



Farmers' perception of benefits of practicing crop diversification

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ABSTRACT

To determine farmers' perception of benefits of practicing crop diversification was the main purpose of the study. The study sought to explore carefully the relationships between twelve characteristics of the farmers and their perception of benefits of practicing crop diversification. Three unions of Rajarhat upazila under Kurigram district were the locale of the study. From a population of 558 NCDP beneficiaries 107 farmers including both male and female were randomly selected as the sample of the study. Data were collected from farmers by the researcher himself using personal interview schedule during 27 March to 03.May 2005. Different question items and scales were developed to measure perception and other key issues for the study. The categorization of data and correlation coefficients were done in order to analyze the survey results in a meaningful way. Results from the analysis indicated that majority (73.83 percent) farmers of the study area had moderately favourable perception of benefits of practicing crop diversification followed by 9.35 percent favourable and 16.82 percent unfavourable perception. Out of twelve selected characteristics of the farmers only three characteristics namely level of education, extension contact and knowledge on crop diversification were positively and significantly correlated with their perception in this regard. The other characteristics of farmers namely age, family education, farm size, annual income, area under rice cultivation, training exposure, cosmopolitanness, innovativeness and risk orientation had no significant relationships with their perception of benefits of practicing crop diversification. The individuals of the characteristics of farmers which showed significant relationship with their perception of benefits of practicing crop diversification should be duly considered during the planning of development programmes for the farmers. The main constraints faced by the farmers in adopting crop diversification were lack of storage facilities for diversified crops, unavailability of improved seeds, less marketing opportunity, lack of knowledge on crop diversification and lack of sufficient training programmes in different aspects of crop diversification. However, some other constraints identified by the farmers can also be considered as important factors for adopting crop diversification and perception regarding this.

INTRODUCTION

Bangladesh has a congenial climate and soil conditions for the production of variety of crops all the year round. There are ample opportunities for crop diversification to balance the production of major crops with that of minor crops. It has to be kept in mind that rice is our main staple food. Therefore, crop diversification allows in the country to keep a balance production system between rice and other crops. Keeping this view point in mind, CDP (Crop Diversification Programme) was launched in the country during

early 1960s wherein a systematic arrangement of growing a variety of crops in rotation with rice was undertaken, based on farmers' own choice and preferences with respect to soil and climatic conditions thereby ensuring a variety of diverse dietary standards and nutritional status of the rural homesteads.

In present, about 75 percent of the total cropped area and 83 percent of the total irrigated area are presently use for rice cultivation. Rice also the most important food item in Bangladesh accounting for an estimated 75 percent of the

peoples' average caloric intake and 66 percent of protein intake (Dey et al. 1996). Improved techniques of rice production and HYV are also responsible for increasing rice production. Another reason is that the most of the farmers of the country are experienced in rice cultivation. Therefore, in many areas, farmers are used to produce rice year after year with no other crop in cropping pattern till now. This has created a number of problems of wide magnitude and alarming the severe condition in the future. Considering this condition, Government of Bangladesh has taken up North West Crop Diversification Project in the north-west part of the country for the sustainable production level and economic growth.

Crop diversification helps to improve soil quality and reduce water consumption by introducing high value crops such as wheat, potato, sunflower, maize, legumes, green manuring crops etc. This prevents new pest outbreaks by introducing crop rotation. This also creates diverse employment opportunities through the agro-processing in commercial scale, diversification of food production and changes of food habits, which could save money and ensure good health. It also promotes the agricultural commercialization that would be a key avenue for transforming the subsistence oriented farming and opening new opportunities for growth in horticultural and promotion of export oriented processed food products.

Realizing the importance, the Government of Bangladesh has introduced North-West Crop Diversification Project (NCDP) in January 2001. After introducing the NCDP the farmers' interest in cultivating some specific crops has been increased but this is not a satisfactory extent. Most probably, it is due to low perception of farmers about the benefits of crop diversification. Thus, it is necessary to assess the perception level of our farmers for the next effective steps in this context. In real sense, success in making change from monoculture to diversified cultivation largely depends on farmers' perception and understanding diversified crop cultivation. Different constraints faced by the farmers in practicing crop diversification should be identified properly and taken necessary action to minimize these.

Green Revolution has led to concentration on rice and wheat at the cost of other crops (Mujeri and Wahab, 1994). While initially the advent of the HYVs seemed to have expanded the available choice of varieties and possibilities for crop diversification for the farmers has reversed in the long run. Some traditional varieties have disappeared reducing genetic diversity and raising risks. Rice monoculture has not only created vast problem on man himself but also on the environment. It is one of the root causes of fragile ecosystem. But to save the environment and conserve human health one may not think of going without agricultural diversification. For the sustainable agriculture and food security of the over population of the country, crop diversification has really a great importance. It is an effective means to improve the performance of agriculture in the country. In a nutshell, crop diversification practice has beneficial effect on increasing production as well as mitigating the nutritional demand, changing food habit and minimizing environmental hazards. But this raises a dilemma regarding the responsibility of the farmers to adopt in this practice. A good perception of our farmers about the benefits of crop diversification is very much necessary to implement and extent this practice. To make more effective and enforce any programme or projects in this line, we should know the farmers' perception of benefits of crop diversification. There are many studies relating to other aspects of crop diversification. However, no researches have been reported in our country to assess farmers' perception in these regards. Considering all these important points, the perception of farmers in practicing crop diversification has been considered as the central theme of this study. This study might become a useful references for policy makers, development planners extension workers, and all concerned related to crop diversification issue to assess farmers' perception and identify the problems and constraints faced by the farmers, and to know the possible ways to overcome those problems.

Considering the above facts the current study was undertaken to determine farmers' perception of benefits of practicing crop diversification, socio-economic characteristics of farmers, relationship of the selected characteristics of the farmers and their perception of benefits of crop diversification

and to find out the constraints faced by the farmers in adopting crop diversification. The key effort of the project is to extend the diversified crops cultivation including 30 high value crops in the project area. The changes adopted in farm practices are expected to result in higher farm productivity and increased income to the entrepreneur households or may help to sustain land fertility.

METHODOLOGY

Locale of the study

Three unions namely Rajarhat, Chhinai and Ghorialdanga under Rajarhat Upazila of Kurigram district were selected for conducting the study as sample areas. The rationale behind selection of this upzila is that it is one of the project areas of NCDP of DAE. The other areas of this project are 57 upazilas of 15 geographical districts in the north- west part of the country. The physical, social and cultural heritage of the people of these areas of the project Rajarhat Upazila is alongside the Kurigram sadar upzila, Kutcha, semipucca

roads and a few pucca roads mostly facilitate it. The other infrastructures of this Upazila are not so developed like as sadar upazila. In Kurigram district only the Rajarhat Upazila was chosen for the NCDP because the area possesses relatively high and medium land suitable for crop cultivation rather than rice cultivation.

Population and sampling

Thirty one NCDP beneficiaries groups were selected purposively of which 15 male and 16 female groups (Table 1). From a list of 558 NCDP beneficiaries 107 (20 percent) beneficiaries were selected randomly as sample farmers. Random selection was used both in male and female beneficiaries separately from the list. According to information from DAE of the Rajarhat Upazila the non-beneficiaries had also been involved in crop diversification practice. Among 107 sample farmers 55 were male and rest 52 were female in the list. However, a reserve list was also prepared taking number of farmers from the population for using in case non-availability of sample farmers.

Table 1

Distribution of population and sample of the study in different unions Rajarhat Upazila.

Nature of beneficiaries	Name of the union	Number of the selected groups	Population	Sample size	Reserve list
Male beneficiaries	Rajarhat	8	170	22	2
	Chinnai	3	61	16	4
	Ghorialdanga	4	63	17	2
Female beneficiaries	Rajarhat	2	36	10	2
	Chinnai	8	130	27	6
	Ghorialdanga	6	98	16	3
Total		31	558	107	19

Variables of the Study

Farmers' perception of benefits of crop diversification stated by them was the main focus of this study and hence it has been taken as dependent variable. There are so many factors, which may influence the perception of farmers. But it is very difficult to deal with all the factors in

a single study. Therefore, only twelve of independent variables were chosen for the study. The variables were selected considering the relevant available literature, discussion with experts and researchers in the relevant field. Time and available resources to the researcher also constituted the primary basis for selecting the variables.

The Research Instrument

A structured interview schedule was used as a research instrument for collecting relevant, valid and reliable information from the respondents. The questions were simple direct and understandable by the respondents. The schedule contained both open and closed form of questions. Some necessary scales were included in the schedule. Before finalizing the questions of the schedule, a pre-test was conducted by the researcher from 12 respondents including both male and female. This pre-test facilitated the researcher to identify faulty questions in the draft schedule and necessary corrections, additions and adjustments were possible to make previously. The modified and corrected schedule was then translated into Bengali for collection of data.

Collection of Data

Data of this study were collected by the researcher himself. Data were collected through interview schedule by the researcher during 27 March to 03 May, 2005.

Measurement of Variables

Independent variables

Age

The age of a respondent was measured by counting the period of time from his birth to the time of interview in terms of years. A score of 1 (one) was assigned for each year of age.

Level of education

Level of education of a respondent was measured in terms of classes passed by him/her from formal institutions (i.e. school, college etc.). A score of 1 (one) was assigned for each year of schooling in a formal education system. A score of 0.5 was given to the respondent who could sign only and score 0 (Zero) was the respondent without knowing how to read and write

Family size

Family size score represented the number of family members of a respondent.

Farm size

Farm size of a respondent was measured in terms of hectare (while converting the local units by using the formula of Farm size = $F_1 + F_2 + \frac{1}{2}(F_3 + F_4 + F_5 + F_6) + F_7$, where F_1 = Homestead area, F_2 = Own land under own cultivation, F_3 = Land taken from others as *borga*, F_4 = Land given to others on *borga*, F_5 = Land given to others on lease, F_6 = Land taken from others on lease, F_7 = Others (Pond, garden etc.)

Annual income was considered as his /her gross income

The annually family income of a respondent's family was considered his/her total yearly earnings from crop production, livestock, fishery and other non-agriculture sources.

Area under rice cultivation

The area under rice cultivation of the respondents was measured in terms of percentage compared to the rice grown area with that of total cropped area cultivated in the last *rabi* season (2004).

Training exposure

It was measured by the total number of days that a respondent participated in agricultural training in his/her enter life from different organizations under various agricultural and other training programmes. A score of 1(one) was assigned for each days of training received.

Extension contact

Extension contact of a respondent was measured on the basis of his/her extent of contact with 18 selectively communication media (8 personal, 4 grouped, and 6 mass media). The extension score of an individual respondent was computed by summing his/her responses against 18 selected communication media.

Individual media contact of Sub Assistant Agriculture Officers (SAAOs), NGO worker (s),

Health worker (s), Agril. input dealer (s), Progressive farmer(s), Upazila Agriculture Officer, Additional Agricultural Officer/ Agricultural Extension Officer, Upazila Fisheries Officer/Upazila Livestock officer/Veterinary Surgeon and group media contact as participation of group discussion, participation in demonstration meeting (Result and Method demonstration), participation in field day/farmers rally, participation in training course/programme were scored as: Not at all-0, at least once per year-1, 1-3 times per month-2 and 4 or more times per month-3.

Mass media contact as Listening agricultural programme in radio, Watching agricultural related programme in TV, Reading agricultural related leaflet, Watching poster on farming, Reading agricultural related magazine (i.e. Krishikatha), Observing agricultural fair, hearing folksong etc were scored as 0-Not at all, 1-Once per 6 month, 2-Once per month and 3-Once per week.

Cosmopolitaness

Cosmopolitaness of a respondent was measured by counting the score based on his/her frequency of visit to five different places to his/her social system. Score assigned to the responses were 0, 1, 2 and 3 respectively.

Knowledge on crop diversification

Knowledge on crop diversification was measured using a test that consisted of True/ False (T/F) and multiple choice questions (MCQ) form and score was given based on the marks obtained for correct answers.

Innovativeness

Score on the basis of adoption of 10 selected agricultural practice by him/her. Score was assigned on the basis of time dimension. Do not use considered as 0 score, 4 years after first hearing as 1, 3-4 years after first hearing as 2, 2-3 years after first hearing as 3, first year of hearing as 5.

Constraints faced in adopting crop diversification

Constraints related to adopting crop diversification practice were scored as no constraint 0, Less constraint 1, Medium constraint 2, High constraint 3.

Risk orientation

This is the farmers' enterprise venture thought for or adopted to farming. A five point likert scale was developed to measure the risk orientation of farmers following similar scale developed earlier by Supe (1969).

Measurement of dependent variable

Each respondent was asked to give his/her responses whether they strongly agree (5), agree (4), undecided (3), disagree (2) or strongly disagree (1) with the statement. The score of each respondent could range from 20-100, where 20 indicating "very low perception" and 100 indicating "very high perception" of the respondent.

Data analysis and interpretation

The SPSS (Statistical Package for Social Science) computer package was used to perform the data analysis. Descriptive analysis such as mean, range, percentage, standard deviation and rank order were used in describing the variables of the study. For exploring the relationship between selected characteristics of the respondents and their perception of benefits of crop diversification, Pearson's Product Moment Correlation Coefficient (r) was computed. A significant value of r does not necessarily indicate the strength at which the variables are related. As the sample was closed to 100 (107) cases, the following general classification was used for interpretation. A coefficient of 0.70 to 1.00 (plus or minus) signifies that there is a high degree of association between the variables. If the co-efficient is greater than 0.40 but less than 0.70, there is a substantial relationship between the variables. If the co-efficient is greater than 0.20 but less than 0.40 (plus or minus) there is a low relationship between the variables; and if the co-efficient is less than 0.20 there is negligible relationship between the concerned variables.

FINDINGS AND DISCUSSION

and female groups. The salient findings of 12 selected characteristics have been presented in table .2.

Selected characteristics of the farmers

According to the objectives of the study data were collected from a sample of 107 farmers both male

Table 2

Salient features of the selected characteristics of the respondents.

Characteristics	Respondents		Measurement unit/ scale	Probable range	Observed range		Mean	Standard deviation
	No.	%			Min.	Max.		
Age								
Young (upto 35)	59	55.14	Years	---	25	70.0	37.91	9.985
Middle aged (36-50)	35	32.71						
Old (>50)	13	12.15						
Level of Education								
Illiterate or can sign only (0-0.5)	32	29.91	Years of schooling	---	0	12.0	5.364	3.877
Primary level (1-5)	32	29.91						
Secondary level (6-10)	38	35.51						
Above secondary level (>10)	5	4.67						
Family size								
Small (upto 4)	44	41.12	Number	---	3	13.0	5.16	1.776
Medium (5-7)	53	49.53						
Large (above 7)	10	9.35						
Farm size								
Landless (<0.02)	0	0.00	Hectare	---	0.18	3.80	0.824	0.540
Marginal (0.02-0.2)	2	1.87						
Small (0.21-1.0)	73	68.22						
Medium (1.01-3.0)	31	28.97						
Large (>3.0)	1	0.94						
Annual income								
Low (<50)	41	38.32	“000” Tk.	---	5	222	60.96	34.15
Medium (50.01-100)	55	51.40						
High (>100)	11	10.28						
Area under rice Cultivation								
Very small(< 25)	10	9.35	Percent	---	0	100	50.46	18.32
Small(26-50)	41	38.31						
Medium (51-75)	47	43.93						
Large (>75)	9	8.41						
Training exposure								
No training (0)	13	12.15	Days	---	0	12	2.18	2.602
Short training (1-5)	83	77.57						
Moderate training (>5)	11	10.28						
Low (<15)	23	21.50						
Medium (16-26)	73	68.22						
High (>26)	11	10.28						
Cosmopolitaness								
			Score	0-15	3	13	8.88	2.715

Low (<6)	22	20.56						
Medium (7-12)	79	73.83						
High (>12)	6	5.61						
Knowledge on crop diversification								
Low (Up to 11)	18	16.82	Score	0-20	7	19	13.62	2.297
Medium (12-16)	82	76.64						
High (>16)	7	6.54						
Innovativeness								
Low (<24)	26	24.30	Score	10-50	19	43	28.91	4.902
Medium (25-33)	61	57.01						
High (>33)	20	18.69						
Risk orientation								
Low (Up to 34)	19	17.76	Score	10-50	27	48	37.05	3.13
Medium (35-40)	79	73.83						
High (>40)	9	8.41						

Table 3

Distribution of respondents according to their socio-economic characters.

Characteristics	Categories (unit in years)	Frequency	Percentage	Mean±SD
Age	Young (up to 35)	59	55.14	37.91±9.985
	Middle aged (36-50)	35	32.71	
	Old aged (above 50)	13	12.15	
	Total	107	100	
Education	Illiterate or can sign only (0-0.5)	32	29.91	5.364±3.877
	Primary level (1-5)	32	29.91	
	Secondary level (6.10)	38	35.51	
	Above secondary (above 10)	5	4.67	
	Total	107	100	
Family size	Small (up to 4)	44	41.12	5.16±1.776
	Medium (5-7)	53	49.53	
	Large (above 7)	10	9.35	
	Total	107	100	
Farm size	Landless (< 0.02 ha)	0	0	0.824±0.540
	Marginal (0.021-0.2 ha)	2	1.87	
	Small (0.21-1.00 ha)	73	68.22	
	Medium (1.01-3.00 ha)	31	28.97	
	Large (> 3.00 ha)	1	0.94	
	Total	107	100	
Annual income (Taka)	LOW (Up to 50)	41	38.32	60.963±34.155
	Medium (50.1-100)	55	51.40	
	High (above 100)	11	10.28	
	Total	107	100	
Area under rice cultivation	Very small (Up to 25)	10	9.35	50.46±18.32
	Small (26-50)	41	38.31	
	Medium(51-75)	47	43.93	
	Large (Above 75)	9	8.41	
	Total	107	100	
Training exposure	No training (0)	13	12.15	
	Short training (1-5)	83	77.57	

	Moderate training (>5)	11	10.28	2.180±2.602
	Total	107	100	
Extension contact	Low (up to 15)	23	21.50	20.14±5.246
	Medium(16-26)	73	68.22	
	High(above 26)	11	10.28	
	Total	107	100	

Age

Age is a very relevant issue for selecting farmers involving them in crop diversification activities. Because it is common believe that the younger farmers are very much eager to accept the change rather than the older one. In the present study, age of the respondent ranged from 25-70 years with an average of 37.91 and standard deviation 9.985 (Table 3). Based on age, the respondents were classified into three categories as shown in the table 3.

Data presented in table in 3 indicates that more than half of the respondents (55.14%) were young and included in the beneficiaries of NCDP. About one-third (32.71%) were middle aged and only 12.15% were old aged respectively. According to development psychologists young and middle aged groups of people have more physical, mental abilities and innovativeness than old aged people. Generally younger farmers tend to have broader outlook and have more social mass media contact then the old aged farmers. They are more aware about present agricultural and other issues.

Level of education

Level of education is very much related to awareness development. Conversely, acceptance of diversified crop is subject to awareness development. Best on their education scores, the farmers were classified into four different categories as shown in the Table 3. Data presented in the Table indicates that illiterate or can sign only and the primary level respondents were equal in number, and they were individually 29.91% of the total respondents .The 35.51 percent respondents had primary level education and only 4.67 percent had above secondary level of education.. There was no higher degree in NCDP beneficiaries included as respondents in the present study. It is expected that education is one

of the important factors in determining farmers' perception. It helps farmers to broaden their outlook and expands their horizon of knowledge. It also helps farmers to increase their power of observation and decision making ability.

Family size

Based on the family size, the respondents were classified in to three categories, such as; small, medium and large (Table 3). The average family size of the respondents was 5.16 which is more or less similar to the national average 5.4. The medium family size of the respondents was found higher in the study area and it was almost half of the total respondents (49.53%). The small family size was found in case of 41.12% respondents whereas only 9.53 % respondents had large only (Table 3).

Farm size

Farm size of respondents varied from 0.18 to 3.80 hectare. However, the mean farm size was 0.824 hectare and standard deviation of 0.540 hectare. Based on their farm size, the respondents were classified into three categories (DAE, 1999) as shown in the following table (Table 3). Data indicates that highest proportion (73%) of the respondents have small farm size followed by medium (31%). Only a single respondent has found to have a large farm size (>3.00 ha). However, there were no respondents in landless categories in the study area.

Annual income

Family annual income scores of the farmers ranged from 5 to 222 thousand Taka with an average 60.96 and standard deviation 34.15 (Table 3). Based on their family annual income, the respondents were classified into three categories. Data indicates that the highest proportion (51.40 percent) of the respondents had medium family

annual income followed by the respondents of low family income (38.32 percent). Only 10.28 percent respondents had high family income. Income of an individual allows him/her to invest more in farming operations taking risks involved in adoption of new alternative technology. The findings of the study of Nasir (2004) stated the similar result and reported that 76 percent, 10 percent and 14 percent farmers had medium, low and high annual income respectively.

Area under rice cultivation

Area under rice cultivation of the respondents was ranged from 0 to 100 percent compare to their total cultivable land. Based on their rice cultivation area, the respondents were classified into four categories. Data presented in table 3 indicates that the most of the farmers (43.93 percent) had 51-75 percent land, 38.31 percent respondents had 26-50 percent land, 9.35 percent respondents had up to 25 percent land and only 8.41 percent respondents had above 75 percent land under rice cultivation compare to their total cultivated area. The findings revealed that most of the farmers of the study area had small to medium area under rice cultivation of the total cultivated area.

Training exposure

Training exposure scores of the respondents ranged from 0 to 12 days with an average 2.18 days and standard deviation 2.60 days. Data indicates that the most of the respondents had short training exposure (77.57%). The 12.15% percent respondents had no training exposure whereas only 10.28% respondents had moderate training exposure (Table 3). The findings revealed

that DAE of Rajarhat upazila and other training organization had given more importance in conducting short training to cover service to maximum beneficiaries. Training increases knowledge, skill of the farmers in farm related activities. It enables them to come into contact with high level of specialist having diversified experience and problem solving capabilities. Therefore, farmers with high training exposure are more competent in different farming activities. They can manage diversified farm production well. Training exposure is also an important factor to build up rationale perception of farmers in practicing farm operations.

Extension contact

Extension contact score of the respondents ranged from 10 to 35 with an average 20.14 and standard deviation of 5.246 (Table 3). Data presented in Table 3 indicates that most of the farmers had medium extension contact (68.22%), 21.50 percent had low extension contact and only 10.28% had high extension contact.

Cosmopolitaness

Cosmopolitaness scores of the respondents ranged from 3 to 13 with an average 8.88 and standard deviation 2.715. Based on their cosmopolitaness scores, the respondents were classified into three categories such as high, medium and low cosmopolite. Data indicates that majority of the farmers (79%) fell in medium cosmopolitaness. About one-fifth (20.56%) in low and only 5.61 percent in high cosmopolite category (Table 4).

Table 4
Distribution of respondents according to their cosmopolitaness.

	Categories	Frequency	Percentage	Mean± SD
Cosmopolitaness	Low (up to 6)	22	20.56	8.88±2.715
	Medium (7-12)	79	73.83	
	High (above 12)	6	5.61	
	Total	107	100	
Knowledge on crop diversification	Low (up to 11)	18	16.82	13.62±2.297
	Medium (12-16)	82	76.64	
	High (above 16)	7	6.54	
	Total	107	100	

Innovativeness	Low (up to 24)	26	24.30	28.91±4.902
	Medium (25-33)	61	57.01	
	High (above 33)	20	18.69	
	Total	107	100	
Risk orientation	Low (up to 34)	19	17.76	37.05±3.13
	Medium (35-40)	79	73.83	
	High (above 40)	9	8.41	
	Total	107	100	
Farmers' perception of benefits of practicing crop diversification	Unfavorable (up to 69)	18	16.82	73.80±4.557
	Moderately favorable (70 - 78)	79	73.83	
	Favorable (Above 78)	10	9.35	
	Total	107	100	

Table 5
Distribution of respondents based on their responses to perception statements.

Sl No	Statements	Responses					Total score
		SA	A	UD	D	SDA	
1	Cultivating diversified crops can create employment opportunities especially for women or increases involvement of women in farming.	36	70	0	1	0	462
2	Diversified crops cultivation improves soil fertility.	24	83	0	0	0	452
3	Practice of crop diversification enriches one's farming knowledge.	5	102	0	0	0	433
4	Consumption of variety of foods increase due to diversified crop cultivation.	1	106	0	0	0	429
5	Crop diversification allows changing existing food habit and lead to a healthy one.	2	101	4	0	0	426
6	Family labour force can be efficient utilized throughout the year by practicing diversified crop cultivation.	1	103	4	0	0	425
7	Cultivating of pulse crops increases soil fertility and act as an important source of cheap protein	1	102	4	0	0	425
8	Green manuring crops grown between two successive crops helps increasing organic matter content in soil and thus increase soil fertility	5	96	5	1	0	425
9	Crop diversification reduces the demand for labourers in some specific periods and thus ensures economic use of labour throughout the year.	2	102	3	0	0	421
10	Cultivation of diversified crops reduces risk of soil degradation.	13	72	22	0	0	419
11	Crop diversification helps in practicing and keeping ITKS	1	101	5	0	0	414
12.	Crop diversification reduces labour crises during peak period in rice cultivation.	0	93	14	0	0	414
13.	Crop diversification helps to improve socio-economic status of a farm family.	1	91	15	0	0	414
14.	Diversified crop cultivation helps to increase in net household income in compare to rice monoculture.	4	95	8	0	0	400
15.	Cultivation of diversified crops instead of rice monoculture ensures sustained farm productivity.	0	58	48	1	0	378

16.	Crop diversification helps in reduction of environmental hazards caused by high input based rice monoculture.	0	41	60	6	0	356
17.	Crop diversification helps to reduce water consumption to the soil by introducing high value crops such as wheat, potato, sunflower, maize, green manuring crops etc.	0	53	34	20	0	354
18.	Crop diversification reduced risk in crop failure.	0	27	65	14	1	333
19.	Cultivation of diversified crops decreases possibility of insect-pest infestation, which increases farm profitability.	2	29	47	24	5	320
20.	Diversified crop cultivation requires low input cost than that of rice monoculture.	3	46	7	36	15	307

SA= strongly agree; A = Agree; UD = Undecided; DA = Disagree; SDA = Strongly disagree

Knowledge on crop diversification

The knowledge scores of the respondents ranged from 7 to 19 with an average 13.62 and standard deviation 2.297. Based on their knowledge scores, the respondents were classified into three categories as low, medium and high. Data presented in table 4 indicates that most of the respondents (76.64%) had medium knowledge on crop diversification practice. About one-sixth (16.82%) respondents had low and only 6.54 percent of the total respondents had high knowledge on crop diversification practice.

Innovativeness

Innovativeness scores of the respondents varied from 19 to 43 with an average 28.91 and standard deviation 4.902. Based on their innovativeness scores, the respondents were classified into three categories such as low, medium and high. Data presented in table 4 indicates that above half of the respondents (57.01%) were in medium innovativeness category whereas 24.30 percent respondents were in low and only 18.69 percent were in high category. The findings revealed that the study area could be considered as a congenial area to the extension agents to get positive response from most of the farmers towards a new practice.

Risk orientation

The risk orientation scores of the respondents ranged from 27 to 48 with an average 37.05 and

standard deviation 3.13. Based on their risk orientation scores, the respondents were classified into three categories such as low, medium and high risk oriented. It is indicated that almost two-third (73.83 percent) of the respondents had medium risk orientation followed by respondents of low risk orientation (17.76 percent) and high risk orientation (8.41 percent). The findings revealed that most of the farmers of the study area have the ability to encounter risk and uncertainty by new ideas.

Farmers' perception of benefits of practicing crop diversification

In this study, farmers' perception of benefits of practicing crop diversification was the dependent variable. The observed perception scores of the respondents varied from 50 to 87 with an average 73.80 and standard deviation 4.557. Based on their perception scores, the respondents were classified into three categories such as "unfavorable perception", moderately favourable perception and favourable perception. The study showed that the highest proportion (73.83 percent) of the respondents had moderately favourable perception. Data also indicate that about one –sixth of the total respondents (18 percent) had unfavorable perception and only 9.35 percent respondents had favourable perception of benefits of practicing crop diversification. That means, most of the respondents had moderate to favourable perception of benefits of practicing crop diversification. It was probably due to adequate extension contact of the respondents, level of their education and existing knowledge. Farming experience and land

topography of the study area might have influenced to build up moderate to favourable perception. DAE and other local NGO's especially RDRS have been encouraging the farmers to practice crop diversification in the study area for the last 4 years (from January 2001).

Data presented in Table 5 indicates that most of the farmers perceived clearly the fact that crop diversification can create employment opportunities especially for women or increases involvement of women in farming (statement 1). A major proportion of farmers were agreed to strongly agree with the phenomenon that crop diversification improves soil fertility (statement 2). Most of the farmers perceived that practice of crop diversification enriches their farming knowledge (statement 3). Almost all of the farmers perceived that consumption of variety of foods increases due to diversified crop cultivation (statement 4) and it allows existing food habit lead to a healthy one (statement 5). For the statement 6, 7 and 8 the farmers had same and good perception. A large proportion of farmers was agreed to strongly with the statement 9 and had a good perception. Though a high proportion of farmers agree to strongly agree with the statement 10, a considerable number of farmers had low perception for it and hence, they were undecided. Most of the farmers had also good and same perception for the statement 11, 12 and 13. Most of the farmers had also good perception for the phenomenon that diversified crop cultivation helps to increase net household income (statement 14). About half of the farmers had good perception with the statement 15 and rest half were undecided or had low perception. Almost similar result found for the statement 16 and 18. Most of the farmers had low perception for the statement 17 and hence, they were undecided or disagree. But a few had also good perception for it. A major proportion of farmers had low perception for the statement 19. About half of farmers had low perception for the statement 20 and hence, they were disagree with the phenomenon that crop diversification requires low input cost than rice monoculture.

Relationship between selected characteristics of the respondents and their perception of benefits of practicing crop diversification

It is established the fact that perception is related to many of things of an individual. Individuals' physical characteristics, their needs and values, knowledge feeling or past experience influence formation of perception (Altman et al. 1985). Again, crop diversification itself depends on many factors. In this section, relationship between selected characteristics of the respondents and their perception of benefits in regards to crop diversification practice has been discussed. The relationship was established through computing Pearson's Product Moment correlation co-efficient 'r' as shown in Table 6.

Table 6
Relationship between the selected characteristics of the respondents and their perception of benefits of crop diversification.

Selected characteristics	Correlation co-efficient (r) with perception of benefits of practicing crop diversification
Age	-0.169 ^{NS}
Level of education	0.346**
Family size	-0.005 ^{NS}
Farm size	0.163 ^{NS}
Annual income	0.051 ^{NS}
Area under rice cultivation	0.001 ^{NS}
Training exposure	-0.003 ^{NS}
Extension contact	0.281**
Cosmopolitaness	0.125 ^{NS}
Knowledge of crop diversification	0.242*
Innovativeness	0.144 ^{NS}
Risk orientation	0.080 ^{NS}

**Correlation is significant at the 0.01 level;

*Correlation is significant at the 0.05 level

Age and perception

A non-significant correlation co-efficient value was found for this relationship. The value indicates that there exists no significant but negative relationship between age of the farmers and their perception of benefits of practicing crop diversification.

Level of education and perception

The significant correlation co-efficient value indicates that there exists a strong relationship between level of education of farmers and their perception of benefits of practicing crop diversification. This means that increase level of education of the farmers results in increased level of perception of that practice. Actually, education enhances an individual to be more conscious and rationale and thus his/her perception become higher than a non-educated person

Family size and perception

The non-significant and negative correlation co-efficient value 'r' (- 0.005^{NS}) in Table 6 indicates that there exist hardly no relationship between farmers' family size and their perception of benefits of practicing crop diversification.

Farm size and perception

The correlation co-efficient value 'r' (0.165^{NS}) for the farm size and perception of the farmers indicates that there exists no significant relationship between farm size and their perception of benefits of practicing crop diversification. This means, either large or small farm size of the farmers does not influence formation of favorable or unfavorable perception of them towards benefits of practicing crop diversification.

Annual income and perception

The computed correlation co-efficient value 'r' (0.051^{NS}) indicates that there exists no relationship between family annual income the farmers and their perception of benefits of practicing crop diversification. Though high annual family income enhances better socio-economic status of the respondent and contributes to the implementation of crop diversification practice, it does not contribute to the formation of perception towards this.

Area under rice cultivation and perception

The correlation co-efficient value r (0.001^{NS}) as shown in the table indicates that there exists no relationship between rice cultivation area of the farmers and their perception of benefits of

practicing crop diversification. It is true that rice is our main staple food. Therefore, most of our farmers are inclined to rice cultivation. However if one has willing to diversified cultivation he/she may does this in his/her farm along with rice cultivation. Even there is a scope of diversified cultivation in homestead area.

Training exposure

The correlation co-efficient value 'r' (- 0.003^{NS}) indicates that there exists no relationship between farmers' training exposure and their perception of benefits of practicing crop diversification. In real sense the subject matter of training is an important factor for developing perception of any specific issues, But this training should be effective and mid or long duration. As most of the farmers belonged to the short or no training category in the study area. the researcher concluded that short duration training exposure of farmers had no significant relationship with their perception.

Extension contact and perception

The correlation co-efficient value 'r' between cosmopolitaness and perception as shown in Table 6 (0.281^{**}) concludes that there was significant and positive relationship between extension contact of the respondents and perception of benefits of practicing crop diversification. In fact, media exposure pertains to one's contact with multifarious bodies of knowledge and information. Therefore, the respondents with higher extension media exposure possess higher perception of benefits of practicing crop diversification..

Cosmopolitaness and perception

The correlation co-efficient value 'r' (0.125^{NS}) as shown in the Table 6 indicates a non significant positive relationship between cosmopolitaness and perception of benefits of practicing crop diversification. That means, either high or less cosmopolitaness of the farmers does not influence formation of perception of them.

Knowledge on crop diversification and perception

Based on the correlation co-efficient value 'r' (0.242*) it can be concluded that there exists a significant and positive relationship between knowledge of the farmers on crop diversification practice and perception of them. In fact, knowledge gaining increases the perception of an

individual. Therefore it could be apprehended that the knowledge about crop diversification made the farmers to understand the importance, worth and necessity of diversifying their existing monoculture.

Table 7

Rank order of constraints faced by the farmers in adopting crop diversification.

Sl. No	Items of constraints	Extent of opinion				Total score	Rank order
		High	Moderate	Low	Not at all		
1	Lack of storage facilities	90	16	1	0	303	1
2	Non availability of improved seeds	81	24	2	0	293	2
3	Less marketing opportunity	67	33	5	2	272	3
4	Lack of knowledge on cultivation of CDP crops	31	69	6	1	237	4
5	Lack of sufficient training programmes in different aspect of crop diversification	24	76	5	2	229	5
6	Insufficient motivational programme on CDP from BSs	18	70	18	1	212	6
7	Absence of sufficient demonstration plots on CDP crops.	8	68	28	3	188	7
8	Problem of irrigation	18	49	29	11	181	8
9	High price for extra labour needed for CDP crops.	9	52	17	29	148	9
10	Cultivation of CDP crops are more complex than rice.	7	23	64	13	131	10
11	Adopting new and many crops seem risky.	2	46	15	44	113	11
12	Dependence on rice for maintaining food security.	0	16	18	73	50	12
13	Most of the land are low areas and not suitable for diversified crop.	3	4	27	73	44	13
14	It is difficult to change practice alone the social system (social pressure)	0	3	24	80	30	14
15	Less financial benefits (low profitability) from crop diversification.	0	0	8	99	8	15

Innovativeness and perception

The computed correlation co-efficient value 'r' (0.144^{NS}) indicates that there exists no relationship between innovativeness of the respondents and their perception of benefits of practicing crop diversification. Data presented in the Table 3 indicates that majority of the farmers in the study area were less to medium innovative. Innovative farmers are usually willing to take risk to adopt in innovation. But innovativeness itself has not

considerable influence on the perception of benefits of practicing crop diversification.

Risk orientation and perception

The correlation co-efficient values 'r'(0.080^{NS}) indicates that risk orientation and perception of farmers was insignificantly related. That means, risk orientation had no significant influence on the perception of farmers towards the benefits of practicing crop diversification. From this it may be apprehended that taking risk in farming does not

increase or decrease the perception level of farmers on this practice.

Constraints faced by the farmers in adopting crop diversification

There were 15 constraints in adopting crop diversification included in the study. The assigned scores were assigned based on farmers' responses as low, medium, high or not at all. However, the highest scores for 'high', 'medium', 'low' and "not at all" responses were 3,2,1 and 0 respectively. To ascertain the extent of seriousness of constraint mean value for each statement was computed. Statements were then ranked according to their mean value (Table 7). Data presented in Table 7 indicates that lack of storage facilities (Statements 1) was perceived number one constraint by most of the farmers in the study area. Lack of non-availability of improved seeds of CDP crops (statements 2) was also serious constraint and ranked as 2. Less marketing opportunity for other crops than rice (statement 3) also major constraint in adopting crop diversification. Lack of knowledge (statement 4) was considered medium to large constraint by most of the farmers. Lack of sufficient training programme was considered constraint in the same extent. Insufficient motivational programme about CDP from BSs (statement 6) was considered medium to high constraint by most of the farmers except a few. Absence of sufficient demonstration plots on CDP crops (statement 7) was considered as medium constraint by most of the farmers, whereas a few considered as high and a very few considered as low constraint. Problem of irrigation (statement 8) was considered low to medium constraint but in some cases as high. High price for extra labour needed for CDP crops (statement 9) was considered low to medium constraint by a good number of farmers. It was high constraint for some farmers also and no constraint for a considerable number of farmers. Most of the farmers perceived statement 10 as low constraint whereas a few perceived as high and rest perceived as not at all. Most of the farmers considered statement 11 as low to medium constraint and more than one third considered it as no constraint at all. Dependence on rice for maintaining food security (statement 12) was not

constraint for most of the farmers but a few considered it low to medium constraint. Most of the land of the study areas was not low at all. Therefore, most of the farmers perceived statement 13 as no constraint at all. Similar perception was occurred for the statement 14. Actually, crop diversification allow more financial benefits than monoculture, hence, almost all of the farmers perceived statements 15 as no constraint at all for them.

RECOMMENDATIONS

- DAE and other extension organizations should be given more emphasis to take necessary programmes in order to increase extension media exposure of farmers. In this regard, the extension organizations can campaign with more persuasive media be launched with the client system.
- Effective motivational programmes should be formulated for the farmers to make understand them the adverse effect of rice monoculture and adopted to crop diversification.
- Government and non government organizations should be provided long run and effective training programmes on different alternative crop production for the farmers at regular intervals to build their farming skills and favourable perception.
- DAE and other liaison organization should be facilitated marketing and storage facilities to the farmers.
- Considering existing socio economic condition location specific programmes should be provided for diversifying existing cropping pattern.
- Monitoring and follow up activities of GOs and NGOs should be strengthened for distributing credit among the farmers. Farmers' involvement should be considered with great care in this respect.
- DAE should be strengthened the field level service by the field workers (BSs) to give farmers proper information, suggestions and advice in adopting crop diversification practice for increasing farmers' perception level.

REFERENCES

- Altman I and Rogoff B (1985). World views in psychology: Trait, interactionist, organismic, and transactionalist approaches. In D. Stokols and I. Altman (Eds.), *Handbook of environmental psychology*. New York: Wiley.

- DAE (1999). *Agricultural Extension Manual*. Department of agricultural extension, Ministry of Agriculture. Government of the people's Republic of Bangladesh.
- Dey MM, Miah MNI, Mustafi BAA and Hossain M (1996). Rice Production Constraints in Bangladesh: Implication for Future Research Priorities, *Rice Research in Asia: Progress and Priorities*. In: R.F. Evenson, R.W. Herdt and M. Hossain (eds): CAB International and IRRI.
- Mujeri MK and Wahab FR (1994). *Impact of Green Revolution in Selected Countries of South Asia and South-East Asia*. Bangladesh; CIRDAP Study Series No. 163; Centre on Integrated Rural Development for Asia and the Pacific.
- Supre SV (1969). *Factors Related to Different Degree of Rationality in Decision Making Among Farmers*. Ph.D. Thesis, I.A.R.I., New Delhi.
- Uddin MN (2004). *Farmers' Perception of Sustainable Agriculture: A Comparative Study between CARE-Beneficiaries and Non-Beneficiaries*. M.S. (Ag. Ext. Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.
- Young PV and Schmid CV (1962). *Scientific Social Survey and Research*. Modern Asia Edition, Fourth Printing, N. J.: Prentice Hall. Inc.