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SOCIO-ECONOMIC ASSESSMENT OF WHEAT VARIETY SHATABDI IN SOME SELECTED AREAS OF BANGLADESH

M. ELAHI BAKSH[1], MD. JAHANGIR KABIR[2]
AND MRS. KALPONA KISPATTA[3]

Abstract

The survey was conducted in two villages under Dinajpur and Thakurgaon Districts during March 2004 to assess the socioeconomic aspects of Shatabdi wheat variety adoption at farm level. Stratified random sampling technique was followed for farmer selection. All categories of farmers expected wheat varieties having high yielding potentialities with less disease and pest infestation, more heat tolerant, and bold grain with golden colour. New wheat variety Shatabdi is able to meet the maximum expected characters. Old variety Kanchan was more disease susceptible and new one was free from disease. A significant yield difference was found between new and old verities (Shatabdi yielded 3l% to 43% higher compared to Kanchan over the locations and farmers group). Gross margin (return over variable cost) of Shatabdi also higher compared to Kanchan. By cultivating new variety, farmers earned additional gross margin of Tk. 6446 to Tk. 8353 per hectare in Jagdal and Tk. 6097 to Tk. 9314 per hectare in Daulatpur over Kanchan. Cent percent farmers over the locations said that their income was increased by cultivating Shatabdi compared to old variety Kanchan. The non-adopter farmers wanted new variety seeds. All groups of farmers wanted training/video show for up-dating their technical know how.

Key Words: New vs old varieties; profitability level, farmers' adoption.

Introduction

Wheat is the second most important cereal crop in Bangladesh. In every year Bangladesh needs to import large amount of wheat grains to meet up local demand of about 3.5 million tons. The highest wheat production of 1.9 million tons was achieved during 1998-99 from 0.85 million hectares due to wide spread adoption of high yielding varieties and production technologies. However, in recent years, both the area and production were reduced to 0.64 million hectares and 1.25 million tons in 2003-04 season, respectively (Fig. 1). The Kanchan variety, released in 1983, covered about 80% of total wheat area. Presently this variety has been affected by Bipolaris leaf blight and sterility; consequently yield is low (the national average grain yield has gone down to 1.95 t/ha in 2003-04 compared with 2.24 t/ha in 2000/01). Now, farmers do not like to cultivate Kanchan variety. This is one of the major causes of area, production and yield

[1&2] Principal, Scientific Officer (Ag. Econ.) and Scientific Officer (Ag. Econ.), respectively, Wheat Research Centre, Dinajpur, Bangladesh, [3]Training Coordinator, Dipshikha, Dinajpur, Bangladesh.

reduction. To recover the farmers' confidence, it is important to replace Kanchan by newly released more potential variety Shatabdi.

Wheat Research Centre (WRC) released new variety Shatabdi in 2000. This variety has more yield potentialities than Kanchan. In some villages of Dinajpur and Thakurgaon districts, scientists of WRC have been trying to introduce new wheat variety with the aims to increase wheat productivity and profitability by replacing the old variety Kanchan.

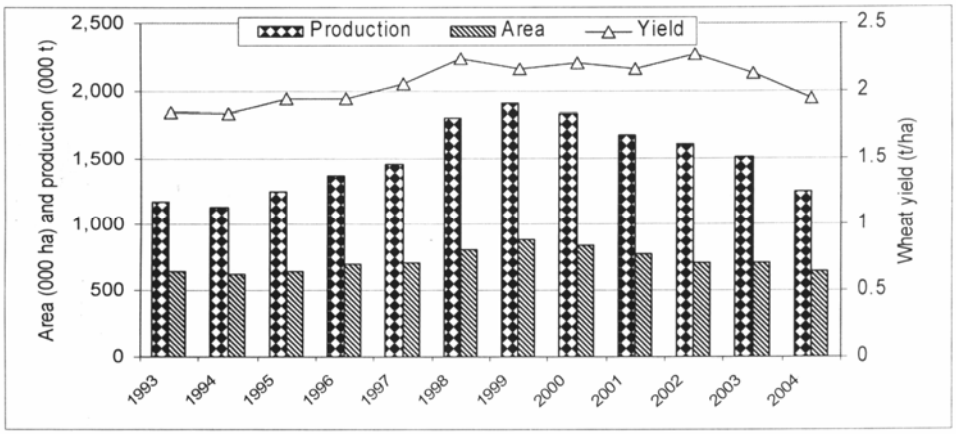

Fig. 1. Area, production and yield of wheat in Bangladesh

Source; BBS

Experience shows that there are so many technologies developed by the research organization, of them few are in farmers' fields. Farmer used their own judgment to adopt new technologies. Some times good technologies are even not in the field due to lack of knowledge of the farmers, ineffective information delivery systems, and for some other socioeconomic blockages. Before providing new technologies to farmers, it is essential to know their farming knowledge, their crops, their farming environment and their socioeconomic conditions (Bellon, 2001). This survey was conducted in order to assess the socioeconomic aspects of Shatabdi wheat variety adoption amongst the communities in the selected villages.

Objectives

The specific objectives of the study were;

1. To assess the wheat growers' expectation about new wheat varieties.
2. To know the socioeconomic profile of new and old wheat varieties.
3. To document the agronomic management practices of wheat at farm level.
4. To estimate the profitability of new and old wheat varieties
5. To suggest guidelines for improving adoption of new wheat in future.

Methodology

The survey was conducted in two villages, namely Jagdal and Daulatpur under Dinajpur and Thakurgaon Districts, respectively, during March 2004. WRC has project activities in these two villages. New wheat variety Shatabdi was selected for socio-economic assessment. For better understanding, data were collected from the adopters and non-adopters of Shatabdi variety. Stratified random sampling technique was followed for farmer selection. In order to fulfill the objectives, 56 wheat growers were selected randomly from the two villages of which 25 farmers were selected from Jagdal and 31 farmers from Daulatpur (Table 1). The selected farmers were grouped in marginal, subsistence and food surplus groups[3] for better presentation of the results. The grouping was mainly done on land holding and food sufficiency situation. The number of farmers in each group is shown in Table 1. Data were collected from the sample farmers through interview method during March 2004. Shatabdi was considered as newly adopted wheat variety and Kanchan as old.

Table 1. Number of sample farmers

Farm categories	Sample Size		
	Jagdal	Daulatpur	Total
Marginal (<0.41 ha)	6	7	13
Subsistence (0.41-1.00 ha)	8	11	19
Food surplus (>1.00 ha)	11	13	24
Total	25	31	56

Tabular technique of analysis was used for descriptive presentation of findings. Tables were prepared in accordance with the objectives of the study. The findings of the study were presented in simple fashion, such as average, percentage, and ratios.

[3] **Marginal Farmer:** Has insufficient land to achieve household food security. Regular shortage of food and cash. Must do labour in order to buy additional food, inputs, and othe basic necessities. Cannot take any risk.

Subsistence farmers: Has sufficient land to meet basic food needs under normal conditions. Remains vulnerable to economic and environmental shocks. Averse risk.

Food surplus farmers: Has sufficient land to guarantee household food security. Able to produce surplus grains and cash crops for sale to buy inputs, send children to school and accumulate “middle class” assets, e.g. bicycle, TV, electric fan. Able to take risk.

Results and Discussion

Farmer's expectation for a new wheat variety

Farmers expressed their opinion about the characteristics of wheat they like. Farmers' opinion was documented by a scoring number and presented in Table 2. All categories of farmers in both the locations expected high yielding varieties with less disease and pest susceptable, more heat tolerant and bold and golden colour grain. Higher yield response to low external inputs was also a preferable character to marginal farmers. And large farmers expected bold grain with higher market value and easily threshable (Table 2).

Tab 2. Farmers expççted charactertics of new wheat variety in the study areas.

Desired characteristics	Ranking score		
	Marginal	Subsistence	Food Surplus
High yield	1	1	1
Higher market price	8	5	4
Less susceptible to insect and diseases	2	2	2
Bold grain size with golden and bright colour	5	4	5
Late sowing heat tolerant/short duration	3	3	3
Less sterility	6	6	6
Easily thresh able	7	8	7
Higher yield response to low inputs	4	7	8

Note: 1 score ranked 1st
Source: Field survey data

Farmers' judgment about new wheat variety Shatabdi

New wheat variety Shatabdi was released in 2000, consists of some good characters what farmers like. Shatabdi variety is able to meet the maximum expected characters like high yield, bold grain size, golden colour, less disease susceptibility and sterility free. But still this variety failed to meet up farmers' expectation in threshability. Its threshability is like Kanchan. Shatabdi plants are a bit taller than Kanchan (Table 3). Manual wheat threshing is a tedious and laborious job; farmers want easily threshable varieties.

Table 3. Characteristics of new wheat variety Shatabdi which farmers like_and dislike.

Characteristics	Farmer's perception
Farmers' liking	
Yield	High
Grain size	Bold
Colour	Golden and bright
Diseases susceptibility	Less
Market price	As like as Kanchan variety
Farmers's disliking	
Threshability	Not easily threshable, like Kanchan variety
Plant height	Relatively high than existing variety Kanchan

Characteristics of old variety Kanchan

The variety kanchan, released in 1983 by WRC, more popular variety that time due to its higher yield, golden colour, bold grain, etc. Once it covers about 80 % of wheat area in Bangladesh. Presently its yield is low due to disease infestation and sterility. But still the old variety Kanchan had some good qualities like bold grain size with white colour and higher market price as new variety Shatabdi. But farmer's dislike is its yield reduction; more disease susceptibility (especially Bipolarize Leaf Blight and leaf spot) and sterility, for those, farmers want to replace it by new variety Shatabdi. Farmers' opinion is presented in Table 4.

Table 4. Characteristics of old variety Kanchan which farmers' like and dislike.

Characteristics	Farmers' perception
Farmers' liking	
Grain size and colour	Good as new one
Market price	Same as new one
Plant height	Moderate
Farmers' disliking	
Yield	Lower than before and than new one
Diseases and insect	Highly susceptible
Sterility	Exists

Yield performance of new and old varieties

A significant yield difference was found between new and old varieties. The adopters of new variety Shatabdi 'received higher yield compared to non-

adopters over the locations and farmers group. At Jagdal 31% to 43% higher yield was found by cultivating new variety than old one. At Daulatpur, the yield difference was more (37% to 74%). At Daulatpur, yield data was taken from experimental plots with recommended package for that here Shatabdi yield was higher than in Jagdal. Farmers obtained yield range from 2.27 t/ha to 2.57 t/ha in old variety Kanchan and yield ranges from 3.24 to 3.95 t/ha for Shatabdi. In Kanchan, subsistence farmers obtained higher yield in both the villages. Farmers found about 38 % and 58 % higher by cultivating Shatabdi over Kanchan in Jagdal and Daulatpur, respectively (Table 5).

To test the significance level of yield differences among old and new varieties the T-test was done among the samples from Jagdal and from Daulatpur villages. In both of the villages, it was found that Shatabdi yield was significantly higher than Kanchan at 5% level.

Table 5. Yield performance of new and old varieties of wheat.

Variety	Yield (t/ha)							
	Jagdal				Daulatpur			
	Marginal	Subsis-tence	Food surplus	All types	Marginal	Subsi-stence	Food surplus	All types
Old (Kanchan)	2.27	2.57	2.42	2.44	2.27	2.51	2.33	2.38
New (Shatabdi)	3.24	3.36	3.46	3.37*	3.95	3.45	3.95	3.77*
Yield difference (%)	43	31	43	38	74	37	70	58

Significant at 5% level

Information flow about new variety

At Jagdal, some farmers have been participated in demonstrations and variety trials of Protiva, Sourav, Gourab, and Shatabdi varieties since 1999. Here WRC scientists have been working with the farmers through several tillage and soil management programmes. So, farmers in Jagdal adopted new varieties from few years ago. From 2002-2003 wheat season, PVS (Participatory Variety Selection) programme was started in Jagdal as well as in Daulatpur village. Daulatpur farmers were acquainted with new variety since 2002-03 wheat season. Last year, they grew wheat under demonstration with full package. This year, farmers cultivated new variety Shatabdi with their own management in Daulatpur.

Hundred percent farmers in both the locations got informations about new variety from WRC by participating demonstration, farmers' rally, field day, and training. And those cultivating new variety, 100% got seed from WRC or from neighboring farmers through seed exchange.

No body was found who stopped to cultivate Shatabdi after adopting. And those are still not using Shatabdi was due to unavailability of seeds. The non-adopter farmers are eagerly waiting for Shatabdi seeds. Some farmers knocked at BADC (Govt. seed supplying agency) for new variety seeds but failed to collect.

Crop Management

All farmers used cow-dung/compost for wheat cultivation, but nobody practiced green manuring. Fertilizer use was similar for new and old variety, but it differs among the marginal and larger groups. The adopters of the new variety were more conscious about fertilizer doses than non-adopters. The adopters used little higher amount of fertilizers than non-adopters. In general, food surplus farmers used higher doses of fertilizers followed by subsistence and marginal farmers for both new and old varieties in both the locations (Table 6 and 7).

Table 6. Quantities of fertilizer used by different groups of farmers for new and old varieties of wheat in Jagdal.

Name of rertilizers	Quantity (kg/ha)					
	New variety			Old variety		
	Marginal	Subsistence	Food surplus	Marginal	Subsistence	Food surplus
Urea	160	198	210	148	185	210
TSP	102	115	124	99	111	124
MP	50	65	75	49	62	74
Gypsum	55	99	99	49	57	37
Zinc Sulphate	-	-	-	-	4.94	-
Borax	-	-	-	-	-	-
Manure (ton/ha)	5.33	4.94	4.94	5	4.96	4.96

Table 7. Quantities of fertilizer used by different groups of farmers for new & old variety of wheat in Daulatpur.

Name of rertilizers	Quantity (kg/ha)					
	New variety			Old variety		
	Marginal	Subsistence	Food surplus	Marginal	Subsistence	Food surplus
Urea	220	220	220	173	197	185
TSP	138	138	138	86	84	89
MP	100	100	100	69	62	70
Gypsum	115	115	115	25	37	25
Zinc sulphate	17	17	17	-	0.29	0.62
Borax	10	10	10	-	0.29	-
Manure (ton/ha)	3.8	4.49	5.00	3.70	4.94	5.00

Old variety Kanchan was more disease susceptible and new one was free from disease. But still they did not use any pesticide to control diseases. The main diseases and insect of wheat were as follows.

Insect and Disease	Name of the pest/diseases	Control methods used
Main insects in wheat	In general, insect pest infestation is low in wheat field. But some infestation of Termites on high land and Stem borer and rat. Wireworm are observed. Rats also exist.	Farmers do not use any pesticides for wheat insect control except rat.
Main diseases in old variety Kanchan	The main diseases of Kanchan wheat were Bipolaris leaf blight and leaf rust. Seedling blight, Foot and Root rot and Black point in wheat seed are also observed.	Due to lack of knowledge they did not took any preventive or control measure. They neither treat the seeds nor apply any foliar fungicides.

Source: Baksh, 2002 and Baksh *et al.*, 2003

Cost of cultivation

Wheat cultivation cost was little bit higher in Jagdal due to higher fertilizer and irrigation costs compared to that in Daulatpur. There was no significant difference in total variable cost between the old and new varieties. However, the total variable cost ranged from Tk. 12,710 to Tk. 13,142 per hectare in Jagdal (Table 8) and Tk. 10,428 to Tk. 11715 per hectare in Daulatpur (Table 9). Maximum portion of variable cost was incurred by human labour followed by fertilizer, seed, and irrigation in both the locations.

Profitability

Shatabdi yielded higher and gross margin also higher compared to old variety Kanchan at both the locations. By cultivating new variety, Shatabdi farmers earned additional gross margin of Tk. 6446 to Tk. 8353 per hectare in Jagdal and Tk. 6097 to Tk. 9314 per hectare in Daulatpur over old variety Kanchan (Table 8 and 9). In Kanchan, subsistence farmers (Tk. 7,549/ha) received higher gross margin at]agdal and food surplus (Tk. 9,726/ha)in Daulatpur due to relatively high yield compared to others (Table 8 and 9). But in case of Shatabdi, marginal farmers earned higher gross margin (Tk. 17,062/ha) in Daulatpur and food surplus (Tk 14,742/ha) in Jagdal due to higher yield. Benefit cost ratio were

higher for Shatabdi variety in both the locations (above 2) compared to Kanchan (less than 2).

Hundred percent farmers over the locations said that their income was increased by cultivating Shatabdi compared to old variety Kanchan. All categories of farmers cultivated wheat for both home consumption and sale. However, lion share of their production was sold.

Table 8. Profitability of new and old wheat cultivation in Jagdal.

Item	New (Shatabdi)			Old (Kanchan)		
	Marginal	Subsis-tence	Food surplus	Marginal	Subsis-tence	Food surplus
Seed cost	1925	1852	2007	2436	2316	2160
Ploughing cost : Animal	741	-	-	741	988	124
Power tiller	494	988	988	494	-	988
Fertilizer cost	2954	3509	3337	2684	3380	3372
Manure cost	1066	988	988	1000	980	980
Irrigation cost	1580	1630	1630	1850	1605	1605
Labour cost	3850	3952	3532	3960	3742	3742
Total variable cost (Tk/ha)	12710	12919	12922	12895	13011	12971
Gross return (Tk/ha)*	25920	26874	27664	18160	20560	19360
Gross margin (Tk/ha)	**13210**	**13995**	**14742**	**5018**	**7549**	**6389**
Additional gross margin (Tk/ha)	8192	6446	8353	-	-	-
BCR	2.01	2.08	2.14	1.38	1.58	1.50

* Considered grain yield only

Table 9. Profitability of new and old wheat cultivation in Daulatpur.

Item	New (Shatabdi)			Old (Kanchan)		
	Marginal	Subsis-tence	Food surplus	Marginal	Subsis-tence	Food surplus
Seed cost	2692	2697	2524	2371	2668	2371
Ploughing cost	1482	1482	1482	1976	1976	1482
Animal	988	-	988	988	988	494
Power tiller	494	1482	494	988	988	988
Fertilizer cost	3120	3120	3120	2756	2884	2871
Manure cost	740	988	1040	760	988	1040
Irrigation cost	1185	796	1185	988	988	1483
Labour cost	3939	3803	4075	3803	3532	3532
Total variable cost (Tk/ha)	11235	11715	12264	10428	11357	11680
Gross return (Tk/ha)*	28297	28297	28087	18176	20606	21406
Gross margin (Tk/ha)	**17062**	**16582**	**15823**	**7748**	**9272**	**9726**
Additional gross margin (Tk/ha)	9314	7310	6097	-	-	-
BCR	2.50	2.41	2.29	1.74	1.81	1.83

* Considered grain yield only

Follow-up support program farmers' needed

The non-adopter farmers wanted new variety seeds. All groups of farmers wanted training/video show for up-dating their technical know how. Subsistence and larger farmers wanted brooklets, leaflets, and other printed materials for new information. Larger farmers seek helps in purchasing power tiller operated seeder (PTOS) and thresher. Marginal farmers seek crop production loan with easy terms and condition and with low interest rate (Table 10)

Table 10. Follow up support programme needed for wheat farmers

Support programme	Priority ranking		
	Marginal	Subsistence	Food surplus
Supply of new variety seed (Shatabdi)	1	1	1
Training on production technology	2	2	2
More demonstration and video show/leaflet	4	3	5
Credit with easy terms and condition and low interest rate	3	4	-
Agil. equipment support (PTOS, Thresher)	-	5	3

Conclusions and Recommendations

New wheat variety Shatabdi satisfied farmers' maximum expectation like high yield potentialities, less susceptible to diseases, bold and bright grain. Farmers adopted Shatabdi and found 31 to 78 percent higher yields over Kanchan over the locations; and also earned higher gross return and margin compared to Kanchan. Contribution of Shatabdi helped farmers in improving their livelihood by increasing income. The following follow-up programme may help farmers more in increasing wheat production and yield.

1) Shatabdi seeds need to be available. At present, BADC can supply about 20% of the seeds requirements. It is quite impossible for one organization to replace Kanchan quickly. The production and storage of Shatabdi seeds at farm level need to be emphasized in both the villages for seed availability.
2) Training/Orientation programme may be arranged for updating farmers' knowledge about new varieties and modern wheat cultivation technique.
3) Booklets, leaflets, production manuals, etc. should be printed and need to be distributed among the farmers.
4) Seasonal/crop production loan can help marginal and resource poor farmers in wheat cultivation.

Appendix Table 1. Assets ownership of the new wheat adopter farmers.

Assets	Jagdal			Daulatpur		
	Marginal	Subsis-tence	Food surplus	Marginal	Subsis-tence	Food surplus
A. Natural capital (No.)						
Cattle	1.85	4	2	1.67	2.3	1
Bullock/Buffalo	0.74	0.5	2	1.32	2	2.5
Goats	1.50	-	-	1.33	1	1
B. Physical capital (No.)						
Power tiller	-	-	-			
STW	-	1	1	-	-	-
Thresher	-	-	-	-	-	0.33
C. Other source of income						
Business	0.32	0.25	-	0.12	0.66	0.16
Service	-	-	-	-	-	0.16

Appendix Table2. Assets ownership of the non-adopter farmers.

Assets	Jagdal			Daulatpur		
	Marginal	Subsis-tence	Food surplus	Marginal	Subsis-tence	Food surplus
A. Natural capital (No.)						
Cattle	4.3	2	4.5	1.33	2	2
Bullock/Buffalo	-	2	1.05	0.67	0.6	1.12
Goats	1	1	3.5	1.73	3	2.67
B. Physical capital (No.)						
Power tiller	-	-	-	-	-	-
STW	-	0.75	0.75	-	0.66	0.47
Thresher	-	-	-	-	-	-
C. Other source of income						
Business	0.5	0.75	0.5	0.50	-	0.22
Service	-	-	-	-	-	-

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