

FUNDAMENTAL CAUSES FOR CHANGING CROPPING PATTERNS IN THE CLIMATIC VULNERABLE BAGERHAT DISTRICT OF BANGLADESH

M. M. Hossain* and M. B. Ahmed¹

Department of Agriculture, Bangabandhu Sheikh Mujibur Rahman
Science & Technology University, Gopalganj-8100, Bangladesh

¹Agro-technology Discipline, Khulna University, Khulna, Bangladesh

*Corresponding author's email: mozammel.dae25@gmail.com

ABSTRACT

The study was conducted during the years of 2019-2021 in Bagerhat (Fakirhat and Rampal upazilas) district of Bangladesh. In the studied upazilas two unions/two agricultural blocks were selected to carry out the study. The research was conducted in the study area and data was collected by two trained enumerators together with the researcher himself from 200 respondents via an interview schedule. Collected data from the respondents were analyzed in accordance with the objectives of the study. The coded data were put into the computer for statistical analyses. The SPSS computer program was used for analyzing the data. Statistical measurements such as number, percentage, range, average, standard deviation and ranking were used to describe the variables where ever applicable. The study critically securitized climate change hazards and revealed that “cyclone” ranked in the 1st position received the attention from 85% respondents, where as “salinity” in 2nd position, “fresh water shortage” in 3rd position and sedimentation in the last (12th) position. The major hazards occurred in coastal Bagerhat district mainly concentrated in four months of the year i.e. February to May. In a whole the agricultural damages were expressed in twenty different lines. Amongst the twenty identified and distinguished damages, “yield loss of rice” was the prime or major damage (supported by cent percent respondents). “Yield loss of vegetables” and “obliterate of fisheries” selected as the 2nd and 3rd top most damages in the coastal Bagerhat district of Bangladesh. Agricultural development is not possible without overcoming these selected issues, through which agricultural activities is under challenging in the coastal zones of Bangladesh. Due to adverse impacts of climate change the coastal agriculture is not in right line, continuously it is being changed. So it is needed to consider the negative changes while adjusting interventions in coastal agriculture.

Key words: Climate change, vulnerability, cropping pattern, coastal Bagerhat district.

Introduction

The coast of Bangladesh are highly resistant to climate change due to very low elevations, some terrain on the sea level, the topography of the deltaic region, the Bay of Bengal, socioeconomic profile and infrastructure renders the capacity to tackle the effects of climate related disasters (Agrawala *et al.*, 2003). This area is more affected than any other regions of Bangladesh. They experience a variety of natural and man-made disaster events (Sea level rising-SLR, cyclones, storm surges, floods, droughts, saltwater intrusions, riverbank erosion, and landslides). The coastal areas of southwestern Bangladesh are already affected by rising temperatures, slow climatic stresses such as saltwater intrusions into agricultural soils, ground water, sudden storm surges and increased intensity such as floods, riverbank erosion impacting from cyclones, storm surges and climate change (Huq *et al.*, 2015). The agricultural sector is also affected by rising temperatures and unpredictable rainfall in Bangladesh (Hossain *et al.*, 2020; Wright *et al.*, 2019). A temperature rise of 40° C has a serious impact on the production of edible grains, especially in wheat production. Though, carbon dioxide fertilization promotes the production of edible grains. As temperatures rise, rice and wheat production declines significantly by 28% and 68%, respectively (DAE, 2007). In this way the agricultural sector of Bangladesh is being badly affected due to climate change. Hence the main focus of the study was to find out the major agricultural impacts from climate changes to minimize the crop losses in coastal Bagerhat district of Bangladesh.

Materials and Methods

The study was conducted during the years of 2019-2021 in Bagerhat (Fakirhat and Rampal upazilas) district of Bangladesh. This area is most vulnerable due to water logging is miserable during the rainy season. Cyclones are frequently affected badly. Crops failed tremendously. In the studied upazilas two unions/two agricultural blocks were selected to carry out the study. To conduct the research, each research method has its own data collection tools. The research was conducted in the study area and data was collected by two trained enumerators together with the researcher himself from 200 respondents via an interview schedule. The researcher first made a report with the respondents and explained the objectives of the study as much as possible using the local language. The questions were clarified when a respondent had problems understanding. After completion of field survey, data from the entire used interview schedule were compiled and tabulated. Tabulations and cross tabulations were done on the basis of categories developed by the investigator himself. Collected data from the respondents were analyzed in accordance with the objectives of the study. The coded data were put into the computer for statistical analyses. The SPSS computer program was used for analyzing the data. Statistical measurements such as number, percentage, range, average, standard deviation and ranking were used to describe the variables where ever applicable.

Results and Discussion

Dimension of threats for agriculture in Bagerhat district

From the incentive survey in assistance with the different GO/NGO authorizes the researcher identified twelve different environmental hazards from Bagerhat district, which are shown in Table 1. The level of hazards were selected accordingly the reactions of the respondents felt in their life. The study critically securitized the issues and revealed that “cyclone” ranked in the 1st position received the attention from 85% respondents, where as “salinity” in 2nd position, “fresh water shortage” in 3rd position and sedimentation in the last (12th) position. Climate change leads to increased temperatures, changing rainfall patterns and amounts, and a higher frequency and intensity of extreme climate events such as floods, cyclone, droughts, and heat wave (Roudier *et al.*, 2011). Generally, Bangladesh is highly prone to natural hazards-a few of which take disastrous proportions. Cyclones, inland flooding, salinity intrusion river bank erosion, droughts are experiencing almost in every year. These climatic extreme events have negative impacts on economic, social and environmental sector of the country (Kabir and Hosain, 2013).

Table 1. Environmental hazards observed in Bagerhat District

Sl no.	Name of the hazards	Respondent's feedback (%)	Rank order
1.	Shortage of fresh water	72	3 rd
2.	Water logging	55	5 th
3.	Flood	70	4 th
4.	Heavy Rainfall	50	6 th
5.	River bank erosion	45	9 th
6.	Decreased Rainfall	48	8 th
7.	Irregular Rainfall	30	10 th
8.	Storm Surges	49	7 th
9.	Tidal Surges	25	11 th
10.	Cyclone	85	1 st
11.	Sedimentation	20	12 th
12.	Salinity	73	2 nd

Occurrence of major natural hazards in Bagerhat district

The major hazards occurred in coastal Bagerhat district mainly concentrated in four months of the year i.e. February to May (Table 2). So to save the agriculture in the study area special attention needs to be paid from community, Department of Agricultural Extension (DAE), Bangladesh Water Development Board (BWDB) and other related organizations for confirming the secured harvesting and ensuring the protection of standing crops during the period of disaster hit at the coastal Bagerhat district of Bangladesh.

Table 2. Occurrence of major natural hazards in Bagerhat district

Natural hazards	Occurrence time
Cyclone	April-May
Salinity	March-April
Shortage of fresh water	February-May

Major agricultural damages in Bagerhat district

The present study is basically oriented with crop cultivation and adaptation in coastal zones, so major agricultural damages were critically investigated during performing the study and presented in Table 3. In a whole the damages were expressed in twenty different lines. Each line item greatly hampers the socio-economic conditions of the community or individuals. Amongst the twenty identified and distinguished damages, “yield loss of rice” was the prime or major damage (supported by cent percent respondents). “Yield loss of vegetables” and “obliterate of fisheries” selected as the 2nd and 3rd top most damages in the coastal Bagerhat district of Bangladesh. Agricultural development is not possible without overcoming these selected issues, though which agricultural activities is under challenging in the coastal zones of Bangladesh.

Table 3. Major agricultural damages due to climate changes in Bagerhat district

Sl	Nature of damages	Respondent's feedback (%)	Rank order
1	Yield loss of rice	100	1st
2	Yield loss of vegetables	96	2nd
3	Severe infestation of pest and diseases	76	5th
4	Obliterate of fisheries	89	3rd
5	Putrid of agricultural crops from flood and water logging	45	14th
6	Dryness of crops	73	6th
7	Mortality of fisheries	78	4th
8	Damages of vegetation	63	9th
9	Poor performances of crops	68	7th
10	Hassel to adopt new crops	48	13th
11	Emergence of new pest and diseases	66	8th
12	Minimum use of net cultivable areas	34	18th
13	Obstacle to higher cropping intensity	51	12th
14	Crisis for profitable cropping pattern	61	10th
15	Limited access for crop rotation	56	11th
16	Inconclusive for investment	30	20th
17	Scarcity for grazing areas	38	16th
18	Communication barrier in marketing	36	17th
19	Non-productive value chain	32	19th
20	Shifting of professions	40	15th

The individual agricultural losses are outlined here covering three years and the observations are cited in Fig. 1. It is the concern to all levels (from policy maker to individuals) that the losses are being increased with time. Indeed, the present study was designed in respect of climatic hazard in the study area covering its losses in agriculture. Hence the study minutely investigated the nature and level of agricultural damages as occurred by natural disaster. Here the level of damages evaluated as highly correlated, medium and not at all (Table 4). It is so cleared in the study that the damages are entirely and strongly correlated with climate changes as agreed by majority respondents (90% of the respondents).

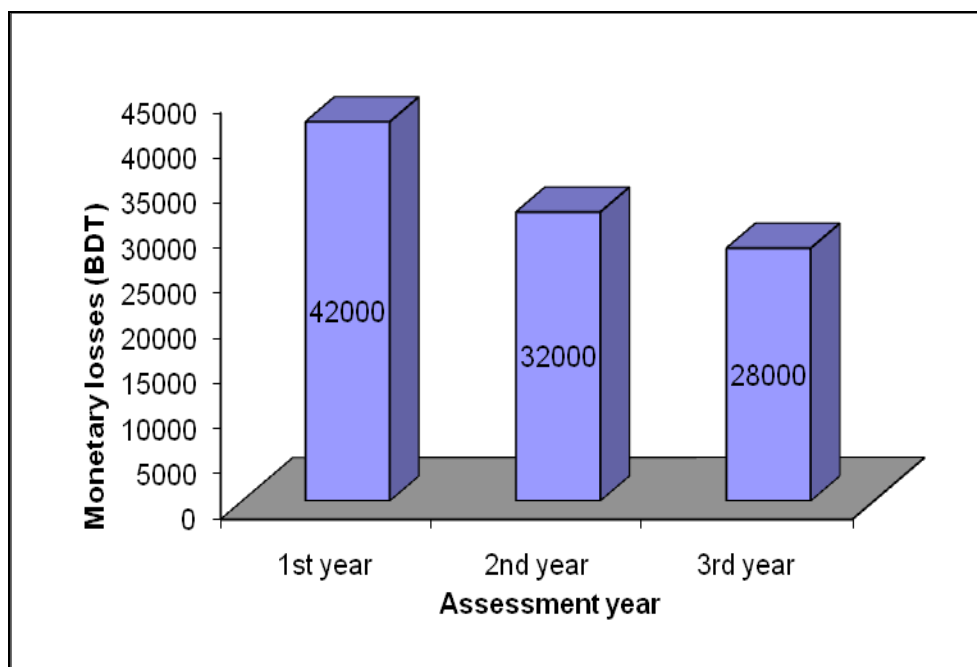


Fig. 1 Individual agricultural losses in Bagerhat district

Table 4. Damages in agriculture related with natural disaster in Bagerhat district

Location	Actual level		Categories	Respondents (n= 200)		Mean	SD
	Possible	Observed		No.	%		
Bagerhat	0-20	3-17	Highly correlated (14-20)	180	90	13.14	6.89
			Medium (1-13)	15	7.5		
			Not at all (0)	5	2.5		

Farm enterprises with changing climate in Bagerhat district

Due to adverse impacts of climate change the coastal agriculture is not in right line, continuously it is being changed as outlined in Table 5. The changes in coastal Bagerhat district were explored in fifteen different forms. The changed were assessed in twelve years. It was observed that most of the changes impacted the coastal agriculture vastly except mechanical ploughing (sl no. 2), planned agriculture (sl no. 3). So it is needed to consider the negative changes while adjusting interventions in coastal agriculture. Extreme weather conditions such as high temperatures, heavy precipitation, floods, droughts, storms, and cyclones affect crop production. Rising temperatures and heavy rainfall can even destroy crops (Chowdhury and

Faisal, 2005). Various studies indicate that a temperature rise of 1 to 20⁰C in combination with lower solar radiation causes sterility in rice spike lets. High temperature was found to reduce yields of HYVs of Aus, Aman and Boro rice in all study locations and in all seasons. The effect was particularly evident at a rise of temperature by 40⁰C. Climate changes, especially in temperature, humidity and radiation, have great effects on the incidence of insect pests, diseases and microorganisms. A change of 10⁰C changes the virulence of some races of rust infecting wheat (DAE, 2007).

Table 5. Farm enterprises in changing climate in Bagerhat district

Sl	Before (12 years ago)	Present
1	Lower salinity	High salinity
2	Conventional ploughing	Mechanical ploughing
3	Primitive cultivation	Planned agriculture
4	Less hassle in cultivation	Great hassle in cultivation
5	High yield of crops	Lower yield of crops
6	Expansion of local variety	Expansion of HYV
7	High fertility of soil	Lower fertility of soil
8	High productivity of soil	Lower productivity of soil
9	Lower sensitivity to viral diseases	High sensitivity to viral diseases
10	Limited water logging	severe water logging
11	Regular rainfall	Asymmetrical rainfall
12	Less infestation from pest and diseases	High infestations from pest and diseases
13	Limited chemical fertilizers and pesticides	Excess uses of chemical fertilizers and pesticides
14	Lower production cost	High production cost
15	Safe agricultural products	Contaminated agricultural products

The vital agricultural sector and groundwater resources of Bangladesh will face immense problems from the consequences of climate change, such as floods, droughts, tornadoes, cyclones, tidal surges, sea level rise, and soil salinity change. Bangladesh is already experiencing unusually strong tropical storms; more recurrent heat waves; heavy rainfall, resulting in severe floods; low seasonal rainfall, causing droughts; sea level rise; and other similar events (GOB, 2012).

Conclusion

Agriculture is under challenges due to changing climate in coastal Bagerhat district. In a whole the damages were expressed in twenty different lines. Agricultural development is not possible without overcoming these selected issues. Overall, due to adverse impacts of climate change the coastal agriculture is not in right line, continuously it is being changed. So it is needed to consider the negative changes while adjusting interventions in coastal agriculture.

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