

## Awareness of Char Land Small Farmers Regarding Effect of Climate Change on Farm Ecosystem in Bangladesh

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### Abstract:

*The main purpose of the study was to determine of the awareness of small farmers regarding effect of climate change on farm ecosystem. Out of 560, 80 small farmers were selected randomly and data was collected by using a structured questionnaire and also conducted FGDs by using check lists. Data was collected between 10 April and 12 May 2013 from char landers of 2 villages under Gouripur Upazila of Mymensingh district. The awareness of char land small farmers on climate change on farm ecosystem was measured by using a 4-point rating scale. Three components such as biotic, abiotic and micro climate of the farm were considered in measuring the farm ecosystem. Appropriate scores were assigned to each of the scales for measuring the awareness char land small farmers. Overall awareness score was calculated by adding the sub-scores of 3 components of climate change. Both descriptive, and inferential statistics (co-efficient of correlation and step-wise multiple regression) were employed to find out the factors associated with awareness of small farmers. All the farmers (100%) had low to medium awareness about effect of climate*

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*change on farm eco- system. None had higher awareness. Out of 11 selected characteristics, level of education, social mobility, information media contact, training exposure and knowledge on climate change of the farmers had significant positive relationship while the age and farming experience were negatively correlated with their awareness. Four explanatory variables such as, information media contact, social mobility, knowledge of climate change and level of education can explain 68.2 percent of the total variation of awareness of the farmers. Mass literacy programme and motivational campaign of GO and NGOs on climate change should be strengthened in building awareness of the farmers about effect of climate change on farm ecosystem.*

**Key words:** Climate change, farm ecosystem, small farmers, awareness, char land

## **Introduction**

Nowadays climate change is a great concern to all over the world. The agricultural sector is the main victim of this phenomenon. The poor peasants of Bangladesh are very much ignored as far as the climate change issues are concerned. Climate change causes social refugee, home displacement, poor yield, salinity problems, drought, floods, and irregular patterns of rainfall, high temperature, extreme coldness and hotness along the whole country. Agriculture and people depend on it completely facing severe threats due to climate change. Knowledge and subsequent awareness regarding effect of climate change on farm ecosystem is very much pitiable of small farmers of Bangladesh. However, due to climate change some extreme nature of our environment was observed. Frequent storm, flood and droughts are observed. Due to these factors, the bio-diversity and energy balance of farm ecosystem have been getting imbalanced. Different type of insects and pests are emerging inside the farms. In Bangladesh, climate change has affected many sectors, including water resources, agriculture, ecosystems, biodiversity, food security, and human

health (Bishwas et. al 2009). Small farmers of Bangladesh are not capable enough to identify and take necessary action to check the effects of climate change on their farm ecosystem due to poor awareness of the phenomenon. The entire farm ecosystem was divided into three major components: abiotic components, biotic components and micro climatic factors of the farm ecosystem. Ultimately these three components and their interrelationships with social system influence on farm ecosystem. The climate change possesses the effect on these three factors and finally reduces the viability of these components which lead to yield loss.

The objectives of the study were as follows:

1. To determine the extent of awareness of the small farmers of the effect of climate changes on farm ecosystem due to climate change.
2. To determine some of the selected characteristics of the farmers. The characteristics included: age, level of education, family education, farm size, farming experience, annual income, social mobility, information media contact, access to agricultural credit, training exposure, and knowledge on climate change.
3. To explore the relationship between characteristics of the farmers and their awareness regarding effect of climate change on farm ecosystem.

## **Methodology**

Uzankashier Char and Vatipara (2 villages) of Bhangnamari Union Parisad, at Gauripur Upazilla under Mymensingh district were the locale of study. These villages are situated on the eastern bank of the river Brahmaputra. The farming systems of the villages have been developed based on the flow of river water and char lands since time immemorial. A structured questionnaire and a check list were prepared and pre-tested with 16 small farmers for collection of data. Out of 560 small

farmers, 80 were selected through random sampling method. The data was collected between 10 April and 12 May 2013 from the sample by using the questionnaire. In addition, FGD was conducted with a group of farmers by using checklist. The awareness regarding effect of climate change was the focus variable of the study while the characteristics such as age, level of education, family education, farming experience, farm size, farming annual income, social mobility, information media contact, access to agricultural credit, training exposure, knowledge of climate change of the farmers were the independent variables of the study. The awareness of the small farmers regarding the effects of climate change was computed on the basis of their awareness on 3 components such as biotic, abiotic and microclimatic components of the farm eco system. The farmers were asked to provide their opinion on twenty four statements regarding components of farm ecosystem. A 4 - point rating scale such as high, moderate, slight and not aware was used in measuring the level of awareness of the farmers. Appropriate weights were assigned to each of the responses such as 3 for highly aware, 2 for moderate, 1 for slight and 0 for not at all awareness of the farmers. Finally, the weights were added together in calculating the awareness score of the farmers. Thus, the awareness score of an individual could range from 0 to 72, where 0 indicating 'no awareness' and 72 indicating 'high awareness' about the effect of climate change on farm ecosystem.

An overall awareness index (OAI) of the twenty four statements was computed for examining the level of awareness on each of the individual statements. It was calculated by multiplying the frequency counts of each cell of scale of individual issue of awareness with its corresponding weights such as, 3 for high awareness, 2 for moderate awareness, 1 for slight awareness and 0 for not awareness. Thus, the value of OAI could range from 0 to 240, where 0 indicating not aware and 240 indicating high awareness about an individual issue of

farm ecosystem.

The age and farming experience of the farmers were measured in actual years, level of education and family education by number of years of schooling of the family members, farm size in terms of area of land under disposal of the family, access to credit was measured based on amount of money received by them, the training exposure by receiving training on farming activities in number of days during farming career. The knowledge of climate change was measured by asking questions on various aspects of climate and expressed in score. The statistical measures such as range, frequency, number, percentage, mean, standard deviation (SD) and rank order were used for interpretation of data. The inferential statistics such as Pearson's product moment correlation coefficient ( $r$ ), step wise regression analyses were conducted for interpretation of findings. The equation of multiple regressions is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} +$$

In order to determine the indirect effect of the non-significant independent variables over the dependent variable path analysis was carried out by using Simple Linear Regression (SLR) technique.

## Results and Discussion

The awareness score of the farmers in respect to biotic, abiotic and microclimatic components of farm ecosystem ranged from 6-19, 6-20 and 6-20 respectively. The overall awareness score ranged from 20 to 54 against the possible range of 0 to 72. The average score was 39.71 and standard deviation 7.75. The farmers were classified into 3 categories on the basis of their awareness score and presented in Table 1.

Components	Observed score	Categories	Farmers		Mean	SD
			Number	Percent		
Biotic	6-19	Slightly aware (1-8)	10	12.5	12.77	2.89
		Moderately aware (9-17)	67	83.8		
		Highly aware (18-24)	3	3.8		
Abiotic	6-20	Slightly aware (1-8)	8	10.0	13.65	3.04
		Moderately aware (9-17)	66	82.5		
		Highly aware (18-24)	6	7.5		
Micro climatic	6-20	Slightly aware (1-8)	10	12.5	13.28	3.21
		Moderately aware (9-17)	69	86.2		
		Highly aware (18-24)	1	1.2		
Overall awareness	20-54	No aware	0	0	39.71	7.75
		Slightly aware (1-24)	9	11.2		
		Moderately aware (25-48)	71	88.8		

**Table. 1** Distribution of small farmers' according to their awareness regarding effect of climate change on farm ecosystem

Having slight awareness and none was found highly aware regarding effect of climate change on farm ecosystem. Idrisa et al. (2012) reported almost similar findings in their study. The Overall Awareness Index (OAI) of the small farmers on twenty four selected issues of farm ecosystem ranged from 111 to 146 against a possible range of 0 to 240. The major issues (concern) of climate change were 'uncertainty of rainfall', 'decreasing speed of field wind and intensity of sunshine', 'inappropriate measures of pest control, 'increase out-break of new diseases and insects', and 'high requirement of irrigating water in crop production'. Due to climate change, a sharp change has occurred in rainfall, temperature, sun shine, wind speed etc. of

the area resulting changes in cropping season. The farmers have to make adaptation in farming practices for harvesting expected output from farming. The extent of awareness of the farmers revealed that the effect of climate change on farm ecosystem is becoming prominent and accordingly farmers are responding through adaptation in farming activities.

### Characteristics of the Farmers

The personal, social and economic characteristics of the farmers have influence on building awareness on various aspects of climate change. Some of the selected characteristics of the farmers were determined and presented in Table 2.

Name of characteristics	Categories
1. Age	Young (Up to 35): 12.5%, Middle (36-55): (70.0%), Old (>55): (17.5%). (Mean= 41.47 years) (SD=10.18)
2. Formal education	Illiterate (0): 12.5%, primary level (1-5): 45.0%, Secondary level (6-10): 38.0%, Higher secondary level (11-12): (3.8%). (Mean= 3.18) (SD=0.64)
3. Family Education	None (0): 5%, low no. (1-2): 66.2%, medium no. (3-4): 27.5%, high no. (>4): 1.2%. (Mean= 2.02) (SD=1.07)
4. Farming experience	Low experience (up to 15): 31.2%, medium experience (16-30): 35.0%, high experience (>30): 33.8%. (Mean= 22.75 yrs.) (SD=10.35)
5. Farm size	Landless (0.002-0.019 ha): 0%, marginal (0.02-0.19 ha): 2.5%, small (0.2-1.0 ha): 97.5 %. (Mean= 0.40 ha) (SD=0.15)
6. Annual income	Low income (up to 50.000 tk): 6.2%, medium income (51.000-100.000 tk): 53.8%, high income (>100.000 tk): 40.0%. (Mean= 97.27 thousand taka) (SD=35.94)
7. Social mobility	Low (up to 5): 87.5%, medium (6-10): 12.5%. (Mean= 3.70) (SD=1.24)
8. Information media contact	Low (1-10): 52.5%, medium (1-20): 47.5%. (Mean= 10.81) (SD=3.70)
9. Access to agricultural credit	Yes (26.3%), No (72.8%); Micro (1.000-10,000 tk): 87.5%, Medium (10.500-50.000 tk): 12.5%. From local money lender (78%*)
10. Training exposure	Yes (30%), No (70%); Short duration training (<7 days): 100%*
11. Knowledge on climate change	Poor (1-6): 21.2%, moderate (7-12): 77.5%, fair (>12): 1.2%. (Mean= 10.90) (SD=2.92)

**Table. 2 Distribution of the farmers on the basis of their characteristics**

The information of Table 2 indicated that the majority of the farmers were young to middle aged having average schooling of 3.18 years and family education was 2.02. Since all the respondents were small farmers having an average of 0.40 hectare of farm size and 22.75 years of farming experience. Most of the respondents had medium annual income and lower social mobility. The farmers have been maintaining low to moderate contact with various information sources indicating operation of farming business with deficit of information. The majority (73.8 percent) of the farmers couldn't have access to agricultural credit and borrow money from local money lenders. The training exposure of the farmers was found inadequate in terms of duration which in turn may hamper operation of modern farming practices although the knowledge on climate change of majority of the farmers ranged from moderate to fair.

### Relationship between the variables

The relationship between awareness of the farmers and their characteristics was explored and presented in Table 3.

Characteristics	Correlation co-efficient (r)
Age (x <sub>1</sub> )	-0.309**
Level of education (x <sub>2</sub> )	0.614**
Family education (x <sub>3</sub> )	0.028 NS
Farming experience (x <sub>4</sub> )	-0.241*
Farm size (x <sub>5</sub> )	0.078 NS
Annual income (x <sub>6</sub> )	0.008 NS
Social mobility (x <sub>7</sub> )	0.650**
Information media contact (x <sub>8</sub> )	0.662**
Access to agricultural credits (x <sub>9</sub> )	-0.048
Training exposure (x <sub>10</sub> )	0.225*
Knowledge on climate change (x <sub>12</sub> )	0.541**

**Table. 3 Relationship between awareness of the farmers and their selected characteristics**

\*\* . Correlation is significant at 0.01 level (2-tailed). NS. Not significant

\* . Correlation is significant at 0.05 level (2-tailed).

The information of Table 3 depicted that the level of education, social mobility, information media contact, training exposure and knowledge on climate change of the farmers was found positively related with their awareness of climate change. The age and farming experience of the farmers had significant negative correlation while the other characteristics of the farmers were not found in a significant correlation with their awareness. Sutradhar (2002), Nurzaman (2000) and Hanif (2000) have found similar results in their studies. They have found that formal education of the respondents have a positive correlation with farmers' awareness on environmental degradation. It is justified that the individuals having more social mobility and contact with information sources might have more interaction with potential sources, which might have increased their level of awareness about adaptation of farming practices in response to climate change. Silva and Abesinghe (2011) and Ole et al. (2009) reported similar findings in their studies. They also found that farmers' having knowledge on climate change have positive significant relationship with their awareness on farm environment.

In order to examine the contribution of selected characteristics of the farmers on their awareness stepwise multiple regression analysis was conducted and results are presented in Table 4.

Model no.	Combination of independent variables	Co-efficient of determination	Adjusted R <sup>2</sup>	% of increase in adjusted R <sup>2</sup>	F-value	t-value
1	Constant + information media contact	.438	0.431	0.431	60.90***	7.80
2	Constant + information media contact + social mobility	.580	0.570	0.139	53.25***	5.10

3	Constant + information media contact + social mobility + knowledge on climate change issues	.659	0.645	0.075	48.84***	4.17
4	Constant + information media contact + social mobility + knowledge on climate change issues + Formal education	.698	0.682	0.037	43.42***	3.15

**Table. 4 Summary of the stepwise multiple regression analysis**

n = 80; \*\*\* (Significance at 1% level); Durbin-Watson = 1.36

The information of Table 4 indicates that among 11 independent variables, four variables entered into the model, showing a significant positive influence in building awareness of the farmers about the effect of climate change on farm ecosystem. The results of the study showed that these five variables collectively can explain 68.2 percent of the total variation of farmers' awareness regarding effect of climate change on farm eco system.

The first variable to enter the step wise multiple regressions was the information media contact which solely had the highest contribution of 43.1 percent in predicting the extent of awareness regarding effect of climate change on farm ecosystem. It indicates that the farmers having more contact with information sources might have more interaction which has broadened their level of understanding and building awareness about climate change. Similarly, social mobility, knowledge on climate change and level of education of the farmers acted as catalytic force in building awareness of the farmers regarding effect of climate change on farm eco system. These 3 variables collectively contribute the rest (25.1 percent) in predicting the level of awareness of the farmers regarding effect of climate change on farm eco system.

There are some other important factors which also have significant influence in predicting farmers' awareness regarding effect of climate change on farm ecosystem that could not be covered by studying explanatory variables selected in the

present study. There are some other explanatory variables and those should be studied for prediction of total awareness of the farmers regarding effect of climate change on farm eco system.

## **Conclusion and Recommendation**

The findings of the study revealed that the char land small farmers possessed moderate extent of awareness regarding effect of climate change on farm eco system. The extension media contact, social mobility, knowledge on climate change, level of education and training exposure of the farmers were found correlated with their awareness regarding effect of climate change on farm eco system. It was also found that the farmers have been trying to make adaptation in farming activities in response to climate change. So, for survival, the concerned stakeholders need to find out ways and means for sustainable increase of crop production. Therefore, it can be recommended that mass literacy and motivational campaign of GO and NGOs should be strengthened for building awareness of the farmers regarding effect of climate change on farm eco system.

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