Food Security, Livelihood, Health and Coping Mechanism Scenario in Disaster Prone Villages of Bangladesh

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Abstract: Coastal areas of Bangladesh more vulnerable in terms of climate change, and coastal zone experience the adversative consequence of the natural disaster. The whole seaside region is affected by the ferocious storm and tropical cyclones during pre-monsoon and post-monsoon season. Bangladesh coastal zone could be labeled a geographical "death trap" due to its extreme helplessness to cyclones and storm surges. Consequences of the natural disaster lasting for a long tenure in coastal areas which negatively affected food security, people lives and health condition. People of this areas face challenges to cope with a post-disaster situation where they applied their community-based knowledge to overcome the most terrible condition. This study commissioned for analyzing and evaluating the post-disaster situation in the coastal zone and evaluate the entire scenario of food security, livelihood, health and coping strategies. The utmost disaster affected two coastal villages from Khulna district had been picked as a study area. In this study exclusively survey method was applied and primary data were collected through interview schedule and focused group discussion. Basically, interview conducted with the household heads and sample drawn by applied simple random sampling techniques. Specifically, focused group discussion was conducted with household heads to realize the coping mechanism to counter food insecurity. Descriptive statistics employed as quantitative data analysis; whereas, the thematic investigation was applied in the qualitative analysis. In this study, basically focused on the household food consumption pattern, sources of basic food components, household status of food storage by own production, status of food shortage and reason of food shortage, the impact of food shortage and food security, post-disaster health problem. Exclusively identified household coping strategy severity as ranked by community people and the household coping mechanism by community people.

Keywords: Bangladesh, Coping Mechanism, Disaster, Food Security, Livelihood

Introduction

Nowadays Bangladesh is generally recognized as most vulnerable to climate change among the other exposed countries [1]. Bangladesh has been one of the victims of climate change consequently the faces the numerous categories of natural calamity and shocks. Every year Bangladesh affected by the cyclone and coastal areas are the more vulnerable than the other part of the country [2]. It has been seen that after the natural disaster the coastal areas face the various problems where the food insecurity is one of them. Though food security is the now global issue but in the context of Bangladesh, it is a more critical issue because of the effect of the natural disaster. After every natural disaster, the food insecurity emerges as a serious regional or local problem where government and NGOs intervention faced challenges to cope with the situation. Food is a basic need of human being and food security enabling people to get the sustainable livelihood. Bangladesh Constitution it clearly stated that in Artilce-15, "It shall be a fundamental responsibility of the State to secure its citizens to the provision of necessities of food (Constitution of Bangladesh, 1972)." In this context, the Government of Bangladesh is strongly committed to achieving food security for all in any circumstance. However, this food security situation facing many hurdles due to a natural disaster in the coastal region of Bangladesh. The coastal region of Bangladesh frequently affected by the cyclone, which adversely affected the people's livelihood in that area [3]. If we look at past two decades 1990s and

2000s we can see notable three cyclones hit in the coastal areas. Powerful tropical cyclone smash into the Chittagong district of southeastern in 1991, very Severe Cyclonic Storm *Sidr* affected the coastal region in 2007 and tropical Cyclone *Aila* hit in the southwestern part of the coastal region in 2009. This study conducted for find out the post-disaster food security scenario where include the livelihood, health condition and coping mechanism of the households. In globally the food security is the serious issue and context of Bangladesh where is the disaster forming the existing food crisis which threat for the people livelihood [4]. Basically, this study focused on the post-disaster food security of the coastal population and their household. In the coastal area, most of the land are cropped once and remain fallow throughout the year. As a result, farmers remain unemployed without any income source. Domestic food production of the coastal area provides little backup of food availability for the population of that area [5]. Natural hazard has a substantial problem in this area, which has a great effect on food security. Not only the food security but also health, livelihood adversely affected by the climate change and natural disaster. Natural vulnerability has a substantial problem in this area, which has a great effect on food security. This study conduct for the find out the impact of natural disaster on the food security where include the livelihood, health, and other vulnerable issues. The present study evaluates the situation of food security of the coastal region, including livelihood, the post-disaster situation in cyclone-affected areas, underlying causes of food security, and copping mechanism of the household.

Objective

The main objective of this study was to evaluate food Security, livelihood, health and coping mechanism scenario in disaster prone villages of Bangladesh in the household's level. There are few specific objectives were identified which are as follows:
1. To analyze the situation of food insecurity and threats to livelihoods in the coastal area.
2. To determine the stage of food insecurity and health interventions.
3. To find out a major coping strategy which uses for overcoming the food insecurity.

Methodology

This study was conducted purely based on the primary data and these data were collected by adopting the survey method. The survey method was adopted due to two advantages: - i) this method enables quick investigation for a large number of cases, ii) its result has wide applicability for drawn the conclusion. Within the Dacope Upazila (Upazila of Khulna District) there are two villages respectively Kamarkhola village and Sutarkhali village is most cyclone affected areas, so the Kamarkhola and Sutarkhali villages were selected as the study area. These two villages selected purposively for data collection. The unit of analysis of the study was household heads, who were affected by the cyclone and vulnerable in food security those household heads were the unit of analysis for this study. Data were collected from the field by using simple random sampling technique. Within the two villages data were collected from the 144 sample household which determined by the sample size determination calculator. Here taken Confidence level 95%, the confidence interval was 10. Primary data was collected through the interview schedule and an interview schedule was prepared which contained both open and close-ended items and then data was collected by the interviewer himself and there was conducted FGD (Focus Group Discussion) to know coping mechanism of community level. Raw data was found from the field and data were processed by removing inappropriate codes, decreasing logical variations, reducing improbabilities and by solving ambiguities. Coding was used to categorize the data in harmony to its quality, quantity, periodical source and then data was organized. Tabulated data was processed by automated and used computer software's SPSS and MS Excel. Process data was assessed and conditional through by means of descriptive along with inferential statistical techniques using the SPSS version 20. Descriptive statistics such as frequencies and percentages were mostly used to analyzed the data.

Result and Discussion

Socio-Economic Characteristics

As per the study requirements, socio-economic characteristics was captured and analyzed to understand their stand within the society. The study findings show that (Table-1) majority of the respondents belongs to age group 36-41 years. From the field, survey observed that 88.2 percent were male respondent and rest of the respondent were female. It was spotted majority households had 5-6 family members in average. In terms of year of schooling, it was recognized 51.4 percent respondents have education in junior secondary level (6-8 grade). In terms of respondent's occupation, it was perceived 51.4 percent household lives on agricultural work and rest of the respondents were employed by non-agriculture work. It was reported that 65 percent households had income below BDT 5000

(monthly) and 67.4 percent of household monthly family expenditure was less than BDT 5000. In this study, there were identified four categories of agriculture land ownership pattern: - functionally landless, marginal, small land and large land. Household ownership pattern over agriculture land, 70.8 percent had 0.5-1.5 acre agriculture land they are the marginal level owner of the land.

Table-1: Socio-economic Characteristics of Respondent

Socio-economic Features (N=144)	N (%)	Mean
Age Composition	**N (%)**	**Mean**
24-29	4 (2.8)	
30-35	20 (13.9)	
36-41	41 (28.5)	
42-47	33 (22.9)	Mean=43
48-53	31 (21.5)	
54-59	7 (4.9)	
60-65	8 (5.6)	
Sex Composition of the HH	**N (%)**	
Male	(88.2)	
Female	(11.8)	
Household Size	**N (%)**	
Below 3	20 (13.9)	
3-4	41 (28.5)	Mean=5
5-6	60 (41.7)	
Above 6	23 (15.9)	
Education	**N (%)**	
Illiterate	16 (11.1)	
Primary (1-5)	33 (22.9)	Mean=6
Junior Secondary (6-8)	74 (51.4)	
Senior Secondary (9-10)	21 (14.6)	
Occupation	**N (%)**	
Agriculture	78 (54.2)	
Artisan	17 (11.8)	
Daily laborer	4 (2.8)	
Fisherman	4 (2.8)	
Housewife	7 (4.9)	
Non-agriculture labor	14 (9.7)	
Rickshaw/ van pulling	4 (2.8)	
Service	4 (2.8)	
Petty trader	12 (8.3)	
Income (BDT)	**N (%)**	
Below 5000 (Low-income Group)	94 (65.3)	
5001-8000 (Medium Income Group)	40 (27.8)	Mean=5109
Above 8000 (High Income Group)	10 (6.9)	
HH Expenditure (BDT)	**N (%)**	
Below 5000	97 (67.4)	
5001-8000	41 (28.5)	Mean= 4778
Above 8001	6 (4.2)	
Agriculture Land Ownership (acre)	**N (%)**	
Functionally landless (0.05-0.5 acre)	26 (18.1)	
Marginal (0.5-1.5 acres)	102 (70.8)	Mean= .93
Small 1.5-2.5 acres	10 (6.9)	
Medium/large 2.5 acres or more	6 (4.2)	

Food Consumption (Countdown) of the Households

Food consumption indicates the food security, food consumption behavior analysis shows the real picture household food security level [6]. Data presented that in average seven days food consumption in household level. The data shows that diet diversity, as measured by household consumption of major food items, increases with household socioeconomic status. Table-2 presents the major food items which consumed during one week period. Rice consumes in average 6.90 days, Potato consumes in average 3.64 days, fish consume in average 2.83 days, Flour consumes in average 2.43 days, egg consumes in average 2.39 days.

Table-2: Food Consumption (Countdown) of the Households

Food Items	Minimum (in days)	Maximum (in days)	Average Consumption (in days)
Rice	5	7	6.90
Flour	1	7	2.43
Potato	1	7	3.64
Pulses	1	5	1.91
Vegetables	1	7	3.71
Fish	1	5	2.83
Egg	1	5	2.39
Chicken	1	2	1.03
Milk	1	3	1.83
Fruits	1	3	1.50

Sources of Carbohydrates, Protein and Vitamin in Household

Carbohydrates are an idyllic source of energy for the body. This is because they can be transformed more eagerly into glucose, the form of sugar that's elated and used by the body than proteins or fats can [7]. We should get half our energy needs from carbohydrates, with at least one-third of our daily intake of food being starchy carbohydrate. Table-3 shows the source of carbohydrate which actually means the food accessibility. 72.9 percent rice obtain from the own production, 86.8 percent flour obtain from the market purchase, 85.4 percent potato obtain from the market purchase and 74.4 percent Pulses obtain from the market purchase. Households only ensure the rice from own production, where flour potato and pulse brought from the market purchase.

There are different sources of protein, but some sources are much better choices than others protein is a nutrient that is very important for the body. Protein is what aids the body feel full, which is particularly unlimited for anyone as dieting. Protein is built from amino acids, which are essential for the body to have [8]. Table-3 shows the source of protein which actually means the food accessibility. 76.1 percent fish obtain from the market purchase, 58.8 percent chicken obtain from the own production, 56.2 percent eggs obtained from the own production and 72.4 percent milk obtain from the market purchase. Majority household responded that, they meet protein source by chicken and eggs from own production, where fish and milk brought from the local market.

Vitamins and minerals are vital for the care of good health and hindrance the number of diseases [9]. In the every period of the life we need vitamin for the physique protected from any deprivation. Table-3 shows the source of vitamin which measures the dietary intake. 53.1 percent vegetables obtain from the market purchase, 86.4 percent fruits obtain from the own production. Then analyzed data indicates that vegitable and fruit meet households need by own production.

Table-3: Sources of Carbohydrates, Protein and Vitamin

Sources of Carbohydrates				
Source of Foods	**Food Items**			
	Rice (%)	**Flour** (%)	**Potato** (%)	**Pulse** (%)
Own production	72.9	7.5	12.6	20.9
Market purchase	27.1	86.8	85.4	74.4
Borrowing/debts	0.0	5.7	1.9	0.0
Storage food	0.0	0.0	0.0	4.7
Sources of Protein				
Source of Foods	**Foods Item**			
	Fish (%)	**Chicken** (%)	**Eggs** (%)	**Milk** (%)
Own production	23.9	58.8	56.2	27.6
Market purchase	76.1	41.2	42.9	72.4
Borrowing/debts	0.0	0.0	1.0	0.0
Sources of Vitamin				
Source of Foods	**Foods Item**			
	Vegetables (%)		**Fruits (%)**	
Own production	53.1		86.4	
Market purchase	45.3		13.6	
Borrowing/debts	1.6		0.0	

Status of Staple Foods Storage from Own Production

In the rural areas of Bangladesh less or more household storage staple foods before next harvest for the future consumption [10]. Food storage provides the food security for the households. Table –4 shows the status of staple foods storage from own production in household level between the present and past year. Data presents that past year 36.8 percent food storage used 2-3 month while present years decrease to 29.2 percent. 33.3 percent household storage food for six months in past year while only 17.4 percent storage in the present year. 18.1 percent household storage in present year for the one month while the past year it was 13.9. The important factor it that 35.4 percent has no storage in present year while 16.0 percent was in past year. Above data signifies that the quantity of staple food storage declined gradually, it occurs by the environmental effect and post-disaster factor which leads less production of staple food.

Table-4: Status of Staple Foods Storage from Own Production

Status of Principle Foods Storage	The year 2011 (%)	The year 2012 (%)
None	16.0	35.4
Up to one month	13.9	18.1
Enough for 2-3 months	36.8	29.2
Enough for 6+ months	33.3	17.4

**Food Shortage and Reasons for the Food Shortage**

Food shortages among inhabitants are caused either by a lack of food or by complications in the food supply; it may be deteriorated by natural disaster variabilities [11]. Food shortage has caused crops failure at present and various researches now blame natural disaster as one factor by which more people around the planet are going hungry as a result. The Chart-1 presents that the response to the household food shortage before the next harvest, 53.5 percent households face the food shortage before the next harvest while the 46.5 percent households do not face the food shortage before the next harvest. The data illustrated that most of the household are vulnerable in terms of foods security. Food shortage occurs by the different causes which made the household food security vulnerable. Crops failure, lack of market access, lack of food production ability and many others reasons are responsible for the food shortage. Food shortages increases food insecurity at the household level, Chart-2 shows that 43 percent household faces the food shortage cause of lack of additional livelihood sources/capacity to purchase additional food, 39

percent household faces the food shortage cause of agricultural crops failure and 18 percent household faces the food shortage cause of lack of ability to produce extra food. In this context, the study found that half of the household suffering by food shortage.
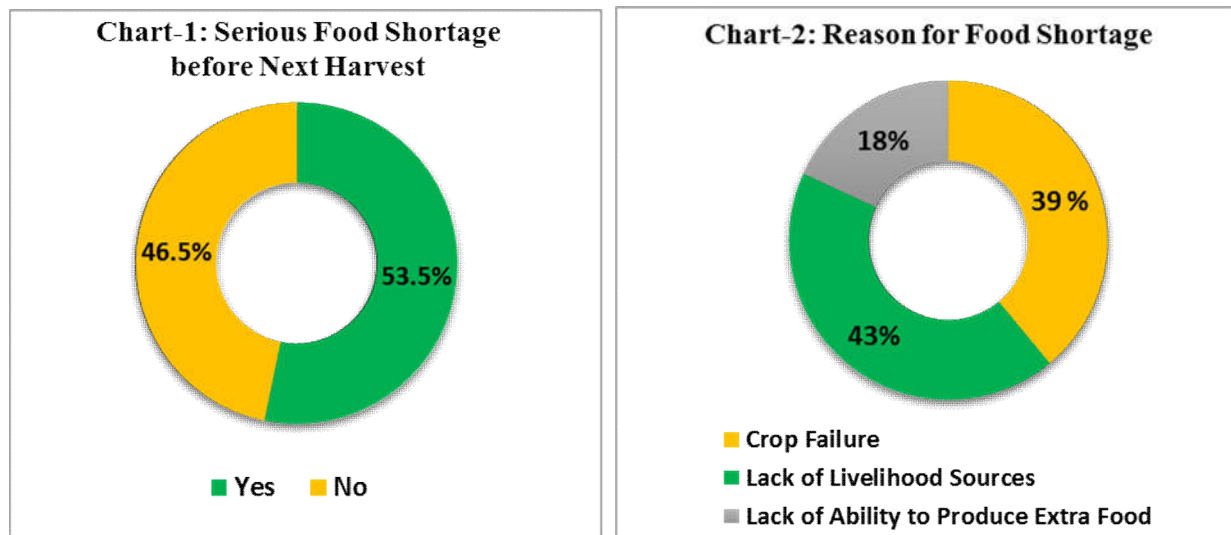
Impact of Food Shortage and Affected Household Members

Food shortage has various impact on the household level in which the household members vulnerable to affected by the different problems [12]. Food shortage increases hunger, health problem, and financial crisis and mobilizes the peoples for the migration. Chart-3 illustrated that the food shortage has an impact on the household members and maximum household responses to the food shortage impact, 50 percent household face health problem, 24 percent households took the financial debt for the overcome food shortage and 20 percent face the problem of the hunger. The information denotes that causes of food shortage the majority household experience the health problems. Food shortage affected the household by health problem, food insecurity, financial crisis, hunger and many others problems [13]. Basically, the food shortage directly impacted on the household member's livelihood adversely. The Male, female, children and elderly affected by food shortage problem. The Chart-4 shows that the affected household members because of food shortage. 62 percent children highly affected by the food shortage, 20 percent female are affected causes of food lacking and 10 percent elderly persons of the family affected by the food shortage. The above data signify that the children and female are the more vulnerable in the context of the food shortage, while the male is less affected.
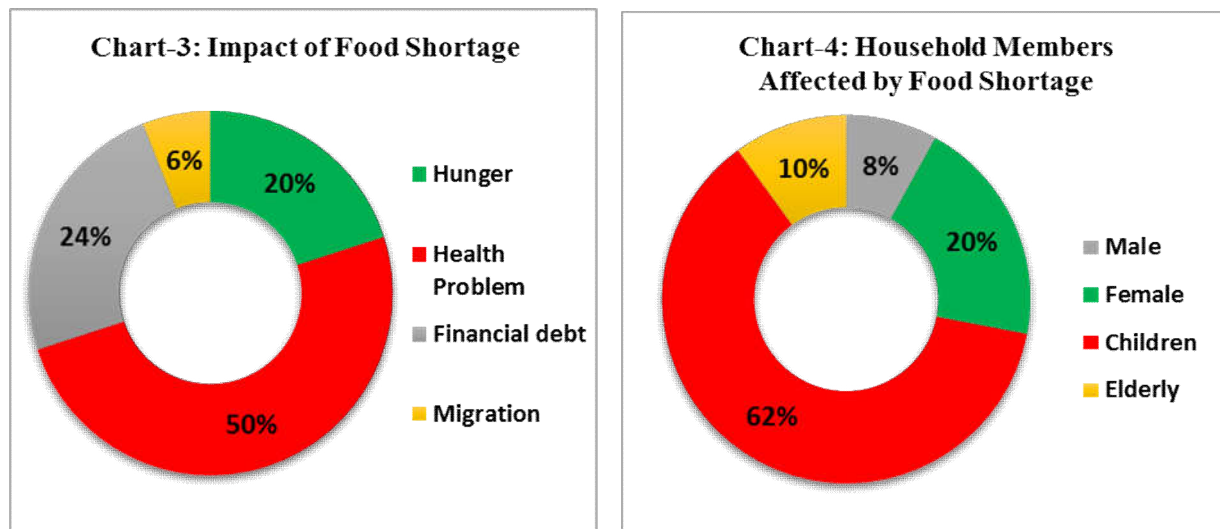
Impact of Negative Event and Shock on Food Security

Rural household face different negative events and shocks within the different month of the year, which increases the food insecurity in the rural households [14]. The study area faces various shocks past one year which made the livelihood vulnerable. The natural climatic situation is responsible for food insecurity situation which also affected the crops and environment. In all the cases, the negative event and shocks increases the food insecurity in the Kamarkhola and Sutarkhali village, table-5 specify that 29.9 percent household head loss their employment because of the natural disaster, 22.9 percent household loss the agricultural crops because of the natural disaster, 18.1 percent household heads losses petty business/ nonagricultural work, 6.9 percent households face the food insecurity because of the household head illness and only 4.2 percent household faces the problem of food security because of the death of the working member of the household.

Table-5: Impact of Negative Event and Shock on Food Security

Affected Event	Frequency	Percent
Agricultural Crop failure	33	22.9
Loss of employment	43	29.9
Household petty business failure, non-agricultural	26	18.1
Major illness or accident of household member	10	6.9
Birth in the household	11	7.6
Death of working member of household	6	4.2
Loss of property due to theft/robbery, flood, fire	3	2.4
Flash floods	12	13.0

Post Disaster Health Problems

World Health Organization (WHO) to contend for a definition of health as 'a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity' [15]. Health problems occurred by the poor food habit, poor sanitary condition and natural disaster impact. Household member faces the various health problems because of various food insecurity and unhealthy condition. Table-6 illustrated males were most affected by the fever (25.7 percent), diarrhea (59.7 percent), asthma (3.5 percent), pain and headache (3.5 percent). Females were most affected by the fever (29.9 percent), female disease (27.1 percent), pain and headache (27.8 percent). And the children were affected by the fever (36.5 percent), diarrhea (27.7 percent), typhoid (19.7 percent) and pneumonia (8.8 percent). The important matter is that male, female and children were commonly affected by diarrhea, fever, and typhoid which occurred by the unhealthy source of water because the majority of households use the pond and rain water for the drinking. The household member seeks for better treatment for overcoming the poor health condition, but proper medical facilities are not available and affordable for them.

Table-6: Post-Disaster Health Problems

Type of Diseases	Who Suffered		
	Male (%)	Female (%)	Children (%)
Diarrhea	59.7	8.3	27.7
Fever	25.7	29.9	36.5
Pain/ Headache	3.5	27.8	4.4
Heart Disease	0.7	2.8	1.5
Typhoid	1.4	2.1	19.7
Pneumonia	0.0	0.7	8.8
Tuberculosis	5.6	0.0	0.0
Jaundice	0.0	0.0	1.5
Female Disease	0.0	27.1	0.0
Asthma	3.5	1.4	0.0

Body Mass Index (BMI) Measure

Body Mass Index (BMI) extensively used as a tool for measure the height and weight balance of an individual. But, we need to remember that BMI is not a diagnostic tool. BMI or Body Mass Index is a method of estimating a person's body fat levels based upon a person's weight and height measurement. While the BMI calculation is an indirect measurement, it has been found to be a fairly reliable indicator of body fat measures in most people[1] [16]. In this study here use metric BMI measure formula, which is given below:

Metric BMI Formula: *weight (kg) / [height (m)]^2*
[Here, kg= Kilogram and m= Meter]

BMI is one of the most accepted categories to the nutritional assessment of the individual. As we know nutrient has a direct relation with food, so food security extremely depends on the nutritional status of the individual. Table -7 demonstrate that around 73.6 household head were in underweight while the 18.0 percent household head were of normal weight. So food security status of most of the households is not good through nutritional perspective because here data presents the majority of the household head exists in underweight scale.

Table-7: Body Mass Index (BMI) Measure

BMI Range (Kg/m^2)	BMI Indicators	Household Head (%)
Below 18.5	Underweight	73.6
18.5 – 24.9	Normal weight	18.0
25.0 – 29.9	Overweight	5.6
30.0 and Above	Obese	2.8

Coping Strategy Severity as Ranked by Community People

The ranked list of coping strategies is presented in Table-8, which averages the focus group severity scores for each coping strategy. Very severe coping strategies received a score of '4'; coping strategies not considered severe received a score of '1'. Data explained that community focus group participants ranked the severity of coping strategies, which range from common adaptive strategies to highly uncommon disruptive and even critical strategies. In below table, implies consume seed stalk, borrow from friends/relatives and rely on cheap or less preferred food these are in close to very severe score. And sold household asset, sold land, sold the animal and reduce the number of meals close to severe score.

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[1] https://www.verywell.com/bmi-what-is-bmi-or-body-mass-index-3120088

Table-8: Coping Strategy Severity as Ranked by Community Focus Group

Coping Strategy	Severity Score
Rely on cheap or less preferred foods	3.4
Consume seed stalk	3.0
Borrow from friends/ relatives	3.0
Purchase food on credit	2.9
Borrow from Money lenders	2.9
Borrow food or rely on others	2.8
Borrow form NGOs/ Grameen Bank	2.8
Rely on casual labour for food	2.5
Farmland mortgage out	2.4
Farmland lease out	2.4
Skip entire day without eating	2.2
Reduce the number of meals	1.7
Sold animals	1.5
Sold land	1.2
Sold household assets	1.1

Household Coping Strategies

The rural households of the coastal region they experience the various shocks and natural disaster less or more every year [17]. In the time of the interviews, there were asked about the dome of important shock and events which negatively affected the households based on that response then outlined the frequency of a variety of strategies employed to cope with the shock. Table-9 clarified information on the various coping strategies households employed. In the below table presents the household members use the various types of coping strategies to overcome food insecurity and food shortage in household level. Data shows the one hundred forty-four households cope within last year for the facing various shocks such as crops failure, illness, loss of employment, the death of working member and natural disasters such as cyclone and flash floods. The most commonly employed coping strategies include:

- Borrow food or rely on others (87.0 percent)
- Rely on cheap or less preferred foods (82 .0percent)
- Purchase food on credit (73.0 percent)
- Rely on casual labour for food (81.0 percent)
- Consume seed stalk (89.0 percent)
- Borrow form NGOs/ Grameen Bank (85.0 percent)
- Borrow from Money lenders (84.0 percent)
- Borrow from friends/ relatives (89.0 percent)
- Farmland mortgage out (69.0 percent)
- Farmland lease out (71.0 present)

Table-9: Household Coping Strategies

Coping Strategies	Never (%)	Seldom (Less than a day per week) (%)	Sometimes (1-2 days per week) (%)	Often (3 or more days per week) (%0	Daily (%)
Reduce number of meals	48.6	36.1	13.9	0.0	1.4
Borrow food or rely on others	13.2	21.5	47.2	4.2	13.9
Rely on cheap or less preferred foods	17.4	13.2	15.3	22.2	31.9
Purchase food on credit	27.1	16.0	18.1	18.8	20.1
Rely on casual labour for food	18.8	30.6	30.6	18.1	2.1
Skip entire day without eating	31.9	31.9	20.8	9.7	5.6
Consume seed stalk	11.1	27.1	26.4	20.1	15.3
Borrow form NGOs/ Grameen Bank	15.3	28.5	28.5	15.3	12.5
Borrow from Money lenders	15.3	20.8	34.0	20.8	9.0
Borrow from friends/ relatives	11.1	19.4	37.5	22.9	9.0
Farmland mortgage out	31.2	27.1	20.1	13.9	7.6
Farmland lease out	29.2	28.5	22.9	12.5	6.9
Sold animals	61.8	24.3	13.9	0.0	0.0
Sold household assets	89.6	9.0	1.4	0.0	0.0
Sold land	81.9	17.4	7.0	0.0	0.0

Conclusion

Coastal areas of Bangladesh undoubtedly expose to natural disaster and effect of natural disaster last for a long tenure. This research conducted for find out the real situation of the food security, where look backward to the underlying causes of food insecurity and threats to livelihoods, the stage of food insecurity and health interventions and major coping strategy which use for overcoming the food insecurity. In this study observed different factors like a financial problem, occupation, education, own food production, food acquisition and natural hazards of the study area. Most of the household faces the food shortage or crisis which leads to food insecurity; in fact, there was very few household who has the sufficient food storage capacity for the next several months. The study identified the key causes for the food shortage which leads food insecurity in the study area where the agricultural crops failure is a major one. Here also found that own food production, one of the influencing factor, gives sustainability in quantitative or qualitative food security. Households with an extra amount of own food have better status than others in terms of food security. But most of the household have no surplus crops; as a result, it cannot give efficient support in the food security of study area. Peoples of coastal villages try to endure with the food insecurity condition, most of the households cope with the condition which rises in a time of post-disaster situation. Basically, the coping mechanism in this area identified through community experience and practice. It could be more effective if the government and non-government entities come forward with their supports and implement relevant programs in coastal areas.

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