Thakurgaon. Then fifty farm samples were selected randomly from the list. Several preliminary visits were made in connection with the study. According to information obtained from preliminary visit, a draft questionnaire was prepared and was pre-tested in study area. The draft questionnaire was reasonably modified after pretesting. Then data were collected, analysed, tabulated and summarised to arrive at meaningful conclusion. A tabular method was employed in analysing and interpreting collected informations. For determining effects of variable inputs on production of sugarcane, both linear and Cobb-Douglas production function models were initially estimated. Finally Cobb-Douglas production function was chosen on the basis of superior properties of function (Koutsoyiannis, 1979). The multiple regression model is shown below.

$$Y = ax_1^{b_1} x_2^{b_2} \dots x_6^{b_6} + U_i$$

$$\text{or } \log Y = \log a + b_1 \log x_1 + b_2 \log x_2 + \dots + b_6 \log x_6 + U_i \dots (1)$$

where Y = Total return from sugarcane (Tk/ha)

X_1 = Cost of human labour (Tk/ha)

X_2 = Cost of annual/mechanical power (Tk/ha)

X_3 = Cost of fertilizers (Tk/ha)

X_4 = Cost of irrigation water (Tk/ha)

X_5 = Cost of insecticides (Tk/ha)

X_6 = Cost of seed material (Tk/ha)

a = Constant or interest value

b_i = Coefficient of respective variables.

To see the technological effects of STP over conventional method, a dummy variable (D) used in the model (No. 1); its value was zero for conventional method and one for STP. Thus the model including dummy variable (D) stood as:

$$\log Y = \log a + b_1 \log x_1 + b_2 \log x_2 + \dots + b_6 \log x_6 + r_D (rD)$$

RESULTS AND DISCUSSION

From the Table 1, it can be observed that cultivated area per farm were 3.98, 2.25 and 4.50 ha for the farms following conventional, STP and both the methods respectively.

Moreover, the cultivated area under sugarcane per farm were 0.49, 0.22 and 0.98 hectares which constituted about 12.3, 9.8 and 21.8 per cent of total cultivated land for the farms following conventional, STP and for both methods respectively.

Data in the Table 2 indicated that human labour cost per hectare were Tk. 6616.4 (24.8%) and Tk. 9773.1 (34.5%) for conventional and STP methods respectively. Thus human labour cost was found to be higher in the STP method than conventional. The production coefficient for human labour of the farms using conventional method were positively significant for all farmer (Table 3). This reveals that with increasing in human

labour keeping other inputs constant increases total return. The production coefficient for farm using STP was also positive but non significant and showed higher standard error.

Table 1. Distribution of cultivated area per farm and land under sugarcane per farm according to practices.

Method of cultivation	No. of farms	Percent of farms	Area of land per farm (ha)	Area of sugarcane per farm (ha)	% of land under sugarcane	
					Owned	Cultivated
Conventional method	25	50	3.98	0.49	11.4	12.3
STP method	10	20	2.25	0.22	9.4	9.8
Both methods	15	30	4.50	0.98	20.4	21.8
All	50	100	3.79	0.59	14.6	15.6

Source: Field survey, 1990

Table 2. Cost and return of sugarcane cultivation on the basis of full cost using conventional and STP method.

Items	Conventional cost/return (Tk/ha)	STP cost/return (Tk/ha)	Increased over conventional method (%)
A. Total cost	26657.6 (100)	28351.6 (100)	1695.1 (6.4)
Human labour	6616.4 (24.8)	9773.1 (34.5)	3156.7 (47.7)
Animal/mechanical power	2014.6 (7.6)	2123.6 (7.5)	109.0 (5.4)
Material inputs:			
Seed materials	6984.9 (26.2)	2679.3 (9.5)	-4305.6 (61.2)
Fertilizer	3856.2 (14.5)	4410.1 (15.6)	554.0 (14.4)
Insecticides	2969.3 (11.1)	3993.8 (14.1)	1024.5 (34.5)
Irrigation	1679.0 (6.3)	2002.1 (7.1)	323.0 (19.2)
Marketing cost	2537.3 (9.5)	3369.8 (11.9)	832.5 (31.8)
B. Total return	51347.3	68831.6	17484.3 (34.1)
C. Net return (A-B)	24689.6	40479.8	15790.2 (64.0)

Figures within parentheses indicate percentage.
Source: Field survey, 1990.

Table 3. Estimated value of coefficients and related statistics of Cobb-Douglas production function model.

Explanatory variables	Farms using conventional method	Farms using STP method	All farms
Intercept	1.773	1.809	1.286
Human labour (X_1)	0.788*** (0.161)	0.193 (0.107)	0.331** (0.135)
Animal/mechanical power (X_2)	0.021 (0.044)	0.121 (0.181)	0.035 (0.089)
Fertilizers (X_3)	0.604*** (0.052)	0.570*** (0.145)	0.672*** (0.059)
Irrigation (X_4)	-0.004 (0.015)	0.063 (0.115)	0.036 (0.029)
Insecticide (X_5)	-0.022* (0.011)	0.130 (0.077)	0.025 (0.027)
Seed material (X_6)	-0.225* (0.125)	0.120 (0.079)	0.103* (0.058)
Dummy (D)	-	-	0.199** (0.081)
R^2	0.973	0.934	0.945
F	103.883***	42.477***	101.057***
Returns of scale	0.962	1.197	1.202

Note: 16 farms under conventional method reported that these did not use irrigation and thus these have been omitted from production function model

Figures within parentheses indicate standard error.. ***Significant at 1 per cent value..

**Significant at 5 per cent value.. * Significant at 10 per cent value.. Source: Field survey, 1990.

The cost for animal/mechanical power were Tk. 2014.7 (7.6%) for conventional and Tk. 2134.6 (4.7%) for STP method (Table 2) of sugarcane production. The highest cost was found for farms using STP methods (5.4%) than conventional one. The production coefficient of animal/mechanical power were positive for all cases (Table 3). All coefficient values showed higher standard error. The data in the Table 2, show that the highest cost of seed materials per hectare was found in case of conventional method (26.2%) than STP method. Production coefficient for seed material for conventional method was negatively significant. It reveals that with increase of cost for seed decreases total return. The production coefficient for seed for STP method was positive having higher standard error (Table 3).

The cost per hectare for fertilizer were Tk. 3856.2 and Tk. 4410.1 for farms following conventional and STP methods respectively (Table 2). The production coefficient for fertilizers were positively significant for both conventional and STP methods and in the all farms. It implies that with increasing cost for fertilizers increases total return.

Cost of insecticides per hectare were Tk. 2969.3 (11.1%) and Tk. 3993.8 (14.1%) in conventional and STP methods respectively (Table 2). The highest cost was observed in STP method. The production coefficient for conventional method was negative and significant, which indicates that with increasing of efficient for conventional method was negative and significant, which indicates that with increasing of cost of insecticides

decreases total return (Table 3). Again, the cost for STP method and for all farms, production coefficient were positive but non-significant, having higher standard error.

The data in Table 2 show that cost of irrigation in the farms, where conventional method was used, was Tk. 1679.0 (6.3%), whereas it was Tk. 2002.1 (7.1%) in the case of STP method. The production coefficient for farms using conventional method was negative but it was positive for STP method in all farms (Table 2). The standard error for the STP method was higher than that of other method (Table 3).

Marketing cost per hectare were Tk. 2537.3 and Tk. 3369.8 which constituted about 9.5% and 11.9% for conventional and STP method respectively (Table 2). The higher cost for marketing was observed in the STP methods (31.8% increase) than conventional method. This was due to higher yield of cane in STP methods.

Moreover, per hectare total cost of sugarcane production were Tk. 26,657.6 for conventional method and Tk. 28,351.8 for STP method. But the total return were Tk. 51,347.3 for conventional and Tk. 68,831.6 for STP method. Thus net return were Tk. 24,689.6 and Tk. 40,479.8 for conventional and STP method respectively. From the statistical analysis (Table 3) it is observed that summation of all regression coefficient of sample farms were equal to 0.962, 1.97 and 1.202 for the farms using conventional and STP method and for all farms respectively. Thus the farms using conventional methods were in stage 11 and farms using STP method were in stage 1.

The coefficient for dummy (D) for all farms were positive and significant at 5 per cent level (Table 3) indicating that STP technology has significant effects and it had superiority over conventional method. Rahman *et al.* (1993) also found 69.2 percent higher income in STP method over conventional method.

REFERENCES

- BBS, 1991. Statistical Year book of Bangladesh. Bangladesh Bureau of Statistics, Dhaka.
- Hossain, M. 1991. Agriculture in Bangladesh, Performance, problems and prospects. University press limited, Dhaka.
- Islam, M.S. 1989. An economic analysis of production and crushing of sugarcane in Gono Unnayan Prochesta (GUP). Gur project area of Madaripur district. M.Sc. Unpublished thesis. Department of Agricultural Economics, BAU, Mymensingh.
- Rahman, A.B.M.M. and Rahman, M.M. 1979. Potential of spaced transplanting of sugarcane. *Bangladesh J. Sugarcane*, 1:50-53.
- Rahman, M.K.; Imam, S.A.; Hossain, A.H. M.D.; Islam, M.J. and Alam, M.J. 1993. Performance of spaced transplanting method of sugarcane in farming systems reasearch sites. *Bangladesh J. Sugarcane*, 12:15:89-94.
- Srivastava, K.K.; Narasimhan, R.G. and Shukla, R.K. 1981. A new technique for sugarcane planting. *Indian farming*, 31:15-17.
- Srivastava, S.C.; Johari, D.P. and Gill, P.H. 1988. Manual of cane production in India. ICAR. Pusa, New Delhi. pp. 1-160.