

Adoption of modern wheat cultivation technologies by the farmers of Birganj upazila under Dinajpur district

A.B.M.S. Mahmud, M.A.S. Mondol¹ and M. Nuruzzaman¹

Establishment Section, Hajee Mohammad Danesh Science and Technology University, Dinajpur, ¹Department of Agricultural Extension, Hajee Mohammad Danesh Science and Technology University, Dinajpur.

Abstract: The main purpose of the study was to describe the selected characteristics of the farmers, to explore the relationships between the selected characteristics of the farmers and their adoption of modern wheat cultivation, to determine the adoption behavior of farmers regarding modern wheat cultivation and to find out the problems faced by the farmers in adopting modern technologies related to wheat cultivation. Data were collected using interview schedule from a sample of 96 farmers selected by simple random sampling procedure from four villages of Sujalpur union of Birganj Upazila under Dinajpur district from 18 September to 17 October 2012. Among the ten selected characteristics education, knowledge on wheat cultivation, extension contact, organizational participation, cosmopolitanism and commercialization of the farmers had significant and positive relationship with the adoption of modern wheat cultivation but rest four were fail to show any relationship with the dependent variable. Two-thirds (65.62%) of the respondent cultivate shatabdi variety, 86.45% did not adopt line sowing method, 55.20% used 1st dose, 2nd dose and 3rd doses of irrigation. About half of the respondents followed standard sowing time, 79.17 percent of the respondents used polythene and gunny bags, 81.25% applied recommended seed. More than four-fifths (85.42%) of the respondents did not use rouging methods, 61.46% used drum thresher and 64.58% had medium adoption of modern wheat cultivation practices. The top most problem faced by the farmers was excessive weed infestation and least problem was land preparation in adoption of modern wheat cultivation.

Keywords: Adoption, modern technologies, wheat, Dinajpur, Bangladesh.

Introduction

Bangladesh is a rice growing country but its climatic conditions are very much suitable for wheat cultivation. Wheat is the second important cereal crop next to rice in our country and has achieved a remarkable progress is increasing wheat production and productivity over the last 40 years (Razzaque *et al.*, 2000). Wheat requires relatively cool, moist growing season followed by dry, warm season for ripening. The crop is cultivated during the cool season with minimum temperature of 30C-40C, optimum of 250C and maximum of about 300C-320C (Balasubramaniyan and Palaniappan, 2004). There is an ample scope for wheat cultivation in Bangladesh as it is cultivated in rabi season having minimum competition with rice for land. Wheat can be grown in winter season along with other crops like pulses, oil seeds, vegetable etc. It can be grown under irrigated and non-irrigated conditions even in marginal soils where most of the other crops can not be profitably grown (Taslim, 1999). The majority of the area under wheat cultivation is found in the northern part especially in Dinajpur region which is the most important wheat growing area in the country. In Dinajpur, the production of wheat was 0.241 million metric ton from 0.089 million hectare of land during 2010-2011 yielding about 2.709 metric ton/hectare. This yield is greater than the average yield (2.601 metric ton/hectare) of wheat in Bangladesh (BBS, 2011).

The production of wheat may be increased by using modern technologies properly. There is an assurance of next crop after harvesting of wheat for its short duration, which can be useful to obtain self-sufficiency in food; it can thus play a great role along with rice. To increase wheat production, transfer of modern technology is essential and to get necessary information related to wheat production, key factor for the farmers is adoption of modern practices (Mondol *et al.*, 2002). Now considerable effort is being made through research and extension delivery system to increase wheat production in our country. But the actual increase in production will be depended on the activities of the wheat growers. The

behavior of a farmer is influenced by his profile characteristics (Hossain, 1991). Improved agricultural practices are the products of modern science and technology. In the transfer of technology, the economically profitable aspects of agricultural research are recommended to the farmers in the form of package of practices, the adoption of which shall bring them higher yield and income from their agricultural enterprises. In real life situation, the farmers are not in a position to continue use of all the technologies recommended or even demonstrated in their own farms (Ray and Chattergee, 1992). Adoption of modern technologies of wheat cultivation is influenced by the farmers demographic and socio economic condition. Considering the above facts, the present study has undertaken- (i) to describe the selected characteristics of the farmers, (ii) to explore the relationships between ten selected characteristics of the farmers and their adoption of modern wheat cultivation practices, (iii) to determine the adoption behavior of farmers regarding modern wheat cultivation practices and (iv) to describe the extent of problems faced by the farmers in adopting modern wheat cultivation practices.

Materials and Methods

The farmers of Sujalpur union under Birganj upazila of Dinajpur district was the locale of the study. Birganj upazila consists of 11 unions out of which Sujalpur union was selected randomly for this study. From the selected union, four villages namely Jakdal, Muriala, Fenapukur and Douladpur were selected randomly. However, data were collected from 96 farmers out of 488 wheat growers of these villages following simple random sampling. The entire process of data collection took one month from 18 September to 17 October, 2012 using interview schedule. After collection of data, all information contained in the interview schedule compiled, tabulated and analyzed for interpreting for findings. Simple statistics like frequency, percent, range, mean, standard deviation and rank order were used to describe the data. Coefficients of correlation were computed to find out the relationships between

selected characteristics of the farmers and their adoption of modern wheat cultivation. SPSS software program was used to analyze the data. Ten selected characteristics of the wheat growers were selected as independent variables. The characteristics were age, education, family size, farm size, annual income, extension contact, organizational participation, cosmopolitaness, knowledge on wheat

cultivation and commercialization. The independent variables were measured employing prevailing standard methods. On the other hand, adoption of modern wheat cultivation of the farmers of this study was the dependent variable and it was computed by using the following the formula of Adoption Quotient (Chattopadhyay, 1963).

$$\text{Adoption Quotient (AQ)} = \frac{\sum_{j=1}^N (Y_j W_j)}{\sum_{j=1}^N W_j} \times 100 \quad \text{Where, } Y_j = \frac{\sum_1^{t_p-t_1} e_j}{t_p - t_1}$$

Where, N= Number of practices for which the individual has the potentiality to adopt. Here number was one.

$\sum_{j=1}^N$ = Summation over each of the N practices, of which any one is the jth practice.

W_j = Weight to be given to a jth practice based on its difficulty of adoption. As the selected practice was recommended by the extension workers for a number of years and was not difficult for the farmers to adopt, all of them were given weightage of 1.

t_p = Time of investigation (2010-'11).

t_1 = Time of first introduction (year) of the jth practice in a community. It means past year upto which the investigation is to be made i. e. 2010-'11.

$\sum_1^{t_p-t_1}$ = Summation over each year from t_p to t_1 , it is 2 years.

e_j = Extent of adoption of any particular (jth) practice in a particular year.

P_j = Potentiality of any particular (jth) practice from which e_j is calculated in that particular year (amount of land).

The adoption quotient (AQ) was expressed in percent. Hence, the AQ of wheat grower could range from 0 to 100, where 0 indicated no adoption and 100 indicated high adoption.

On the other hand, adoption of wheat variety was determined by computing the area covered by each variety. Respondents were asked to mention the name of fertilizers with doses applied in their wheat cultivation. Their response were classified as very low dose (20% less than recommended does), low dose (10% less than recommended does), recommended dose, high dose (10% higher than recommended dose) and vary high dose (20% higher than recommended dose). Adoption of line sowing was determined by computing the area covered by line sowing. Adoption of irrigation was measured based on the frequency of irrigation applied in the field. Problem in wheat cultivation was measured through 13 problems by using structured questionnaire which might be faced by the wheat growers. The wheat growers were asked to mention the problems that hinder their adoption of modern wheat cultivation practices. A four point scale such as 'very much', 'moderate', 'little', and 'not at all' were used in this purpose and weights were assigned to each of the scale responses as 3 for 'very much', 2 for 'moderate', 1 for 'little' and 0 for 'not at all'. Thus the computed score of the farmers was therefore determined by adding the score against the four point scale.

Table 1. Characteristics of the wheat growers (n = 96)

Results and Discussion

Characteristics of the farmers: Human life is aggregation of variety of attributes by his characteristics. For this reasons, it can rightly be assumed that the characteristics of different farmers might have differential influence on the adoption of modern practices in wheat cultivation. In the present study ten selected characteristics such as age, education, family size, farm size, annual income, extension contact, organizational participation, cosmopolitaness, knowledge on wheat cultivation and commercialization. The salient findings of the characteristics of the farmers are presented in Table 1.

Relationship between adoption of modern wheat cultivation technologies by the farmers and their selected characteristics: Relationship between adoption of modern wheat cultivation by the farmers and their selected characteristics were determined by simple correlation coefficient (Table 2).

The findings presented in Table 2 indicated that education, knowledge on wheat cultivation, extension contact, organizational participation, cosmopolitaness and commercialization of the farmers had significant and positive relationship with the extent of adoption of modern wheat cultivation practices.

However, the age, family size, farm size and annual income fail to provide any relationship with the dependent variable.

Characteristics (measurement unit)	Possible	Observed	Category	Respondents		Mean	SD
				No.	%		
1. Age (year)	Un known	18-55	Young (≤ 30)	32	33.3	35.91	9.05
			Middle aged (3-45)	45	46.8		
			Old (>45)	19	19.8		
2. Education (year of schooling)	Un known	0-14	Illiterate (0)	29	30.2	5.54	4.22
			Primary (1-5)	20	20.8		
			Secondary (6-10)	43	44.8		
			Above (>10)	04	4.2		
3. Family size (number)	Un known	3-14	Small (≤ 4)	6	6.3	6.66	1.69
			Medium (5-7)	64	66.7		
			Large (>7)	26	27.0		
4. Farm size (hectare)	Un known	.40-7.69	Marginal (≤ 0.50)	4	4.2	1.82	1.25
			Small (0.51 -1)	23	24.0		
			Medium (1.1 -3)	59	61.4		
5. Annual income (‘000’ Taka)	Un known	25-274	Large (>3)	10	10.4	56,990	36,318
			Low (≤ 50)	53	55.2		
			Medium (51-100)	38	39.6		
6. Extension contact (score)	0-42	13-31	High (>100)	5	5.2	20.77	4.56
			Low (≤ 17)	23	24.0		
			Medium (18-26)	58	60.4		
7. Organizational Participation (score)	0-24	0-7	High (>26)	15	15.6	1.30	1.35
			No (0)	39	40.6		
			Low (1-2)	43	44.8		
			Medium (3-4)	12	12.5		
8. Cosmopolitaness (score)	0-18	5-14	High (>4)	2	2.1	8.23	2.31
			Low (≤ 6)	24	25.0		
			Medium (7-12)	69	71.9		
9. Knowledge on wheat cultivation (score)	0-30	13-28	High (>12)	3	3.1	19.81	4.39
			Low (≤ 16)	38	39.6		
			Medium (17-24)	45	46.9		
10. Commercialization (score)	Un known	23.26-90	High (>24)	13	13.5	63.66	16.45
			Low (≤ 47)	24	25.0		
			Medium (47.1-80)	55	57.3		
			High (>80)	17	17.7		

Adoption of modern wheat cultivation technologies: In the present study adoption of modern wheat cultivation technologies was covered nine modern wheat related

practices which were variety, line sowing, irrigation, sowing time, storage system, cultivation practices, rouging, thresher and modern cultivation (Table 3).

Table 2. Relationship between dependent variable and independent variable

Dependent variable	Independent variable	Correlation Coefficient
Adoption of modern wheat cultivation practices	Age	0.177 NS
	Education	0.321**
	Family size	0.116 NS
	Farm size	0.005 NS
	Annual income	-0.035NS
	Knowledge on wheat cultivation	0.306**
	Extension contact	0.212 *
	Organizational participation	0.205*
	Cosmopolitaness	0.277**
	Commercialization	0.255*

* Indicates significant at the 0.05 level, ** Indicates significant at the 0.01 level, NS Indicates insignificant

Data provided in Table 3 indicates that the shatabdi variety individually covered more than two-thirds (65.62%) area and rest of the areas were covered by the variety of kanchan, prodip, bijoy and gourov. The majority (86.45%)

of the respondents did not adopt line sowing method. Highest (55.20%) proportion of the respondents used 1st dose, 2nd dose and 3rd doses of irrigation, while 27.08 percent of the respondents used 1st and 2nd doses, 11.46

percent of the respondents used 1st and 3rd doses of irrigation. About half of the respondents (48.96%) followed standard sowing time, while 26.04 percent of the respondents followed late, 21.87 percent followed standard and late and 3.13 percent followed early and standard sowing time. The highest 79.17 percent of the respondents used polythene and gunny bags while 12.50 percent of the respondents used tin box, 7.29 percent of the respondents used metallic drums and 1.04 percent used earthen pot.

Majority (81.25%) of the respondents applied recommended seed rate followed by 73.95 percent of the respondents applied weed control. Where negligible respondents used bed planter and power tiller operated seeder. The highest (85.42%) proportion of the

respondents did not use rouging methods in their wheat field. The majority (61.46%) of the respondents used drum thresher, while 30.21 percent of the respondents used paddle thresher, 5.21 percent of the respondents used floor thresher and 3.12 percent of the respondents used power thresher method. In case of modern wheat practices it was found that, the about two-thirds (64.58%) of the respondents had medium adoption of modern wheat cultivation, while 18.75 percent of the respondents low and 16.67 percent respondents had high adoption of wheat cultivation. The findings indicate that the farmers were adopted all modern wheat practices with satisfactory level except rouging. It may be due to lack of knowledge of the farmers on the practice.

Table 3. Adoption of modern wheat cultivation practices by the farmers

Practices	Categories	Respondents	
		Number (N= 96)	Percent
1. Variety	Shatabdi	63	65.62
	Kanchan	18	18.75
	Prodip	6	6.25
	Bijoy	5	5.21
	Gourov	4	4.17
2. Line sowing	No adoption	83	86.46
	Adoption	13	13.54
3. Irrigation	No irrigation	3	3.13
	1st irrigation	3	3.13
	1st + 2nd irrigation	26	27.08
	1st + 3rd irrigation	11	11.46
	1st + 2nd + 3rd irrigation	53	55.20
4. Sowing time	Standard	47	48.96
	Late	25	26.04
	Early + Standard	3	3.13
	Standard + Late	21	21.87
5. Storage system	Tin box	12	12.50
	Polythene and gunny bags	76	79.17
	Earthen pot	1	1.04
	Metallic drums	7	7.29
6. Cultivation practices	Seed treatment by vitavex-200	13	13.54
	Recommended seed rate	78	81.25
	Power tiller operated seeder	03	3.12
	Minimum tillage	19	19.79
	Bed planter	03	3.12
	Weed control	71	73.95
	Insect control	49	51.04
Disease control	25	26.04	
7. Rouging	Rouging	14	14.58
	No Rouging	82	85.42
8. Thresher	Power thresher	3	3.12
	Paddle thresher	29	30.21
	Drum thresher	59	61.46
	Floor thresher	5	5.21
9. Modern cultivation	Low adoption	18	18.75
	Medium adoption	62	64.58
	High adoption	16	16.67

Problems on adoption of modern wheat cultivation technologies: Problem on adoption of modern wheat cultivation technologies was measured through 13

problems which might be faced by the wheat growers (Table 4).

Results in Table 4, indicate that excessive weed infestation ranked first as severe problem followed by lack of

technical information, limited availability of foundation seeds, unavailability of mechanical thresher and line sowing is more expensive and time consuming than broadcasting. Among the areas of problems faced by the respondents, excessive weed infestation was the major problem followed by lack of technical information, limited availability of foundation wheat seeds and unavailability

of mechanical thresher. Proper arrangement should be taken to minimize these problems by the concerned agencies and personnel as far as possible. The findings indicate that the farmers were opined problems as not at all categories on the last four but they were not opined not at all category on the first nine.

Table 4. Rank order of problems confrontation by the farmers according to their adoption of modern wheat cultivation practices

Problems	Extent of problems				Computed score	Rank order
	Very much	Moderate	Little	Not at all		
Excessive weed infestation	62	25	9	0	245	01
Lack of technical information	57	29	10	0	239	02
Limited availability of foundation seeds	54	28	14	0	232	03
Unavailability of mechanical thresher	51	60	15	0	228	04
Line sowing is more expensive and time consuming than broadcasting	50	25	21	0	221	05
Lack of knowledge about proper time of sowing	39	31	26	0	205	06
High input cost (seed, fertilizer, pesticide)	34	29	33	0	193	07
Unavailability of credit	26	29	41	0	177	08
Storage facility	25	21	50	0	167	09
Seed purity problem	11	17	51	17	118	10
Marketing related problem	0	37	25	34	99	11
Less irrigation facilities	3	13	52	28	87	12
Land preparation	0	3	48	45	54	13

Educational implications: This research was conducted in Birganj upazila of Dinajpur district on the adoption of modern wheat cultivation technologies and to explore the relationship between the selected characteristics of the farmers and their adoption of modern wheat cultivation technologies. The conclusions and recommendations from this research may be helpful to the Agricultural Educational Institutions, Wheat Research Centre (WRC), Department of Agricultural Extension (DAE), Bangladesh Agricultural Development Corporation (BADC), Research Institutions and Community Development Programs of Bangladesh.

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