Study on adptation measures taken by the farmers in response to disaster in Bajua union of Dacope upazila of Khulna district in Bangladesh

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Abstract: The study was conducted to determine the extent of the farmer's perception and adaptation measures to disaster in the selected area of Bajua union of Dacope Upazila of Khulna District during March to May, 2016. The study consisted of 120 randomly selected farmers through an interview using questionnaire in order to identify the respondent's perception and their adaptation measures against disaster. The findings of the study indicated that cyclone, salinity, flood and drought were the major problems of natural disaster faced by the farmers in the study area. The result also indicated that majority (50%) of the farmers had medium impact of disaster while 47.5 % had high impact of disaster and 2.5 % respondents had low impact of disaster. However majority (59.16%) of the farmers had medium adaptation capability compare to 26.66% farmers had low and 14.16% farmers had high disaster adaptation capability. Correlation analysis of the variables indicates that there was no significant relationship of age and credit received with their adaptation measures, but the other characteristics of the farmers like, farm size, annual income, knowledge about disaster and climate, environmental hazards and impact of disaster as observed by farmers had positive significant (0.01 level) relationship with their adaptation measures. Therefore, disaster had created a great impact on farmers and in response they are taking adaptation measures which need to be accelerated in the study area.
Key words: Adptation measures, disaster, Bajua union, Dacope upazila, Khulna district, Bangladesh.

Introduction

Geographically, Bangladesh is located in the tropical region (FAO, 2011). Bangladesh is one of the most vulnerable countries to the effects of climate change. The country is facing more frequent and intense natural disasters such as flood, drought, and cyclone, lack of access to adequate safe drinking water, contamination and water-related diseases, and lack of water for irrigation. Bangladesh experiences frequent natural disasters, which cause loss of life, damage to infrastructure and economic assets, and adversely impact lives and livelihoods, especially of poor people living in remote or ecologically fragile parts of the country, such as river islands and cyclone-prone coastal belts (MoEF, 2008). The geographical location and geo-morphological conditions of Bangladesh have made the country one of the most vulnerable to climate change, particularly to sea level rise (SLR) (Ali, 1999).

The south western part, also known as the Ganges tidal plain, is comprised of the semi-active delta and is crisscrossed by numerous channels and creeks. This area is particularly vulnerable as its topography is very low and flat (IPCC, 2001). The impacts of climate variability are manifested by floods, droughts, erratic rains and extreme events consequence on crop agriculture and food security in many parts of the world, particularly in developing countries (Roudier *et al*., 2011). Given the over-dependence on rain-fed agriculture by the majority of people living in rural areas, CC and V has been one of the major limiting factors in agriculture production, resulting in food insecurity and low-income generation. Changes in rainfall patterns and amounts have led to loss of crops and reduced livestock production (Rosenzweig *et al*., 2002).

There are also practiced some managerial advances which are proved very effective for facing climate change impacts. In the coastal zone, most of them are adopted as community based adaptation from this region. These adaptation measures include: floating gardens for cropping and vegetables, cage culture, community based rich-fish farm in the low lands; cultivation of saline resistant varieties of rice and other crops to improve productivity and nutritional security; e.g. cultivation of mele reed (Rahman *et al*., 2009).

The coastal areas are inundated by tidal floods twice a day due to astronomical tide from the Bay of Bengal. These areas are also prone to storm surge floods due to tropical cyclones (BUET, 2008). Sea level rise accelerates risk of flooding and water logging in the coastal areas. This is due to there are no defense mechanism to protect coastal plain land and rising sea level in the contour line (Doha and Chowdhury, 2007). Coastal zone of Bangladesh is known as a geographical "death trap". When cyclone is associated with tidal waves, it causes great problems of lives and property. The physiology, morphology and other natural conditions have madeit vulnerable to disaster, cyclonic storms and floods which are very devastating and cause immense suffering and damage to people, property and the environment (Doha, 2006).

A common disadvantage for local coping strategies is that they are often not shared widely, but rather handed down through oral history and local expertise (McGregor, 2004). To deal with salinity, Changing of crop practices can be applied in the coastal zones. New rice varities with higher salinity and higher temperature tolerant can be developed and grown during the non-cyclonic period (Ali, 1999). Considering the above views in minds, the present work was designed to find out the impact of disaster on crops, livestock and fisheries in Bajua Union of Dacope Upazila of Khulna district.

Materials and Methods

Location of the study: The study was conducted in Bajua Union of Dacope Upazila under the District of Khulna of Bangladesh. Dacope Upazila lies between 22°57″ north latitudes and 89°51″ east longitudes. Keeping in view, the main objectives of the study four villages of Bajua Union of Dacope Upazila in Khulna district, namely Bajua, Dhuthihara, Cunkuri and Kakrabunia were selected (Banglapedia 2015).

Population and Sampling: Approximately 10 percent of the farmers were randomly selected as representative sample by using a table of random numbers. Thus the sample size was 120 which were distributed in four

villages named Bajua, Dhuthihara, Cunkuri and Kakrabunia. From each of these villages 30 farmers were selected.

Variables of the study: The independent variables of the study were age, education, farm size, annual income, knowledge about disaster and climate, credit received, natural disasters experienced by the farmers and impact of disaster as observed by farmers. The adaptation measure is the dependent variable.

Data collection: Data were collected by means of interviewing the selected sampled farmers. The researcher himself collected data for this study.

Data processing: To facilitate tabulation, the collected data were properly coded and transferred from interview schedule to a master sheet. Qualitative data were converted into quantitative forms by means of suitable scoring whenever necessary.

Descriptive analysis: Such statistical measures as number, percentage, range, mean, standard deviation and rank order were used in describing the variables where ever applicable.

Correlation analysis: In order to test the formulated hypotheses of the study, person's product moment Correlation Co-efficient (r) was used. Through this statistical treatment, nature of relationship between the dependent and independent variables was determined.

Data Analysis procedure: The analysis was performed using statistical treatment with SPSS (Statistical Package for Social Sciences) computer package. The mean differences were evaluated by DMRT and LSD (Gomez and Gomez, 1984).

Results and Discussion

Selected Characteristics of the Farmers: The findings related to the selected characteristics of the farmers namely age, education, farm size, annual income, knowledge about disaster and climate, credit received are shown in Table 1.

Table 1. Salient feature of the respondent and there characteristics

Characteristics	Scoring system	Possible ranged	Observed ranged	Categories	Total Respondents (N=120)		Mean	SD
					Number	percentage		
Age	Actual years	-	20-70	Young(up to35)	43	35.83	41.61	±11.048
				Middle aged(36-50)	51	42.5		
				Old(>50)	26	21.66		
Education	Level of schooling	-	0-14	Illiterate(0)	0	0	7.44	±3.72
				Can sing only (0.5)	15	12.5		
				Primary(1-5)	21	17.5		
				Secondary (6-10)	56	46.66		
				Higher Secondary (>10)	28	23.33		
Farm size	Actual in 'ha'	_	0.20-4.00	Marginal (up to .2)	3	2.5	1.069	±0.75
				Small (.21-1)	69	57.5		
				Medium (1.01-2)	36	30		
				Large (>2)	12	10		
Annual income	Actual in taka "000"	-	50.0-250.0	Low income(up to 50)	3	2.5	125.35	±52.76
				Medium income (50.01-100)	53	44.16		
				high income(>100)	64	53.33		
Knowledge about disaster and climate	Computed score	5-30	7-27	Low (up to 10)	24	20	14.96	±4.35
				Medium (11-20)	80	66.66		
				High (>20)	16	13.33		
Credit received	Actual in taka "000"	-	5.0-150.0	No credit received((0)	36	30	20.00	±25.60
				Low (1.o-50.0)	73	60.83		
				Medium (50.01-100.0)	5	4.16		
				High (>100.0)	6	5		

Natural disasters experienced by the farmers: Data presented in Table 2 indicates that the majority (66.66 percent) of the respondent had medium natural disasters scores while 32.5% had high natural disasters scores and 0.83% low natural disasters was found in the study area. Data presented in the Table 2 indicates that most of the farmers of the study area faced Cyclone to a considerable extent rather than others natural disaster. The highest disaster index (338) was found in case of cyclone. The next index was found in case of Salinity (327), Drought (263) and Flood (236).

Table 2. Statement-wise score of natural disasters experienced by the farmers

Problems	Farmers (N=120)				Natural Disaster Index (NDI)	Rank order
	High	Medium	Low	Not at all		
Drought	57	34	24	05	263	3
Flood	40	36	44	0	236	4
Cyclone	99	20	01	0	338	1
Salinity	90	27	03	0	327	2

Impact of disaster as observed by farmers: Data presented in the Table 3 indicates that the majority (50%) of the farmers had medium impact of disaster while 47.5 percent had high impact of disaster and 2.5 percent respondents had low impact of disaster (Table 3). "Increase cyclone" was the most severe impact (351) faced by the respondents regarded as top in ranking order followed by next five impacts best on their descending order of severity or ranking were "Salinity increase (320)", "Decrease safe source of water (285)", "Decrease plants (264)", "Decrease soil fertility (241)" and "Disease increase (240). The Table 4.5 also shows that the last three least severe problems are "Decrease crop yield (188)", "Cropping pattern change (112)" and "Change in seasonal diversity (105) (Table 4).

Table 3. Overall categories of farmer based on their impacts of disaster as observed by farmers.

Possible ranged	Observed ranged	Impact of Disaster Categories	Total Respondents (N=120)		Mean	SD
			Number	Percent		
0-39	12-35	Low (1-15)	3	2.5	24.71	±5.23
		Medium (16-25)	60	50		
		High (>25)	57	47.5		

Table 4. Statement-wise score of impacts disaster as observed by farmers

Impacts	Farmers (N=120)				Impact of Disaster Index (IDI)	Rank order
	High	Medium	Low	Not at all		
Salinity increase	85	30	05	0	320	2
Decrease plants	47	51	21	1	264	4
Decrease safe source of water	69	27	24	0	285	3
Disease increase	37	47	35	1	240	6
Increase temperature at summer season	31	31	56	2	211	8
Fall temperature at winter	29	31	57	3	206	9
Change in seasonal diversity	4	15	63	38	105	13
Decrease soil fertility	43	38	36	3	241	5
Decrease crop yield	18	47	40	15	188	11
Cropping pattern change	7	14	63	36	112	12
Increase land erosion	29	34	49	8	204	10
Increase flood	32	54	34	0	238	7
Increase cyclone	111	9	0	0	351	1

Adaptation measures of disaster: Data presented in the Table 5 indicates that majority of respondents 59.16% of the farmers had medium adaptation measure compared to 26.66% had low adaption measures and 14.16% had high adaptation measures. The above findings show that a large number of the respondents had low to medium adaptation to disaster. Table 6 shows, "Increase of use TV/radio for disaster signal" got the first rank among the statements. It was found that 94.16 percent of the respondent had highly adaptation to this statement and 4.16 percent of the respondents had medium adaptation to this statement and 1.66 percent of them had low adaptation to this statement with the total AMI of 351.

Table 5. Overall categories of farmer based on their adaptation measures

Possible ranged	Observed ranged	Adaptation Measure Categories	Total Respondents (N=120)		Mean	SD
			Number	Percent		
0-81	25-75	Low (up to 45)	32	26.66	50.52	±7.70
		Medium (46-60)	71	59.16		
		High (>60)	17	14.16		

Table 6. Statement-wise score of adaptation measures

Adaptations	Farmers (N=120)				Adaptation Measures Index(AMI)	Rank order
	High	Medium	Low	Not at all		
Increase cultivation of salinity tolerant rice varieties	2	26	58	34	116	23
Increase cultivation of flood tolerant rice varieties	1	8	57	54	76	26
Increase cultivation of short durable crop	72	40	8	0	304	5
Increase use of water dam for irrigation	22	54	42	2	216	16
Increase application of organic matter	11	62	47	0	204	17
Increase quality and quantity of food	48	57	11	4	269	12
Increase family income	92	26	1	2	327	3
Increase total cropped area	8	9	40	63	82	24
Increase vegetable cultivation	78	25	15	2	299	7
Increase triple cropped area	2	3	14	101	26	27
Increase tendency of conserving water in the ditch for	8	59	43	10	185	21
Increase of agroforestry system	4	35	64	17	146	22
Increase using of mulching for conserving water	17	69	31	3	220	15
Increase cultivation of shade crop for reserving water	12	63	39	6	201	18
Increase use mixed fertilizer	25	35	38	22	183	20
Increase spread of fish culture	68	29	20	3	282	9
Increase use of fertilizer for increasing fish production	29	32	44	15	195	19
Increase poultry production	54	38	21	7	259	13
Increase livestock rearing	63	30	25	2	274	11
Increase multiple cropping	6	7	47	60	79	25
Increase of embankment to protect from flood	54	51	13	2	277	10
Increase tendency to take shelter in cyclone center	81	27	10	1	307	4
Increase of use TV/radio for disaster signal	113	5	2	0	351	1
Increase of tree plantation	64	53	3	0	301	6
Increase of high platform house buildup	66	36	18	0	288	8
Increase of safe water use from filter	103	13	4	0	339	2
Increase of tree and crop cultivation on gher	49	40	26	5	253	14

"Increase of safe water use from filter" got the second highest score and thus stood in the rank order. 85.83 percent among the respondents had highly adaptation, 10.83 percent of them had medium adaptation and 3.33

percent of them had low adaptation to this statement with the total AMI of 339. "Increase family income" obtained the third highest AMI (327) and stood third in the rank order. "Increase triple cropped area" obtained the least score (26) and so got the last position in rank order regarding the adaptation measure.

Relationship between Selected characteristics of the farmers and their adaptation measures: The findings indicate that the age and credit received of the farmers had no significant and positive relationship with their adaptation measures. While education, farm size, annual income, knowledge about disaster and climate**,** natural disaster as observed by farmers, the impact of disaster had significant and positive relationship with their adaptation measures (Table 7).

Table 7. Correlation co-efficient between the selected characteristics of the farmers and their adaptation measures to disaster

Dependent variable	Independent variable	Computed value of 'r'	Table value of 'r' for N= 120 respondents	
			0.05	0.01
Adaptation measures	Age	0.028^{NS}	0.195	0.254
	Education	0.208*		
	Farm size	0.327**		
	Annual income	0.307**		
	Knowledge about disaster and climate	0.364**		
	Credit received	0.157^{NS}		
	Natural disaster as observed by farmers	0.485**		
	Impact of disaster as observed by farmers	0.438**		

** = Significant at 1 % (0.01) level, * = Significant at 5 % (0.05) level, NS = Not significant

Findings o f the present study and the logical interpretation of other relevant facts, promoted the researchers to draw the following conclusion. The study reveals that, the majority (50%) of the farmers had medium impact of disaster while 47.5 percent had high impact of disaster and 2.5 percent respondents had low impact of disaster. Findings reveal that average adaptation score of disaster was found 50.52, which were not much satisfactory, because all aspects of the disaster adaptation were not fulfilled by the farmers in high extent. Thus it can be concluded that such a low adaptation which indicated that there is scope to take necessary steps to make them more aware of adaptation measure. The study reveals that age and credit received of the farmers had no significant relationship with their adaptation measures. Education, farm size, annual income, knowledge about disaster, environmental hazards and impact of disaster as observed by farmers had significant relationship with their adaptation measures.

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