

Factors Affecting Adoption of Improved Sugarcane Production Technologies among the Growers of A Sugar Mills Zone

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ABSTRACT

This study aimed at analyzing the factors affecting adoption of improved sugarcane cultivation technologies by the growers of a sugar mills zone in cultivating sugarcane and also to explore the relationship between selected characteristics of the growers with their extent of adoption of improved sugarcane cultivation technologies. Based on Improved Sugarcane Cultivation Technologies Use Index (ISCTUI), highest proportion of the farmers covering 46% had medium adoption of improved sugarcane cultivation technologies followed by 37% low adoption and 17% having high adoption of technologies. The highly adopted technologies are ratoon management and recommended varieties which ranked 1st and 2nd respectively and paired row planting ranked 15th was the least adopted technology. Out of eleven selected characteristics of the farmers such as education, farm size, farming experience, training exposure, organizational participation, extension media contact, innovativeness, input availability and awareness about improved sugarcane of improved sugarcane cultivation technologies revealed positive significant relationship with their adoption of improved sugarcane cultivation technologies. Age and annual family income had no significant relationship with their extent of adoption of improved sugarcane cultivation technologies.

Key words: Sugarcane, improved technologies, selected characteristics, innovativeness.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L) is an important cash cum industrial field crop of the farmers covering 2.05 percent (0.17 million hectares) of the country's total cultivable land (BBS, 2005). Sugar industry plays an important role to develop infrastructure in rural areas, rural employment, income of farm families, contribution to national exchequer, foreign exchange saving, poverty reduction and value addition to the sugar as well as by-product industries (Alam, 2007). For increasing sugarcane yield, farmers are required to adopt improved sugarcane cultivation technologies. The benefit of the newly recommended technology is actually derived only when it is efficiently utilized by the farmers or adopters in their local situation.

The current recommended sugarcane cultivation technologies e.g. recommended sugarcane varieties, early planting, use of certified seed, seed treatment with chemicals, trench method, STP method, paired row planting, recommended doses of fertilizers, intercropping with sugarcane, flood irrigation, use of IPM practices, earthing up, spade harvesting, detrashing of dry leaves and ratoon management are recommended in recent years. It was observed in a study conducted by Hussen (2001) on adoption of modern sugarcane cultivation by the farmers of Dewangonj upazila in Jamalpur district that about 91 percent of the respondents had medium adoption of modern sugarcane cultivation practices compared to 7 percent having low and only 2 percent having high adoption of modern sugarcane cultivation. Farmers' education, farm size, annual income and extension media contact showed positive relation with their adoption of improved sugarcane cultivation technologies.

Islam (2002) found that ages of the farmers was not related to their adoption of modern agricultural technologies. Hossain (1999) found that organizational participation and innovativeness was positively correlated with their use. The present study was conducted to determine the extent of adoption improved sugarcane cultivation technologies and to identify the personal, social, educational, psychological and other factors that have influence (either positive, negative or no relationship) on the adoption level of farmers' about improved sugarcane cultivation technologies.

MATERIALS AND METHODS

The study was conducted at Mill Gate sub-zone of Pabna Sugar Mills under Ishurdi Upazila of Pabna district during 25 April 2008 to 22 May 2008. Under this sub-zone, there are 12 Cane Development Units with the total population of 882 farmers constituting the population of this study. About 13.04% of farmers were selected randomly and proportionately from all these units which consisted of 115 farmers. These 115 farmers constituted the sample for the present study.

The extent of adoption of improved sugarcane cultivation technologies by the farmers was considered as the dependent variable of the study. The scores of the respondents were computed on the basis of the respondents' adoption of 15 improved technologies namely, "Recommended sugarcane varieties, early planting, use of certified seed, seed treatment with chemicals, trench method, STP method, paired row planting, recommended doses of fertilizer, intercropping with sugarcane, flood irrigation, use of

IPM practices, earthing up, spade harvesting, detrashing of dry leaves and ratoon management". A four-point rating scale such as 'frequently', 'occasionally', 'rarely' and 'not at all' was used and the corresponding scores assigned are 3,2,1,0 for using improved technologies 'frequently', 'occasionally', 'rarely' and 'not at all' respectively was used to measure the extent of adoption of improved sugarcane cultivation technologies. As 15 improved sugarcane technologies were selected for the study, so the range of improved sugarcane technologies adoption score of a respondent could vary from 0 to 45, where, 0 indicate adoption of no technologies at all and 45 indicate adoption of different improved sugarcane technologies frequently. Eleven characteristics of the farmers selected as the independent variables for this study include age, education, farm size, annual income, farming experience, agricultural training exposure, organizational participation, extension media contact, innovativeness, input availability and awareness about improved sugarcane cultivation technologies.

The collected data were compiled, tabulated and analyzed in accordance with the objectives of the study. Percentage, range, mean, standard deviation etc were used as statistical measure describing adoption of improved sugarcane cultivation technologies and their selected characteristics. Correlation and regression analysis were used for determining relationship of adoption improved sugarcane cultivation technologies with their selected characteristics.

RESULTS AND DISCUSSION

a) Characteristics of the sugarcane farmers

Eleven characteristics of the farmers were selected to find out their relationship with their adoption of improved sugarcane cultivation technologies. Descriptive statistics of the individual characteristics are presented in Table 1. Majority proportion (53%) of the farmers fell in the middle-aged category compared to 28% young and 19% old aged categories. About 47% of the farmers fell under the category of "secondary education" compared to 10% with no education, about 18% having primary education and 25% with above secondary education. About 62% of the farmers had medium farm size compared to 34% had small farm and 4% with large farm. About 45% of the respondents

had low and medium annual family income and 10% having high annual family income. About 57% of the respondents had low farming experience compared to about 36% with medium and 7% having high farming experience. Around 45% of the respondents had low training experience compared to 40% with medium training experience and only 15% having high training experience. One-fifth (20%) of the farmers had no organizational participation compared to 43% low, 27% medium and 10% high organizational participation. Most (79%) of the respondents had medium to high extension contact. Majority (61%) of the respondents had medium to high innovativeness. Three fourth (75%) of the farmers having medium input availability compared to 18% having high and 7% with low input availability. About 51% of the farmers fell in the medium awareness category compared to 26% high and 23% in the low awareness category.

b) Comparison among the extent of adoption selected improved sugarcane cultivation technologies

In order to compare the extent of adoption of selected technologies among the sample farmers, an Improved Sugarcane Cultivation Technologies Use Index (ISCTUI) was developed. The ISCTUI along with their associated ranks mentioned in Table 2.

Table 1. Distribution of respondents according to their personal characters.

Characteristics	Categories	Number	Percentage	Standard Deviation
Age (years)	Young aged (up to 31)	32	28	14.152
	Middle aged (32 to 56)	61	53	
	Old aged (above 56)	22	19	
Education (years of schooling)	No education (0 or 0.5)	11	10	4.096
	Primary education (1-5)	21	18	
	Secondary education (6-10)	54	47	
	Above secondary education(>10)	29	25	
Farm Size (ha)	Small farm (0.02 to 1.00ha)	39	34	1.61
	Medium farm (1.01 to 3.00ha)	71	62	
	Large farm (Above 3.00ha)	5	4	
Annual family income (score)	Low income (up to 50)	52	45	36.158
	Medium income (50.50 to 150)	52	45	
	High income (Above 150)	11	10	
Farming experience (years)	Low farming experience (up to 20)	65	57	12.281
	Medium farming experience (21 to 40)	42	36	
	High farming experience (Above 40)	8	7	
Training experience (score)	Low training experience (up to 10)	52	45	9.678
	Medium training experience (11 to 25)	46	40	
	High training experience (Above 25)	17	15	
Organizational participation (score)	No participation (0)	23	20	8.853
	Low participation (1 to 10)	49	43	
	Medium participation (11 to 20)	31	27	
	High participation (Above 20)	12	10	

Extension media contact (score)	Low media contact (up to 15)	24	21	5.761
	Medium media contact (16 to 20)	36	31	
	High media contact (Above 20)	55	48	
Innovativeness (score)	Low innovativeness (up to 25)	45	39	4.597
	Medium innovativeness (26 to 30)	47	41	
	High innovativeness (Above 30)	23	20	
Input availability (score)	Low input availability (up to 12)	8	7	3.416
	Medium input availability (13 to 18)	86	75	
	High input availability (Above 18)	21	18	
Awareness about improved sugarcane cultivation technologies (score)	Low awareness (up to 20)	27	23	4.205
	Medium awareness (21 to 28)	59	51	
	High awareness (Above 28)	29	26	

Table 2. Comparison of improved sugarcane cultivation technologies as adopted by the sample farmer

SL. NO.	Technologies	No of farmers adopted different levels of technologies (N = 115)					
		F	O	R	N	ISUI	Rank
1	Recommended sugarcane varieties	75	40	0	0	305	2
2	Early planting	40	55	15	6	245	8
3	Use of certified seed	34	45	23	15	215	12
4	Seed treatment with chemicals	50	22	25	18	219	11
5	Trench method	67	34	15	0	284	4
6	STP method	45	35	26	10	231	9
7	Paired row planting	25	20	26	45	141	15
8	Recommended doses of fertilizer	50	47	19	0	263	7
9	Intercropping with sugarcane	65	33	11	7	272	5
10	Flood irrigation	32	55	20	9	226	10
11	Use of IPM practices	29	50	21	16	208	13
12	Earthing up	73	25	18	0	287	3
13	Spade harvesting	40	23	12	41	178	14
14	Detrashing of dry leaves	59	40	12	5	269	6
15	Ratoon management	84	32	0	0	316	1

Abbreviation: F= Frequently, O= Occasionally, R= Rarely, N= Not at all ISCTUI= Improved Sugarcane Cultivation Technologies Use Index

Using mean and standard deviation of ISCTUI of different technologies, the improved sugarcane cultivation technologies could be classified into the following categories such as in Table 3.

Table 3. Distribution of improved sugarcane technologies based on their ISCTUI

Categories	Score	Distribution of technologies	
		Number	Percentage
Highly used technologies	>287	1, 15 =2	13.33
Medium used technologies	174-287	2,3,4,5,6,8,9,10, 1,12,13,14=12	80.00
Low used technologies	=173	7=1	6.67

Among the 15 identified improved technologies, the percentage of highest adopted technologies by the farmers is 13.33. The highly adopted technologies are "Ratoon management and recommended sugarcane varieties" which ranked 1st and 2nd respectively. The percentage of medium used technologies is 80. Medium used technologies are : early planting, use of certified seed, seed treatment with chemicals, trench method, STP method, intercropping with sugarcane, flood irrigation, use of IPM practices, earthing up, spade harvesting and detaching of dry leaves which ranked as 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th respectively. The percentage of low adopted technologies is 6.67. Paired row planting was least used technologies by the farmers which ranked 15th.

c) Overall adoption improved sugarcane cultivation technologies

Scores on adoption of improved sugarcane cultivation technologies by the farmers ranged from 24 to 44 with an average of 32.90 and standard deviation 5.279. The sugarcane farmers were classified into three categories on the basis of their adoption of improved sugarcane cultivation technologies scores, such as low (up to 30), medium (31 to 37) and high (above 37). The adopter categorizations of sample farmers are diagrammatically shown in Figure 1.

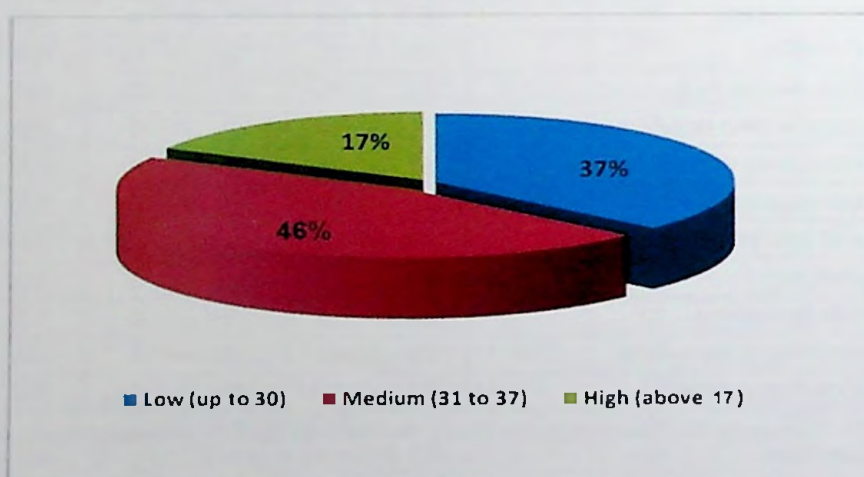


Figure 1. Pie graph showing the categories of respondents on the basis of their adoption of improved sugarcane cultivation technologies.

Most (83%) of the farmers were under low to medium (37-46%) followed by 17% in the adopter category.

d) Relationship between the selected characteristics of the farmers and their use of improved sugarcane cultivation technologies

Simple correlation analysis was used for determining relationship between dependent and independent variables and results are presented in Table 4. It shows that farmers' education, farm size, farming experience, training exposure, organizational participation, extension media contact, innovativeness, input availability and awareness about improved sugarcane cultivation technologies have significant positive correlation with adoption of improved sugarcane cultivation technologies. The rest of the independent variables i.e., age and annual family incomes of the farmers have no significant relationship with their adoption improved sugarcane cultivation technologies.

Table 4. Relationship between the selected characteristics of the farmers and adoption of improved sugarcane cultivation technologies

Selected characteristics (Independent variables)	Computed 'r' values
Age	^{NS} 0.04
Education	0.369**
Farm size	0.193*
Annual family income	^{NS} 0.173
Farming experience	0.233*
Training experience	0.306**
Organizational participation	0.194*
Extension media contact	0.463**
Innovativeness	0.441**
Input availability	0.204*
Awareness about improved sugarcane cultivation technologies	0.352**

NS = Not significant

* = Significant at 0.05 level of probability

** = Significant at 0.01 level of probability

Multiple regression analysis revealed that farmers' education, farming experience, agricultural training exposure and innovativeness have significant positive influence on adoption of improved sugarcane cultivation technologies as shown in the table 5. These results indicated that the higher the farmers' education, training experience, agricultural training exposure and innovativeness, higher is the technology adoption. Many studies revealed such results. On the other hand, age of the farmers and annual family income showed significant negative influence on technology adoption. Up to certain level age (which is also positively related to farming experience) exert positive influence, but above that it intends to show negative influence on technology adoption. Higher is the annual income richer is the farm family. In many studies richer farmers showed negative trend in technology

adoption of like that of present one. All the studied independent variables jointly explained 43.90 percent ($R^2 \times 100$) of variance of the adoption of improved sugarcane cultivation technologies which is highly significant ($F = 7.337^{**}$). This means that 56.1% of the variance of technology adoption still remained unexplained and indicated that some more important independent variables need to be included in future studies.

Table 5. Multiple regression analysis of all the eleven independent variables

SL. NO.	Independent Variables	Regression coefficients b values	Standard error	Probability
1	Age	-0.111	0.043	0.011
2	Education	0.284	0.117	0.017
3	Farm Size	0.548	0.306	0.076
4	Annual Family Income	-0.010	0.015	0.505
5	Farming Experience	0.158	0.049	0.002
6	Agricultural Training exposure	0.099	0.045	0.029
7	Organizational Participation	0.081	0.050	0.111
8	Extension Media Contact	0.122	0.101	0.230
9	Innovativeness	0.244	0.109	0.027
10	Input Availability	-0.013	0.144	0.930
11	Awareness about improved sugarcane cultivation technologies	0.101	0.115	0.384

Constant = 5.478

$R^2 = 0.439$, $F = 7.337^{**}$

In simple correlation analysis all the independent variables except age of the farmers resulted significant positive relationship with adoption of improved sugarcane cultivation technologies. But in simple regression analysis education, farming experience, agricultural training exposure, extension contact and innovativeness emerged as the significant positive contributors of technology adoption. Age of the farmers and annual income contributed negatively. About 83% of the farmers showed low to medium technology adoption and only 17% exhibited higher adoption. This emphasized need to concentrate technology transfer activities in Pabna Sugar Mills particularly and sugar mills zone generally.

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