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Factors influencing farmers' awareness on environmental hazards caused by rice monoculture

A.H. Chowdhury
Lecturer, Department of Agricultural Extension Education, BAU, Mymensingh

Abstract

This purposive study was undertaken to examine the factors associated with farmers' awareness on environmental hazards caused by rice monoculture and ascertain the factors contribute to their awareness. Char ishardia village of Mymensingh sadar upazila and Tulatuli village of Sonagazi upazila, Feni were purposively selected as traditional and progressive village respectively. Data were collected from the randomly selected sample e.g. 96 farmers 48 form each village using a pre-tested structured interview schedule during March and July 2003. About half (54percent) of the respondents had high awareness on environmental hazards of rice monoculture compared to 30 percent low awareness. Farmers of progressive village had more average level of education, family size, training exposure, knowledge of diversified crop cultivation, cosmopoliteness, extension media contact, and innovativeness than those of traditional village. Out of ten selected characteristics, level of education, knowledge of diversified crop cultivation, cosmopoliteness and innovativeness were positively related with the awareness while family size was negatively related. Three factors namely knowledge of diversified crop cultivation, family size and level of education contributed significantly to the farmers' awareness considering both the villages while innovativeness together with the former two factors mentioned contributed to the awareness considering progressive village. On the other hand, only two factors such as knowledge of diversified crop cultivation and level of education contributed in predicting awareness of the farmers of traditional village.

Keywords: Awareness, Factors, Rice monoculture, Farmers

Introduction

Environment is a combination of various physical and biological elements that affect the life of an organism. Environment is degradated due to destruction of its elements, what surround us. The degradation of the environment in the developing countries is greatly influenced by the techno-industrial global culture and the rapid population growth. Firstly, these countries have to exploit nature without any restriction to fulfill the demand of growing population. To them production of good is more important than the nature. Secondly, these countries are blindly following the West where exploitation of the nature and its resources is the order of the day. Bangladesh being a developing country had to introduce the so-called 'green revolution' in mid 1960s to fulfill the demand of food for her growing population. The success of rice production in Bangladesh began to achieve as farmers started cultivation of modern HYV rice with the help of 'HYV seeds-water-fertiliser-pesticides technology' since 1960s. They turned their single cropped land into double cropped or even triple cropped. Thus, the production of food grain jumped from 11.08 million tons in 1970-71 to 26.71 million tons in 2000-2001 recording an annual growth rate of 2.64 percent (BBS, 2001). Farmers in many areas of our country are now cultivating rice years after year with no other crops in the cropping pattern. This continuous rice cultivation has been termed as 'rice monoculture'. Rice monoculture, instead of its contribution to socio-economic development of the nation, has been criticised for its various adverse effect of wide magnitude on the elements of the environment. Depletion of soil fertility, loss of bio-diversity, increasing animal and human health hazards, decrease in nutritional status, contamination of water bodies and ground water, increasing cost of production, marginalization of land ownership of farmers, loss of traditional knowledge are the major negative impacts, the list is by no means complete (Conway and Pretty, 1991; Rahman, 2001).Scientists based on their ecological knowledge have suggested suitable alternative approaches such as crop diversification, Integrated Pest Management, Integrated Nutrient Management, organic farming etc. to mitigate the problems created by continuous rice cultivation.

There are moral relations between humans and the natural world. Environmental ethics deals with the behaviour of human beings towards nature (Bashar, 2004). In order to ensure use of environment friendly farm practice we require fundamental changes in the social, legal, political and economic institutions that embody our values. What we need is to create awareness regarding adverse effect of a farm practice (e.g. rice monoculture) at the individual level first (e.g. farmers), then at the level of community (e.g. village) and finally at the national level. There are many factors contribute to awareness building in an individual. Again, these factors may differ from one community to another and from one nation to another. Members of a community may aware earlier than the others regarding effect of a practice. Some communities behave puritanically and require continuous motivation where others do not. Thus, it is necessary to assess the awareness of the farmers on environmental hazards caused by rice monoculture regarding individual community. In the light of foregoing discussion, the present study has been undertaken to fulfill the following specific objectives:

- to determine the awareness of the farmers on the environmental hazards of rice monoculture
- to determine the difference between farmers of two villages, one being progressive and non-CDP area and another being traditional and CDP area regarding awareness and some selected factors
- to explore relationships between the awareness of the farmers and their selected characteristics in two different villages
- to determine the factors that influence the awareness of the farmers on environmental hazards of rice monoculture in two different villages

Methodology

Study locations

One union of Mymensingh Sadar upazila and one union of Sonagazi upazila, Feni were selected as the locale of the study. Tulatuli village of Tulatuli union under Sonagazi upazila, Feni and Char Ishardia village of Char Ishardia union under Mymensingh sadar upazila were purposively selected as progressive and traditional village respectively. The rationale behind the selection was that the farmers of these areas had been practicing rice monoculture for last three decades. Crop Diversification Programme (CDP) was being launched by DAE in Char Ishardia for several years (since 1990s) to motivate the farmers to shift from monoculture to diversified cultivation pattern. On the other hand, Tulatuli was not a target area of CDP. The villages were rightly justified as progressive and traditional following most of the criteria as discussed by Chowdhury (2003).

Population and sample

Farmers who have been practicing rice cultivation for over the decades were the population of the study. According to the list provided by the concerned Block Supervisors there were 510 and 250 farmers in Char Ishardia and Tulatuli village respectively. About twenty-percent farmers of Tulatuli and ten percent of Char Ishardia village were selected as sample following random sampling method. Thus, 96 farmers, 48 from each village were the sample of the study.

Measurement of the Variables

Farmers' awareness on environmental hazards of rice monoculture was the focus variable of the study, while ten selected characteristics of the farmers *viz.* age, level of education, family size, farming experience, family annual income, training exposure, cosmopoliteness, extension media contact, knowledge of diversified crop cultivation, innovativeness were the independent variables. A 2-point awareness scale was developed for measuring farmer's awareness on environmental hazards caused by

rice monoculture. Twelve statements regarding adverse effect of rice monoculture on different aspects of the environment like agricultural production, soil fertility, crop ecology, economic condition of farmer and socio-cultural settings were constructed in order to measure this variable. Farmers were asked to answer against 2-point continuum of "aware' and "not aware". A score of one was assigned for the response "aware" and zero (0) for "not aware". Total awareness score of a respondent was obtained by summing his responses to all twelve statements. Thus, total awareness score could range from 0 to 12, where 0 indicating "no awareness" and 12 indicating "very high awareness" on environmental hazards caused by rice monoculture.

However, the measuring techniques of the selected characteristics were as follows:

Selected characteristics	Scoring technique
Age	Number of years
Level of education	Years of schooling
Family size	Number of family member
Farming experience	Number of years
Family annual income	000' Tk
Training exposure	Number of days
Cosmopoliteness	Scale score
Extension media contact	Scale score
Knowledge of diversified crop cultivation	Test score
Innovativeness	Scale score

Data collection and analysis

In order to collect valid and reliable information from the farmers, an interview schedule was prepared carefully keeping the objectives in mind. The schedule contained both open and closed form questions with a test constructed for measuring farmers' knowledge of diversified crop cultivation. Data were collected during March and July 2003. Pearson's Product Moment Correlation Co-efficient (r) was computed for exploring the relationships between the selected characteristics of the farmers and their awareness on environmental hazards of rice monoculture. Stepwise multiple regression was computed for determining the influence of selected characteristics on farmers' awareness. For determining differences between the respondents of two locales regarding their awareness and selected characteristics student t-tests for the difference of means were computed.

Results and Discussion

Farmers' awareness on environmental hazards caused by the rice monoculture

The awareness of the respondents ranged from three to twelve with an average of 9.2 and standard deviation of 2.83. The farmers were classified into three categories on the basis of their awareness score as shown in the Table 1. Data presented in Table 1 indicate that about half (54 percent) of the respondents had high awareness on environmental hazards of rice monoculture compared to 30 percent low awareness and 16 percent medium awareness. Farmers of traditional village having less awareness (34 percent) were more than those of progressive village (26 percent) and farmers having high awareness in progressive village were more (63 percent) compared to those in traditional village (41 percent).

Table 1. Distribution of the respondents according to their awareness on environmental hazards caused by rice monoculture

Categories with score values	Percentage			Mean and standard deviation[1]		t-value (df=94)
	All farmers	Progressive Village (Non-CDP area)	Traditional village (CDP area)	Progressive village (Non-CDP area)	Traditional village (CDP area)	
Less (up to 6)	30	26	34			
Medium (7 to 9)	16	11	25	9.2	8.19	
High (above 9)	54	63	41			1.428
Total	100	100	100	(2.60)	(3.04)	

[1]Figures in the parenthesis indicate standard deviation

Average awareness score of the farmers of progressive village was more (9.2) than that of traditional village (8.19). This difference is not also statistically significant as indicated by t- test. This implies that farmers of both the villages are equally aware about adverse effect of rice monoculture on environment. Farmers having high awareness on environmental hazards of rice monoculture are expected to take initiatives to adopt alternative practices such as diversified crop cultivation. About two- third farmers of the study area had medium to high awareness on environmental hazards caused by the rice monoculture. Thus, they may have mental make up to take necessary steps to diversify their cultivation system as one of the solution of minimizing adverse effect of rice monoculture on environment.

Characteristics of the respondents

In order to get an idea about personal, socio-economic, socio-communicative, and psychological aspects of the respondents ten of their characteristics have been taken into consideration. In order to avoid complexity, only means and standard deviation have been shown in the Table 2 along with computed t-value for the difference of mean.

Date presented in Table 2 indicate that farmers of the progressive village i.e. non-CDP area possessed higher mean values regarding some personal variables such as level of education, family size, training exposure, knowledge of diversified crop cultivation; socio-communicative factors such as cosmopoliteness, extension media contact and also psychological aspect e.g. innovativeness than those of the traditional village i.e. CDP area. These differences are statistically significant as indicated by the t-test. On the other hand, farmers of the two communities have no significant difference regarding their age, farming experience and family annual income.

Thus, it can be interpreted that farmers of the progressive village are in favourable situation compared to that of CDP area to be persuaded by different extension methods. It is the indication of progressiveness of the farmers of non-CDP area. This also implies that factors influencing farmers' awareness on environmental hazards caused by the rice monoculture may differ depending on their progressiveness.

Table 2. Characteristics profile of the farmers of two differently developed villages along with results of t-tests

Characteristics and measuring unit	Observed score range[2]	Mean and Standard deviation[1]			't' value for the difference of means (df=94)
		All farmers (N=96)	Progressive village (Non-CDP area) (n=48)	Traditional village (CDP area) (n=48)	
Age (years)	16-75	36.29 (13.9)	36.90 (12.49)	35.69 (15.14)	0.304
Level of education (years of schooling)	0-14	5.93 (4.21)	7.2 (3.41)	4.67 (4.53)	2.401*
Family size (numbers)	4-15	6.42 (3.08)	5.52 (3.20)	7.33 (2.67)	-2.184*
Training exposure (days)	0-45	6.54 (7.06)	9.1 (8.2)	3.98 (4.42)	3.264**
Knowledge of diversified crop cultivation (score)	0-20 (0-18)	13.53 (4.25)	14.68 (3.20)	12.38 (4.83)	2.356*
Farming experience (Number of years)	2-45	16.94 (9.80)	16.40 (9.07)	17.48 (10.55)	-0.540
Family annual income (000' Tk)	22-305	68.62 (52.28)	69.01 (48.01)	68.23 (56.23)	0.051
Cosmopoliteness (scale score)	4-18 (0-18)	11.45 (3.79)	12.50 (3.24)	10.40 (4.01)	2.445*
Extension media contact (scale score)	7-40 (0-42)	20.60 (7.79)	22.50 (7.25)	18.71 (7.84)	2.310*
Innovativeness (scale score)	4-30 (0-40)	16.16 (7.42)	19.01 (6.71)	13.31 (6.99)	3.987**

[1]Figures in the parentheses indicate standard deviation
[2]Figures in the parentheses indicate possible range of score
*Significant at $p<0.05$; **Significant at $p<0.01$

Relationships between farmers' selected characteristics and their awareness

The summary of the relationships between the farmers' selected characteristics and their awareness on environmental hazards caused by the rice monoculture as computed by the Pearson's Product Moment Correlation test are shown in the Table 3.

The findings indicate that level of education, knowledge of diversified crop cultivation, cosmopoliteness and innovativeness have significant positive relationship with the farmer's awareness on environmental hazards caused by the rice monoculture where the relationship between family size and awareness is significant and negative. This implies that the higher the farmers' level of education, knowledge of crop diversification, cosmopoliteness and innovativeness the more will be their awareness on environmental hazards caused by the rice monoculture and the less the number of family members the more will be their awareness.

Table 3. Coefficient of correlation showing relationships between the selected characteristics of the farmers and their awareness on environmental hazards caused by the rice monoculture

Selected characteristics of the farmers	Observed 'r' value		
	All farmers (N=96)	Progressive village (Non -CDP area) (n_1=48)	Traditional Village (CDP area) (n_2=48)
Age	0.167	0.096	0.242
Level of education	0.308*	0.093	0.441**
Family size	-0.285*	-0.355*	-0.186
Training exposure	0.080	0.124	-0.095
Knowledge of diversified crop cultivation	0.447**	0.480**	0.400**
Farming Experience	0.129	0.029	0.224
Annual family income	0.059	-0.045	0.141
Cosmopoliteness	0.319**	0.295*	0.299*
Extension media contact	0.084	0.006	0.095
Innovativeness	0.207*	0.472**	-0.098

*Significant at p<0.05; **Significant at p<0.01

On the other hand, level of education and innovativeness have no relationship with the awareness in case of the farmers of progressive village and traditional village respectively. It is interesting that there is no relationship between innovativeness and awareness in case of the farmers of traditional village. This implies that instead of being innovative an individual of a traditional community may not be aware about recent development issues. Generally, the members of such communities are either superstitious or behave puritanically. In such type of communities, it is very difficult to change the behaviour of the farmers by taking any interventions like CDP.

Factors influencing farmers' awareness

In order to determine the influence of some selected characteristics on the awareness of the farmers stepwise multiple regression analysis was conducted taking all the selected characteristics and considering all farmers, farmers of non-CDP area and farmers of CDP area. The summary of the results of regression analysis have been presented in the Table 4.

Table 4 indicates that three factors namely knowledge of diversified crop cultivation, family size and education contributed 29.6 percent variation in predicting farmers' awareness considering all the farmers while innovativeness together with the first two factors mentioned contributed to 33.7 percent variation in predicting awareness in case of non-CDP area i.e. progressive village. However, only two factors *viz* level of education and knowledge of diversified crop cultivation contributed 27.5 percent variation in predicting farmers' awareness in case of the farmers of CDP area i.e. traditional village. The influence of different factors on farmers' awareness of environmental hazards caused by the rice monoculture is discussed below:

Table 4. Results of stepwise multiple regression analysis between the selected characteristics of the farmers and their awareness on environmental hazards caused by rice monoculture

Farmers	Steps	Independent variable in steps	Adjusted R^2	R^2 change	Variation explained (percent)	Standardized coefficients (β) computed at last step
All farmers (N=96)	1	Knowledge of diversified crop cultivation	0.191	–	19.1	0.392***
	2	Family size	0.255	0.064	6.4	-0.260**
	3	Level of education	0.296	0.041	4.1	0.221*
Progressive village (Non-CDP area) (n_1=48)	1	Knowledge of diversified crop cultivation	0.213	–	21.3	0.287*
	2	Family size	0.283	0.07	7	-0.285*
	3	Innovativeness	0.337	0.054	5.4	0.299*
Traditional village (CDP area) (n_2=48)	1	Level of education	0.177	–	17.7	0.387**
	2	Knowledge of diversified crop cultivation	0.275	0.098	9.8	0.338**

*Significant at p<0.05; **Significant at p<0.01; ***Significant at p<0.001

1. Knowledge of diversified crop cultivation: Knowledge of diversified crop cultivation was the first factor entered in the regression equation considering all the farmers and farmers of progressive village while it was the second factor to enter in the regression equation for predicting farmers' awareness level in case of traditional village. Knowledge and awareness is interrelated. Farmers' knowledge of a farm practice increases his evaluative ability about the merits and demerits of the practice. If farmers have enough knowledge regarding diversified cultivation, they can compare it with the rice monoculture that might help them to be aware about the adverse effect of the later.

2. Family size: The family size was the second variable entered in the equation considering all the farmers and farmers of progressive village whereas it was not entered in the equation for the farmers of traditional village. Family plays the basic unit of communication in a society. In a progressive society, the roles of family members are always important regarding a development issue. In contrary, family plays as a resistance to change in a traditional society. It might be due to the fact that family size was found as an important factor for predicting awareness in the progressive village where no intervention was taken to change the existing rice monoculture pattern.

3. Level of education: Education was the second variable entered in the regression equation considering all the farmers where it was the first variable entered in the regression equation for the farmers of traditional village. Education broadens the mental horizon of a person. It also increases the power of observation of a person, which may help him to be aware regarding adverse effect of a farm practice. There is a lack regarding these two phenomena in the members of a traditional society. On the

other hand, members of a progressive village possess these two qualities due to their high level of education. As mean level of education of the farmers of progressive village was more compared to those of traditional village it might be the fact that level of education need to be increased in the traditional village to increase their awareness level.

4. Innovativeness: Innovativeness was found as third predictive variable for farmers' awareness in case of non-CDP area i.e. progressive village. Innovators are active information-seeker about different ideas. They have a high degree of mass media exposure and their interpersonal networks extend over a wide area, reaching outside of their local system (Rogers, 1995). Farmers of progressive village possessed more average innovativeness than those of traditional village. That is why, instead of lack of CDP interventions farmers of the progressive village was equally aware regarding environmental hazards caused by the rice monoculture.

Conclusions

The study revealed that farmers of a CDP area i.e. traditional village and non-CDP area i.e. progressive village were equally aware regarding environmental hazards due to rice monoculture. The equal level of awareness of the farmers of non-CDP area, i.e. progressive village might be due to their superiority regarding some factors like level of education, knowledge of diversified crop cultivation, training exposure, cosmopoliteness, extension media contact, innovativeness etc. compared to those of traditional village, CDP area. It is not obvious that taking an intervention will increase the awareness of the clients. Some factors should be favourable to get the effective result. Therefore, location based awareness programme is necessary regarding a farm practice. In case of a traditional society extension programme is necessary giving more emphasis on the family level communication, i.e. interpersonal communication where group or mass media may be more effective in a progressive society. Again, mass literacy should be given more emphasis for the farmers of backward society to be aware in respect of adverse effect of a farm practice. However, training programme, group meetings etc. should be arranged to increase the knowledge of different alternative environment friendly farm practices together with the knowledge of adverse effect of the existing farm practice i.e. rice monoculture.

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