Bangladesh J. Agric. Econs. XVII, I and 2 (1994) : 45-60

PATTERNS AND INTENSITY OF ADOPTION OF THE HYVs OF BORO RICE IN BANGLADESH

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ABSTRACT

This paper reports on an investigation concerning patterns and intensity of adoption of the high yielding varieties HYVs) of *boro* (winter) rice among the opinion leaders and the farmers in a progressive village and in a less progressive village of Bangladesh. In case of the less progressive village, the intensity of adoption of the HYVs of *boro* rice increased with the increase in the size of the irrigated area. However, for the farmers of the progressive village an opposite pattern of decreased intensity of adoption of the HYVs of *boro* in relation to the size of the irrigated area was observed. For all the farmers increase in the intensity of adoption of the HYVs of *boro* rice could be perfectly attributed to the percentage of the irrigated area showing the decisive importance of water in the cultivation of winter rice. The results of stepwise regression combining both the economic and non-economic factors and the economic factors as a set re-established the above finding. However, as a set, the non-economic factors contributed to a various but generally low extent to the explanation of the variance of intensity of adoption of the HYVs of Boro rice.

1. INTRODUCTION

Since its introduction during the Green Revolution modern high yielding varieties (HYVs) of rice have been replacing the traditional low yielding varieties. The input intensive HYVs of rice, because of their better performance, are sought by the primary producers. Among the inputs water, chemical fertilizers, insecticides and capital play the most vital role in successful farming. Irrigation facilities are particularly important for the adoption of the HYVs of rice (Flinn et al., 1980). Dinar and Yaron (1990) and Wichelns and Cone (1992) have stressed the critical role of water showing that its scarcity may restrict farming activities at any site.

Although importance of water on crop production has been studied in the past, some of those studies had some methodological drawbacks (e.g., Dinar and Yaron, 1990; Alauddin and Tisdell, 1988). The present study represents a departure from the past for several reasons. First, past studies have measured intensity of cultivation following conventional method. That is, cropping intensity was defined involving all crops for a particular time frame.'

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In the case of a mixed crop situation, Agarwal (1984) treated one crop as principal holding others constant. Such a mixed cropping situation blurs the measurement of intensity of cultivation due to the unknown impact of the second crop on the principal crop. Moreover, they did not measure the effect of a single factor on the intensity of adoption of a single farming enterprise. Secondly, past research results (Agarwal, 1984; Alauddin and Tisdell, 1988) did not put emphasis on explaining the intensity of adoption on interregional variations in terms of differential level of development. There was no focus on opinion leaders who play a crucial role in the overall intensity of adoption and/or provide a role model for farmers. Furthermore, non-economic factors were not taken into consideration to ascertain their effects on the intensity of adoption. The present research attempts to overcome those shortfalls and captures more accurately the effects of irrigation on the intensity of adoption of HYVs of Boro rice. Among non-economic factors farmer's educational orientation, exposure to information, managerial capacity may also contribute to the extent of adoption of the HYVs of Boro rice. Such factors may affect the intensity of adoption of the HYVs of rice for both opinion leaders and farmers in the farming community.

This paper presents empirical evidence on two central issues, namely, the contribution of irrigation in particular and economic and non-economic factors in general to the intensity of adoption of the HYVs of rice in a progressive and less progressive village of Bangladesh. Apart from the introduction in Section 1 above, data sources and methodology are discussed in Section II. Section III examines the results of the study accompanied by discussion. Finally, concluding remarks have been drawn in the Section IV.

II. METHODOLOGY

The field data collection for this study was conducted during 1989 in Muktagacha *Thana* (sub-district) of Mymensingh district, Bangladesh. The *Unions* (similar to precinct), surveyed in this study, from the same *Thana,* represent two areas in different stages of the development. They were selected randomly from two groups of *Unions* - relatively progressive and less progressive. These *Unions* had similar physical, agro-climatic, socio-cultural, demographic and religious make up and topographical characteristics. Also, identical programmes of technological change were introduced by the Department of Agricultural Extension in the selected *Unions* almost at the same time. The relative progressiveness of the villages was determined using several criteria : proximity to the main road transport system; markets; towns; extension centres; closeness to the facilities such as education, health care, services; judgements by the experts; differences in the rate of technological adoption and other qualitative and quantitative criteria (Hossain, 1992). At a later stage two villages were selected for this study. One village was chosen from the progressive *Union* purposely because of the factors considered above for relative progressiveness. Another village was selected randomly

out of 28 villages of the less progressive Union which was far away from those modern facilities.

Sixteen non-economic (age, farming experience, personal education, family education, family size, conservation concern, political knowledge, cosmopoliteness, fatalism, achievement motivation, managerial skill, local interaction, social participation, innovation proneness, exposure to modern farming information, and contact with extension worker) and I 1 economic (own farm area, total farm area, tenancy, absolute subsistence pressure, relative subsistence pressure, agricultural worker, availability of labour, herd size, area irrigated, percentage area irrigated, and economic level of living) independent variables were included in the study to explain the situations of the farmers. Both dependent and independent variables (which finally appeared in the regression models) and their measurements are given in the subsequent section. Unidimensionality of the indexed independent variables were ascertained by using factor analysis following the extraction of the first factor pattern from unrotated factor matrix (Tabachnick and Fidell, 1989). For those indexed variables Cronbach's alpha reliability[2] procedure was employed using the internal consistency method for assessing reliability (Carmines and Zeller, 1979). Ordinary least Square and stepwise regression procedure were used to ascertain the contribution of the independent variable(s) on the dependent variables. In this paper only Boro (winter) HYVs of rice cultivation is considered. Winter in Bangladesh is dry with very low precipitation. Correlation matrices are also provided to check the multicollinearity of the selected variables (Appendix).

Concept and Measurement of Opinion Leadership

Farming community is characterized by a tight-knit network of social relationship. Some members in such a community exert informal and unequal pressure on others in their decision-making process in everyday life. They are group selected and informally given the leadership position. These leaders are called opinion leaders. Rogers (1983) defined "opinion leadership as the degree to which an individual is able to influence informally the attitudes or overt behaviour of other individuals in a desired way with relative frequency." Opinion leadership is not trait. Such influentials are known to have considerable knowledge and experience in certain subject areas. However, these leaders are not totally devoid of formal power and are not strictly anonymous in the traditional rural community (Hossain, 1988).

Such opinion leaders are known to perform "gate-keeper" functions, determining what farming information is worth communicating to other village members. Although the degree of informal influences by opinion leaders vary their actions are universal in all kind of societies (Van den Ban, 1970.

Sociometric technique was employed to identify opinion leaders. Five farm practices, namely, cultivation of the HYVs of rice, vegetable cultivation, use of insecticides, treatment of sick cattle and milking cows were the areas where sociometric information was sought. Each respondent was asked to nominate only one person as a preferred informal consultant on

each of the five farming areas. At least two incoming choices were considered to be indicative of an opinion leader. Following this process of identification the total sample of 109 and 108 farmers was interviewed respectively in the progressive and less progressive villages containing 38 and 47 opinion leaders.

Variables and their Measurement

In this instance the HYVs of Boro rice were recommended by the Department of Agricultural Extension.

For the purpose of this study intensity of adoption was measured by the percentage of farm area under the HYVs of rice (Asaduzzaman, 1979; Ahmed, 1981).

The selected independent variables in this study were measured as follows :

Education was measured by the number of years of schooling completed by the head of the family (male members in all cases). Similarly, education of the dependent members was measured by the number of years of schooling attained up to the time of the survey. Family education was calculated by giving an arbitrary score on the basis of the level of education attained by the family members. The scores assigned are as follows : Above secondary = 1.00; above primary and up to secondary = 0.50; primary = 0.25 (Asaduzzaman, 1979). The aggregate of these scores is the education score of the family.

Conservation concern is a measure of knowledge of maintenance of selected non-renewable resources in classical agriculture. A two-point Likert scale for four statements was used to construct the index. A score of 1 for 'yes' and 0 for 'no' were used to the statements complying positively to the index and the scoring pattern was reversed for statements negative to the index. The scale scored Cronbach's alpha reliability of 0.56.

Political knowledge is a measure of a respondent's degree of awareness of political events at the local and national levels. The index had Cronbach's alpha reliability of 0.83.

Fatalism is defined as a belief that human situation and acts are predetermined by some supernatural power and could never or seldom be influenced by individual volition or by the act of any person (Niehoff and Anderson, 1965). A three-point Likert scale for nine statements was constructed to measure the fatalism of respondents. The extent of fatalistic attitude was ascertained by responding either'agree','no opinion', or'disagree' with a possible score of 2, 1 and 0 respectively for statements positive towards fatalism and it was reversed otherwise. The scale of fatalism had Cronbach's alpha reliability of 0.82.

Achievement motivation has been defined as the degree to excel regardless of social rewards (McClelland, 1961). The variable was operationalized by including three-items and using the three-point Likert scale similar to fatalism above. Cronbach's alpha reliability for this scale was 0.71.

Managerial skills of a respondent was a measure of his skilful role as a farmer in combining roles of manager or executive, planner, and economist. Ten statements were

incorporated in this index. Possible scores were 1 for 'yes' and 0 for 'no'. Cronbach's alpha reliability test for the scale of managerial skill gave a score of 0.74.

Social participation has been defined as the degree to which an individual participates voluntarily in different organizations in the community in some form of executive capacity, and is involved both in formal and informal activities. Thus a respondent could be involved in the local committees of irrigation, mosque/mandir, daily/weekly markets and school. The extent of participation as measured by summing up involvement as an executive member, simple member or name, with a weight of 2, 1, and 0 respectively. Cronbach's alpha reliability test for the index was 0.56.

Exposure to modern farming information was a measure of farmers' ideas about some of the significant components of farming at the time of the survey. The index consisted of five statements and a two-point Likert scale was constructed to score the response pattern. Its Cronbach's alpha reliability score was 0.66.

Area irrigated indicated the acres of irrigated land, including rented land, used for the cultivation of the high yielding varieties of rice. Percentage area irrigated implies irrigated land as a percentage of operated land.

Other independent variables are not defined here mainly because they did not contribute explicitly in explaining the variation in any situation of this paper (Hossain, 1992).

III. ANALYSIS OF RESULTS

Irrigation and Intensity of Adoption of the HYVs of Boro Rice

Water used for irrigation, *inter alia*, plays a very vital role in the intensity of cultivation of the HYVs of rice. However, the intensity of adoption of the HYVs of rice might have varied with the amount of area irrigated and the irrigated land as a percentage of the operated land.

In order to estimate the relationship between the intensity of adoption of the HYVs of rice and the area irrigated a linear function was fitted using Least Square Regression to the scatter of observations for all the four groups of the respondents, namely, opinion leaders in the progressive and less progressive villages, and the farmer respondents in these villages. The results are given in Figure 1 and 2. The results in these regression equations do not show consistency across the types of village and the groups of the respondents.

Although the statistical fits of these regression lines are not very strong, except the equation in Figure 1a all others had significantly high t-value. Nevertheless, in case of the opinion leaders and the farmer respondents as a whole in the less progressive village, area irrigated has a relatively high explanatory power of the intensity of adoption of the HYVs of rice.

Furthermore, Figure 1a which shows a very poor fit indicates that the intensity of adoption of the HYVs of rice decreases with the increase in the size of operated area. Alauddin

and Tisdell (1988) identified a similar phenomenon. However, for the Figure 1b, 2a and 2b the regression lines show that intensity of adoption increases with the increasing area under irrigation. This could be primarily due to the availability of water factor. Steenbergen (1992) observed in Balochistan in Pakistan that increased water availability will also mean that new land can be brought under permanent cultivation. Similarly, Ghose (1979) explained that as modern irrigation equipment (e.g., shallow and deep tubewells) become increasingly more available, the advantages of the smaller farmers in this respect would tend to disappear, since the larger farms would be in a better position to purchase and utilize such equipment. The high price for buying irrigation water, lack of a modern irrigation equipment or sharing crop output with the owner of irrigation equipment, often prevent the economically vulnerable smaller farmers from increasing the intensification of cultivation of the HYVs of Boro rice.

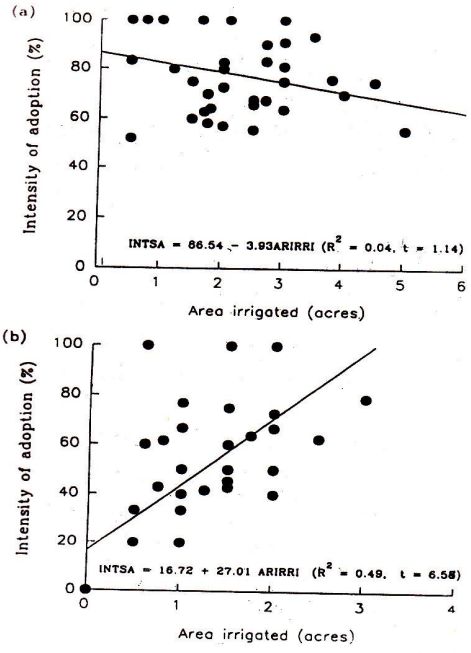

Fig. 1. Scattergram and Regression Line Showing the Relationship Between Intensity of Adoption of the HYVs of Boro Rice and Area Irrigated for the Opinion Leaders of (a) Progressive and (b) Less Progressive Villages.

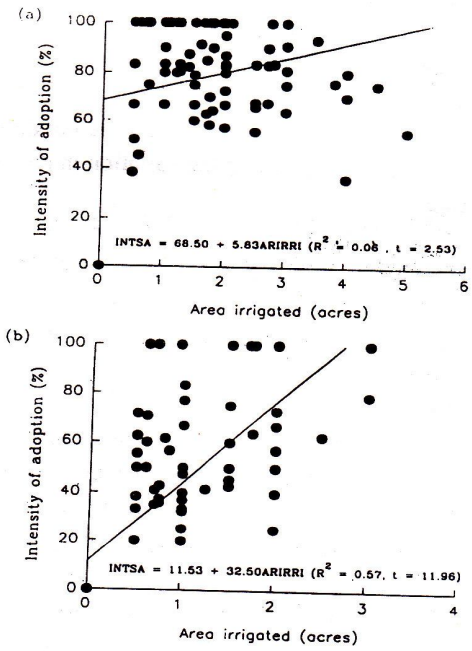

Fig. 2. Scattergram and Regression Line Showing the Relationship Between Intensity of the HYVs of Boro Rice and Area Irrigated for the Farmers of (a) Progressive and (b) Less Progressive Villages.

In addition to the area irrigated, intensity of adoption of the HYVs of Boro rice seems to be entirely dependent on the ratio of the percentage of area under irrigation to the total land area operated (Figure 3 and 4). This implies a decisive role of water in increasing the intensity

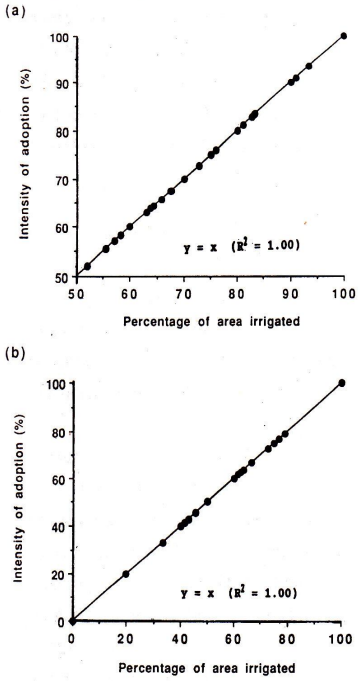

Fig. 3. Scattergram and Regression Line Showing the Relationship Between Intensity of Adoption of the HYVs of Boro Rice and Percentage Area Irrigated for the Opinion Leaders of (a) Progressive and (b) Less Progressive Villages.

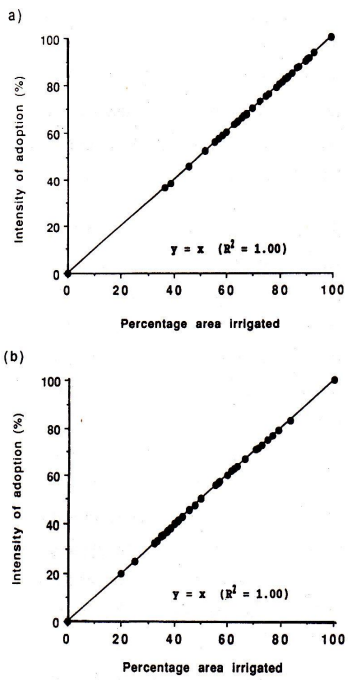

Fig. 4. Scattergram and Regression Line Showing the Relationship Between Intensity of the HYVs of Boro Rice and Percentage Area Irrigated for the Farmers of (a) Progressive and (b) Less Progressive Villages.

of adoption of the HYVs of Boro rice. The fitted regression lines in Figure 3 and 4 indicate the perfect contribution of water in increasing the intensity of adoption of the HYVs of rice irrespective of level of development of villages and leadership role.

Such a perfect attribution of irrigation water could be further explained by the fact that irrigable HYVs of rice produce their optimum economic yield per unit of water applied. Also in risk-benefit terms as irrigation reduces yield risk, additional benefit in the form of reduced risks of low net incomes are obtained by risk-averse farmers. Pandy's (1990) study of irrigation for winter wheat grown in the central India supported the importance of the risk factor in water use. He also found benefits in terms of reduced risk and differences of a large

order of magnitude in mean net returns from farms with and without irrigation. Etienne (1977) observed the crucial importance of irrigation water for the cultivation of the HYVs of Boro rice in Bangladesh.

In another recent study reported from Sri Lanka, Mahendrarajah and Warr (1991) observed that adoption of the HYVs of rice and efficient intertemporal allocation of water resources resulted in a striking increase of crop yield up to five-fold over the traditional old rice technology. However, the intensity of cultivation of the adopted HYVs of rice in the dry season was entirely dependent upon the quality of water stored in local dams since not other artificial irrigation device was used.

Factors Contributing to the Intensity of Adoption of the HYVs of Boro Rice : Results of Stepwise Regression Analysis.

To determine the per cent contribution in the variation of the intensity of adoption of the HYVs of Boro rice by the selected independent variables (both economic and non-economic), stepwise regression analysis method was used. The significance level for entry into the model was 0.15 by default. The results are set out for the opinion leaders and the respondents in two types (progressive and less progressive) of the villages.

The test indicated a consistent result that when economic and non-economic variables are combined, respectively, for the opinion leaders in the progressive and less progressive villages and the farmers in the progressive and less progressive villages, percentage area irrigated had perfect (100 per cent) contribution to the intensity of adoption of the HYVs of Boro rice. Also using only the economic variables the outcome was similar as above for all groups and sub-groups of the respondents. This has reestablished the decisive importance of irrigation in the winter HYVs of rice cultivation. It is also important to note that during this season quantity of precipitation and its rate in the country is very low. So farmers have to depend entirely on irrigation for growing HYVs of rice. It is, thus, an indication that with the increase of ability to irrigate more farm area the intensity of cultivation of the HYVs of rice during winter season in Bangladesh will increase as well. Similarly, Ahmed and Sampath (1992) observed that in the irrigation-induced technological change of rice production in Bangladesh unless irrigated area expands the concomitant production of more HYVs of rice would be quite a difficult task. In other words, increasing the intensity of cultivation of the HYVs of rice is dependent on the assurance of irrigation water. At present, barely 30 per cent of the total land under agricultural production is served by irrigation (BBS, 1992).

However, to ascertain the per cent contribution of only non-economic variables, stepwise regression tables were created. With regard to opinion leaders in the less progressive village none of the non-economic factors had any contribution at all. Thus the stepwise regression results for the opinion leaders in the progressive village, the respondents in the progressive village and less progressive village are only reported.

Opinion Leaders (Progressive Village)

The results presented in Table 1 show that five out of the 16 non-economic variables, namely, managerial skills, personal education, political knowledge, family education and social participation explained 49.4 per cent of the variance in the intensity of adoption of the HYVs of rice by the opinion leaders in the progressive village. No other variables met the signifi-

Table 1. Stepwise Regression Analysis on Intensity of Adoption of the HYVs of Boro Rice by the Non-economic Variables for the Opinion Leaders of Progressive Village.

Variable entered	b	Standard error of b	Coefficient of determination R^2	df	F-value
MGSK	-4.12	1.04	0.1906	1,36	15.56**
PRED	2.69	0.76	0.3057	2,35	12.58**
POKN	-4.30	1.71	0.3771	3,34	6.29*
FMED	-4.98	2.04	0.4362	4,33	5.98*
SOPR	2.77	1.45	0.4940	5,32	3.65NS

"*" indicates significant at 0.05 probability level

"**" indicates significant at 0.01 probability level

"NS" indicates not significant

Sum of squared residuals = 4969.96

Note : MGSK = Managerial skill, PRED = Personal education, POKN = Political knowledge, FMED = Family education, SOPR = Social participation.

cance criteria required to be entered into the stepwise regression equation. It is also obvious from Table1 that social participation did not contribute significantly to the total variance. On the other hand, managerial skills contributed the highest proportion (19.1 per cent) of the variation in the intensity of adoption of the HYVs of rice. Similarly, Crouch (1986) found that the variable contributing most to the multiple relationship between adoption of the improved farm practices and the selected independent variables was the index of managerial skills.

Personal education had the next highest contribution of 11.5 per cent to the total variance explained. Political knowledge and family education contributed, respectively, 7.1 per cent and 5.9 per cent to the total variance in the intensity of adoption of the HYVs of rice.

The results signify that managerial skills together with increased education among family members and knowledge of politics, a measure of externalities, played important role in the intensity of adoption of the HYVs of rice for the opinion leaders in the progressive village.

Farmers in the Progressive Village

The results of the stepwise analysis revealed that only three-non-economic variables were significantly contributing to the intensity of adoption of the HYVs of rice (Table 2) in case of the respondents in the progressive village. They were personal and family education, and conservation concern.

These three variables produced the coefficient of multiple correlation (R) and the coefficient of determination (R^2) of 0.3626 and 0.1315, respectively. In other words, 13.2 per cent of the variation in the intensity of adoption of the HYVs of rice was accounted for by the combined effect of those three non-economic variables listed above. The three variables, namely, personal education, family education and conservation concern explained 5.6 cent, 3.2 per cent and 4.3 per cent of variations, respectively.

Table 2. Stepwise Regression Analysis on Intensity of Adoption of the HYVs of Boro Rice by the Non-economic Variables for the Farmers of Progressive and Less Progressive Village.

Variable entered	b	Standard error of b	Coefficient of determination R^2	df	F-value
Progressive Village					
PRED	2.47	0.73	0.0560	1,107	11.14**
PMED	-7.63	2.81	0.0883	2,106	7.34**
CONS	5.13	2.24	0.1315	3,105	5.23*
Less Progressive Village					
EXPM	6.92	2.36	0.0204	1.106	8.60**
NACH	-4.76	1.63	0.0691	2,105	8.46**
CONS	-5.90	2.76	0.0975	3,104	4.54*
FATS	-1.11	0.67	0.1211	4.103	$2,77^{NS}$

"*" indicates significant at 0.05 probability level

"**" indicates significant at 0.01 probability level

"NS" indicates not significant

Sum of squared residuals for the progressive village = 69847.37 and less progressive village = 97126.60.

Note : PRED = Personal education, FMED = Family education, CONS = Conservation concern, EXPM = Exposure to modern farming information, NACH = Achievement motivation, FATS = Fatalism..

Farmers of the Less Progressive Village

Like in the progressive village, the non-economic factors in the less progressive village did not explain much of the variation in the intensity of adoption of the HYVs of rice. Table 2 shows that four variables, namely, exposure to modern farming information, achievement motivation, conservation concern and fatalism contributed to the variation explaining the intensity of adoption of the HYVs of rice. However, with the exception of fatalism the contribution of other variables was significant.

Achievement motivation has the highest contribution of 4.9 per cent, then conservation concern (2.8 per cent) and exposure to modern farming information (2 per cent). The computed coefficient of multiple correlation and coefficient of determination are respectively 0.3480 and 0.1211.

IV. CONCLUDING REMARKS

Several conclusions can be drawn from the analysis of data documented in this study. In case of the opinion leaders and the farmers of the less progressive village the intensity of adoption of the HYVs of Boro rice increased at an increasing rate with the increase in the size of the area irrigated. However, for the opinion leaders and the respondents in the progressive village opposite pattern was observed.

For all groups and sub-groups of the respondents increase in the intensity of adoption of the HYVs of Boro rice is perfectly attributed to the percentage of area irrigated. In other words, water in the form of irrigation played core role in the intensity of adoption of the HYVs of Boro rice.

The results reestablished that when all the economic and non-economic variables were combined and economic variables as a set were considered, the intensity of adoption of the HYVs of Boro rice was perfectly related to the percentage of area irrigated. On the other hand, a non-economic variable set did not contribute at all for the opinion leaders in the less progressive village. Besides this sub-group, the non-economic variables contributed to various extent to the explanation of the variability—49.4 per cent, 13.1 per cent, and 12.1 per cent, respectively, in case of opinion leaders in the progressive village, respondents in the progressive and less progressive villages.

Irrigation was found to increase the intensity of adoption of the HYVs of Boro rice. Thus irrigation facilities in both progressive and less progressive villages should be increased with the intent of increasing the intensity of adoption of the HYVs of rice. In this regard, electrification of the irrigation machines would reduce the cost and make their management more efficient encouraging farmers to intensify the adoption of the HYVs of rice. Repair and maintenance of the existing irrigation machines and sinking of additional machine, would ensure added land for cultivation. Also hand tube-wells should be made available for irrigation at a reasonable price among farmers. In addition, re-excavation of existing derelict ponds and

excavating small ponds would serve as water reservoir for rice fields' used during the dry season.

Training programme for farmers, water supervisors of irrigation projects and opinion leaders could help effective use of irrigation water. This is a specific training need for developing countries particularly for Bangladesh where irrigation involves not one farmer but a group of farmers. Hence, smooth operation of the irrigation system in that case can only be achieved if the cooperation of all the farmers and opinion leaders is guaranteed. Alongwith the technological aspects, attention to socio-economic, administration, legal and political conditions which influence local decisions need to be apprehended for the success in irrigation projects. Should the presence of irrigated water be assured for the growth of crops during dry season, it can augment above normal food supply including rice.

Footnotes

1. For Detail See Agarwal (1984)
2. The internal consistency method for assessing reliability (Carmines and Zeller, 1979) was used in this study. Cronbach's (1951) alpha (α) reliability procedure was employed using the following equation (Carmines and Zeller, 1979:40) to measure the level of reliability of the indices constructed.

$$a = N\rho/[1 + \rho (N - 1)]$$

where, N = number of items

ρ = mean inter-item correlation

In measurement the internal consistency, inter-item total correlation procedure were utilized to examine the possibility of further improvement of the indices. Jackson's (1988) remark of items showing item-total correlation of less than 0.25 shall be excluded from the index, was strictly followed throughout.

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APPENDIX

Table A-1. Correlation Matrix Among Selected Variables for the Farmers in Progressive Village

Variable	PRED	FMED	CONS	POKN	FATS	NACH	MGSK	SOPR	EXPM	ARIRRI	PRIRRI
PRED	1.0										
FMED	0.26**	1.0									
CONS	0.22*	0.44**	1.0								
POKN	0.57**	0.31**	-0.03NS								
FATS	-0.49**	-0.43**	-0.20*	-0.33**	1.0						
NACH	0.49**	0.16NS	-0.04NS	0.47**	-0.29**	1.0					
MGSK	0.26**	0.34**	0.44**	0.01NS	-0.39**	0.11NS	1.0				
SOPR	0.53**	0.51**	0.27**	0.31**	-0.44**	0.24*	0.34**	1.0			
EXPM	0.64**	0.42**	0.29**	0.48**	-0.53**	0.40**	0.39**	0.40**	1.0		
ARIRRI	0.18NS	0.39**	0.05NS	0.05NS	-0.26**	-0.50**	0.50**	0.31**	0.31**	1.0	
PRIRRI	0.24*	-0.02NS	0.09NS	0.09NS	-0.04NS	0.16NS	0.18NS	0.14NS	0.19*	0.24*	1.0

"*" indicates significant at 0.05 probability level

"**" Cranbach, L. J. (1951). "Coefficient Alpha and he Internal Structure of Tests", Psychometrika, 16 : 294-334.

"NS" indicates not significant

Note : ARIRRI = Area Irrigated , PRIRRI = Percentage area irrigated.Full names of all other variabls are explained in Table 1 and Table 2.

Table A-2. Correlation Matrix Among Selected Variables for the Farmers in Less Progressive Village

Variable	PRED	FMED	CONS	POKN	FATS	NACH	MGSK	SOPR	EXPM	ARIRRI	PRIRRI
PRED	1.0										
FMED	0.13NS	1.0									
CONS	-0.01NS	0.07NS**	1.0								
POKN	0.66**	0.48**	-0.04NS	1.0							
FATS	-0.17NS	-0.10NS	-0.18NS	-0.11NS	1.0						
NACH	0.51**	-0.31**	-0.09NS	0.62**	-0.14NS	1.0					
MGSK	0.24*	0.27**	0.24*	0.16NS	-0.05NS	0.15NS	1.0				
SOPR	0.32**	0.33**	0.21*	0.30**	-0.24*	0.06NS	0.22*	1.0			
EXPM	0.59**	0.41**	0.10NS	0.56**	-0.01NS	0.48**	0.37**	0.28**	1.0		
ARIRRI	0.09NS	0.06NS	0.09NS	0.05NS	-0.23*	-0.08NS	0.16NS	.15NS	0.17NS	1.0	
PRIRRI	0.03NS	-0.02NS	-0.12NS	0.03NS	0.08NS	-0.13NS	-0.04NS	-0.03NS	0.14NS	0.76*	1.0

"*" indicates significant at 0.05 probability level

"**" Cranbach, L. J. (1951). "Coefficient Alpha and he Internal Structure of Tests", Psychometrika, 16 : 294-334.

"NS" indicates not significant

Note : ARIRRI = Area Irrigated , PRIRRI = Percentage area irrigated.Full names of all other variabls are explained in Table 1 and Table 2.

Table A-3. Correlation Matrix Among Selected Variables for the Opinion Leaders in Progressive Village

Variable	PRED	FMED	CONS	POKN	FATS	NACH	MGSK	SOPR	EXPM	ARIRRI	PRIRRI
PRED	1.0										
FMED	0.03NS	1.0									
CONS	0.62**	0.58**	1.0								
POKN	0.46**	0.20NS	0.33*	1.0							
FATS	-0.45**	-0.42**	-0.29NS	-0.19NS	1.0						
NACH	0.18NS	0.08NS	0.04NS	0.29NS	-0.07NS	1.0					
MGSK	0.21NS	0.35*	0.06NS	0.10NS	-0.41**	0.05NS	1.0				
SOPR	0.50**	0.56**	0.41**	0.26NS	-0.33*	0.03NS	0.31NS	1.0			
EXPM	0.46**	0.16NS	0.30NS	0.35*	-0.41**	0.33NS	0.24NS	0.22NS	1.0		
ARIRRI	0.35*	0.38*	0.24NS	-0.23NS	-0.24NS	-0.14NS	0.42**	0.26NS	-0.08NS	1.0	
PRIRRI	0.27NS	-0.11NS	0.23NS	-0.01NS	0.14NS	-0.02NS	-0.44**	0.12NS	0.08NS	-0.09NS	1.0

"*" indicates significant at 0.05 probability level

"**" Cranbach, L. J. (1951). "Coefficient Alpha and he Internal Structure of Tests", Psychometrika, 16 : 294-334.

"NS" indicates not significant

Note : ARIRRI = Area Irrigated , PRIRRI = Percentage area irrigated.Full names of all other variabls are explained in Table 1 and Table 2.