



Documentation of Local Level Coping Measures

An Experience from Central Coastal Belt of Bangladesh



Bangladesh Country Office

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An Experience from Central Coastal Belt of Bangladesh

Sharmind Neelormi

IUCN (International Union for Conservation of Nature)
December 2008

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Cover Photo by: Shehzad Chowdhury

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PREFACE

IUCN Bangladesh has implemented the 'Promotion of Adaptation to Climate Change and Climate Variability Project' in the Noakhali Sadar and Subarnachar upazilas under the Netherlands Climate Assistance Programme-Phase (NCAP) II. One of the objectives of NCAP was to build capacity for participating countries to mainstream climate change into development planning which focuses on creating enable condition for promoting adaptation to climate change and climate variability in national policies and plans, and also at the community level.

Bangladesh faces multiple manifestations of climate change and variability and is globally regarded as one of the most vulnerable countries in the world. The coastline of Bangladesh is particularly vulnerable to multiple effects of climate change such as flooding, waterlogging, cyclones, storm surges etc. on account of the low-lying deltaic environment. The principal objective of this study was to understand how people in the coastal regions of Bangladesh cope with the realities of changes in the climatic regime and associated impacts on their lives and livelihoods.

The study on documentation of local level coping covered 10 unions of the Noakhali Sadar and Subarnachar Upazila and tried to capture the field level information on community coping practices. The basic research tool was Participatory Rural Appraisal (PRA) accompanied by Focus Group Discussions (FGD). On behalf of the author, I would like to take this opportunity to thank all the participants who provided their valuable experiences and information in enriching this study.

IUCN Bangladesh would also like to acknowledge the financial support received from the Netherlands Climate Assistance Programme through ETC International, Netherlands for supporting the 'Promotion of Adaptation to Climate Change and Climate Variability Project' in Bangladesh and publication of this report. We recognize the support of Ian Tellam and Bram Truijen of ETC Netherlands. I would also like to take this opportunity to thank Ms. Remeen Firoz, Sk. Asaduzzaman, Ms. Ahana Adrika and Ms. Farida Shahnaz who have contributed significantly in making this publication possible.

Dhaka
December 2008

Ainun Nishat, PhD
Country Representative

DEFINITIONS

Climate Change means a change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere in addition to natural climate variability observed over comparable time periods.

Adverse effect of climate change means changes in the physical environment or biota resulting from climate changes which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare.

Vulnerability signifies the extent to which a natural or social system is susceptible to sustaining damage from climate change. Adaptation can thus be seen as a way of reducing vulnerability to climate change. Vulnerability is commonly seen as a function of three elements: first, the exposure of systems to climatic hazards, i.e. the physical risk that such an event may take place; second, the sensitivity of a system, i.e. the degree to which a given change in climate will lead to positive or negative changes in a system; and third, the capacity of a system to adjust practices, processes or structures to moderate or offset the potential damage or take advantages of the opportunities created by a given change in climate.

Coping measures are the practices which people innovate in a given situation. People live with problems. In some cases, they adjust themselves with the situation by conceding. For example, in a deteriorating economic situation, they spend less.

Adaptation is described as adjustments in practices, processes, or structures to take into account the changing climate conditions, to moderate potential damages, or to benefit from the opportunities associated with climate change (McCarthy et al, 2001).

Indigenous Knowledge or IK is the knowledge gained over time by people local to a specific area. This knowledge encompasses all aspects of life from their social structures to local adaptations of modern technology and local knowledge, for example, which crops grow best on which soil. Indigenous knowledge is formed through a long process of innovation, experimentation and interaction of people with their local environment. The knowledge is collected and adapted over time and passed from one generation to the next.

Resilience describes the ability of groups or communities to cope with external stresses and disturbances as a result of social, political or environmental change.

GRISHHO		BORSHA		SHOROT		HEMONTO		SHEET		BOSHONTO	
Boishak	Joshtho	Ashar	Srabon	Bhadro	Ashwin	Kartik	Agrahan	Poush	Magh	Falgun	Choitro
April - May	May - June	June - July	July - August	August - September	September - October	October - November	November - December	December - January	January - February	February - March	March - April
SUMMER			AUTUMN			WINTER			SPRING		

Bangla and English Year and Seasons

Chapter 1

INTRODUCTION

1.1 Background of the Study

Bangladesh faces multiple manifestations of climate variability and change (e.g. flood, cyclones and storm surges, sea-level rise, drainage congestion, salinity increase, drought etc.). It is regarded globally as one of the most vulnerable countries in the world regarding impacts of climate change. The coast line of Bangladesh is particularly vulnerable to the combined effects of coastal flooding, cyclone, storm, surges and sea level rise (SLR) in the Bay of Bengal on account of the low-lying deltaic environment. The tropical cyclones strike the coastal areas periodically, creating misery and loss of life, property and ecosystem damages.

The coastal belt of the country comprises an area of about 39,300 sq. km (27 percent of the country's total area), where more than 29 million people (22 percent of the national population) live (ICZMP-PDO, 2005). The coastal zone also comprises very old settlements and newly emerged lands. Different dynasties ruled this part of coastal area for centuries, which eventually shaped the cultural trait and social fabric of the population. The western part is a moribund delta (in this part the largest mangrove forest, The Sundarban, is located), the middle part (the Meghna estuary area) is an active delta and the eastern part (Chittagong coast) is a stable landmass.

From published literature, it is revealed that climate change may affect this coastal region by means of salinity, erosion, accretion, floods, water logging, cyclones, tidal surges (Warrick and Ahmad, 1996; Huq et al., 1998). Considering this, the people living in the coastal area and depending on its resources for their livelihoods belong to a vulnerable category. Livelihoods of people have been affected through the impacts of climate changes on agriculture, fishery, livestock, shrimp farming, off-farm activities and even the locations of human settlements. Over the centuries, climate variability and extreme weather events have caused damages to people's lives, assets, resources and livelihoods practices, which eventually have led people to devise indigenous coping strategies for survival (Neelormi et al., 2003; Alam, 1990; Ahmed, 2003). The practiced coping mechanisms within the communities and their traditional knowledge-base enable them to organize at the community level and manage disasters; even their wealth of knowledge regarding the management of their livelihoods in different changed climatic scenarios is substantial.

1.2 Objective of the particular component

The principal objective of this component is to understand how people in coastal region of Bangladesh cope with the realities of climate variability based on the information collected from the two pre-selected sites. For this, the specific objectives are to:

- Gather field level information on the perception of local people regarding vulnerability and coping practices representing various economic as well as occupation groups

- Compile the field level information on community coping practices
- Prepare and submit a report based on field level observation on the above topic.

1.3 Methodology

1.3.1 Mode of investigation

IUCNB has selected Noakhali coastal district namely, Noakhali Sadar upazila and newly declared Subarnochar upazila as the project study site. IUCNB has also chosen fisheries and agriculture sectors over other sectors for this study as majority of the population of this area depends on these two sectors for their livelihoods.¹

Owing to limited resources and time, the less structured data collection method, popularly known as “rapid appraisal” has been used. The principal advantage of this rapid appraisal method is that it lies between the two extreme ends of the continuum ranging from highly informal intuitive research to highly formal and structured information. The basic research tool in this study has been Participatory Rural Appraisal (PRA), which has enabled the investigator to elicit information through focus group interviews of a representative group of individuals from the sample site. The PRA method assumes that popular participation is fundamental to development planning: and hence, Focus Group Discussions (FGD) has yielded the maximum amount of data and information through grassroots participation in exchanging ideas related to the theme of the research. 10 FGDs with different occupational groups and several case studies were carried out. The case study approach is being adopted as an important mode of investigation for this study. Case studies of individual respondents, as conventionally used in qualitative social research, have been transformed into representative sample sites to be treated as individual cases. The subjects of the case studies have actually acted as key informants and provided quick insights into the issues of concern.

1.3.2 Project sites description

Out of 16 unions² of Noakhali Sadar upazila, seven unions have been selected. In order to select the Unions, different inundation land-types had been taken into consideration due to the fact that the magnitude of climate related hazards varies with different land types.

These seven Unions are:

- Noakhali
- Dadpur
- Kadir Hanif
- Niazpur
- Binodpur
- Ashwadia
- Ewazbalia

Shubarnachar upazila comprises of 7 Unions. Among them 3 Unions have been selected as study sites:

- Char Jubilee
- Char Bata
- Char Clerk

Char Jubilee is at the south of Sadar upazila, and at the north of Shubarnochar upazila. Char Bata and Char Clerk are situated to the southwest and southeast part of the Shubarnochar upazila, respectively. These char areas are selected, assuming that the southern part of the upazila, i.e., the areas closer to the sea, must have some distinct climate related features - that is not common in Noakhali Sadar upazila, not even in the northern part of Shubarnochar upazila.

¹ The ground realities were understood by conducting a reconnaissance survey by IUCNB Officials, even before engaging the Consultant.

² The lowest tier of Governance System in Bangladesh, where an Elected Body (Local Government Institution called Union Parishad) takes care of all local level development and management issues.

1.3.3 The Study Population

The study population is distributed by gender, profession and residing Upazila. The study populations are:

- Villagers (different professional communities)
- Members of Union Parishad
- Local community based organizations and NGOs
- Local level policy implementers.

1.4 Report and Analysis

This report is comprised of five chapters. The first chapter initiates the background of the study and depicts the methodology of the study. Chapter two summarizes the Local Level Perception on climate change-induced problems and consequences. Chapter three documents some of the frequent and best practiced coping measures taken by the local people in Noakhali. Chapter four describes the Women's Vulnerability to Natural Disasters in the selected study site. Finally chapter five synthesizes present capacity of coping to different climate-related disasters/hazards and indicates some potential future initiatives and policy interventions. Qualitative analysis has been made from the information gathered from Focus Group Discussions and case studies.

Chapter 2

LOCAL LEVEL PERCEPTION ON CLIMATE CHANGE

2. Findings of Focus Group Discussions

The Focus Group Discussions (FGD) have been initiated with some specific objectives in mind: to identify the prevailing patterns of the different climatic events, to understand and/or assess the associated climate-related vulnerability as confronted and/or perceived by the vulnerable people of the area, to elicit and record the various indigenous coping measures that they have been practicing from time immemorial and/or these days and to gather their suggestions for the possible reduction of climate-related risks.

At the outset, in each of the FGDs, the participants have explicitly been explained the objectives and processes of the PVA/PRA exercise, following a brief self-introductory round. As the discussions have proceeded, the participants have been requested to identify/mention the observed weather pattern/climatic events that prevail and, any observed and/or perceived deviation from the pattern prevalent in the past/yesteryears which they consider to be remarkable.

2.1 Perceived Changes in the Observed Climate

The changing scenarios of climatic events that have been perceived and mentioned by the participants are as follows:

- *Excessive rainfall in a few successive days:* Torrential rainfall within a short period (in days) being experienced these days, rather than constant rainfall over a wider span of days in the past.
- *Change in rainfall calendar:* Time/season of rainfall has changed over the years, what the participants termed as 'untimely rainfall' that poses much difficulty in the cultivation of crops. The highest rainfall round the year still occurs in the month of *Ashar* and *Srabon*, however since the past 5/6 years rainfall in *Ashwin* and *Kartik* has been increasing significantly, causing severe devastation to *Aman* crops and culture fisheries.
- *Increase in Temperature:* Temperature, as perceived by the participants in general, has increased these days as compared to the past.
- *Routine occurrence of drought:* Drought is being experienced every year in a routine manner. Both the time-span and intensity of drought have increased over the years. Excessive heat is felt during drought-time.
- *Colder winter:* The span of winter has become shorter but the intensity seems to be higher.
- *Excessive fog during winter:* Fog/mist is being experienced in an erratic manner as far as timing of occurrence is concerned but the intensity and volume are higher/ greater than the past.
- *Salinity in soil:* According to the participants, salinity is noticeably present in the soil of the whole area covering both Subarnachar

and Noakhali Shadar but not up to that extent in water. Due to this salinity in soil, bricks made of soil remain saline affected and causes brick-made house to be less durable. But to their relief, the extent of salinity has declined these days after making embankments.

- *Salinity in drinking water:* Although salinity in surface water has remarkably declined, it continues to affect drinking water extracted from shallow tube-wells.
- *Water-logging:* Water logging has become a major climatic concern for all the inhabitants of the area. In the past, lands used to become temporarily waterlogged due to inundation fueled by unusual high-tide. After the construction of “*veri-bandh*”³ in 1974 (in some areas, i.e. in Char-Clerk, an embankment was constructed about 4/5 years ago), sea water no longer enters the area, but water poured from excessive rainfall during the rainy season remain stagnant and turns the whole area into a ‘seasonally waterlogged’ area (for at least 5-6 months) causing excruciating misery to the people. The extent of water-logging, according to them, is increasing day by day.
- *Occurrence of tidal surge:* Tidal surge no longer affects the people residing inside the embankments. In the past, water used to enter and inundate the area with any unusual high-tide in the time of full-moon. During those days there was no well-built, designated cyclone shelter in the coastal areas. Modern multipurpose cyclone shelters have been built after 1991. Now-a-days tidal surge no longer occurs due to embankments. However, it still torments the life of people residing outside the embankment, especially when cyclone-led surge routinely occurs once or twice every year.
- *Occurrence of flood:* Inundation is very common caused mainly due to excessive rainfall during the rainy season. But this type of inundation can not be termed as ‘flood’ caused by the overflow of water from rivers. The construction of embankment is obstructing inflow of water from the overflow of the river Meghna (as seen in the form of flood in the past). Flood still occurs these days but not as severe and as frequent as it had been in the past due to the brought-about structural changes.
- *Frequency of Occurrence of Cyclone:* According to the participants, the frequency of cyclone has lessened over the years. In the past, cyclone coupled with tidal surge used to devastate the whole area.

2.2 Different Climatic Events: People Facing Different Problems

The participants identified the seasonality of occurrences of different climatic events on one brown paper. Exhibit shows that cyclones and storm surges used to hit during any month of *Baishak* to *Kartik* (mid April to mid October), but its prevalence is lower in *Bhadro* and *Ashwin* (mid August to mid September), as the participants perceived. Rainfall potentials overlap this cyclone prone season. Drought is prevalent in dry season which is accompanied by lack of safe drinking water in this dry/winter season.

2.2.1 Prioritizing events

After identifying the major climatic events that are prevalent in their area and the noticeable changes, their nature and extent, that have taken place over the years, the participants in each of the focused group discussions were requested to rank the five major climatic events in descending order of severity, and the extent of damages and sufferings afflicted upon the people. Upon a general verbal consensus the participants have come up with the ranking. Although water-logging has been identified as the worst climatic event by the participants in all the places, the rankings of other events have appeared to be different in the cases of the two Upazilla (Noakhali Sadar and Subarnachar). The difference in the ranking of the events reflect the differences in reality prevailing in the two study areas upon which people ascribe relative importance and set their priority.

³ Embankment to protect the area from tidal surge.

For the Noakhali Sadar Upazila, the list of five most important climate variability-induced problems are:

- Water-logging
- Drought
- Cyclone
- Changes in temperature
- Salinity

And in the case of Subarnachar Upazila, the list of the five most important climatic concerns appear as:

- Water-logging
- Salinity
- Drought
- Cyclone
- Tidal surges

As per request, participants in all the discussions then have cited the problems and sufferings: personal, social and economic, that they confront in their day-to-day lives afflicted by the occurrence and variability of the major climatic events.

2.2.2 Water-logging

- o Low-lying houses usually go under water or are greatly damaged by water.
- o Severe damage takes place in case of crop-agriculture, especially when it is inundated.
- o The very process of cultivation is hampered, particularly timely cultivation becomes difficult.
- o Both the '*Aaoush*' and '*Aman*' crops are potentially at high risk of being damaged due to water-logging, especially when the lands start getting inundated at the time of harvesting of '*Aaoush*' crop causing immediate damage to that crop as well as stalling the process of sowing for '*Aman*' crop.
- o The untimely excessive rainfall in *Ashwin* and *Kartik* causes devastation to *Aman* paddy; Just before harvesting this rainfall creates the problem of water logging which leads to a huge loss in *Aman* production.
- o Water-logging causes severe damage to vegetable cultivation.
- o Even if serious loss does not occur in the case of crop-cultivation in the water-logged land, the yield declines mainly due to the ageing of saplings.
- o Saplings in water-logged land become infected with pests/ insects. Use of pesticide/ insecticide appears impossible due to water standing on land, which results in lesser yield.
- o The cultivation of potatoes, peppers, soybeans, nuts, etc. is not possible during the period of water-logging.
- o Trees are severely affected by any prolonged standing of water. Jackfruit trees, *Neem* trees, papaya trees, etc. die in thousands, due to water-logging.
- o Water-logging causes an enormous loss to fishery of the area, especially when it becomes impossible to keep the fishes inside the ponds/water reservoirs with the rise of water level that causes overflow of water. The untimely rain in October in 2004 caused almost total devastation to culture fisheries as the banks of the ponds overflowed and the fishermen were not prepared to face the situation.
- o Houses especially low-cost houses made of mud, bamboo become dilapidated due to stagnant water and eventually collapse.
- o During the prolonged period of water-logging, a number of people die of snake-bites. An enormous loss to domestic livestock viz. cattle, chickens, ducks, etc. also takes place.
- o Since it becomes very troublesome for people to go outside during that period, they incur a huge loss from worklessness and lack of income/earning.
- o Communication is disrupted since most of the roads are damaged causing great misery to the people, especially to the elderly, children and patients. Access to treatment facilities is a great source of worry for the families.

- o People now invariably use shallow tube-wells for drinking water; whereas previously they used to drink surface water, pond-water in particular. They continue to drink water from shallow tube-wells despite the probable presence of arsenic.
- o During the period of water-logging, the problem of sanitation becomes acute. There appears an outbreak of diarrhea and other water-borne diseases.
- o People face energy crisis during this situation.
- o Water logging condition ultimately leads to a situation of environmental degradation. The polluted standing water causes severe environmental hazards.
- o It can be summed up that water logging increases vulnerability of people; especially poor people who hardly have the shock absorbing capacity.

2.2.3 Drought

- o During the winter/dry seasons the southern part of Noakhali Sadar (Aozbalia, for example) and most parts of Shubarnochar face the problem of salinity ingress. This leads to a substantial part of these lands being abandoned during dry winter season.
- o A substantial part of Noakhali Sadar and Shubarnochar do not have electricity and cannot have deep tube-well irrigation. So these people can not go for *Boro* cultivation which needs intense irrigation. Besides this problem the salinity ingress during dry season does not allow people to cultivate.
- o The problem of drinking water becomes evident during this drought condition. In many areas tube wells can not support the demand as the water table declines.
- o Fishermen who practice culture fisheries face tremendous problems. The ponds become dry and then there exists no fish in these dried ponds. For most of the fishermen this drought situation leads to worklessness during winter.
- o Fishermen face tremendous employment and food insecurity during winter
- o People try some vegetable cultivation in winter which is hampered by severe drought situation.
- o Heat stress leads to different health hazards and outbreak of diseases.

2.2.4 Cyclone

- o The participants reported deaths due to cyclone. Cyclone causes devastation not only to the human being; but also creates damages to the lives of animals, cattle.
- o The physical effect of cyclone is evident. It destroys houses, especially weakly-built houses.
- o People lose physical assets (houses, garden, household utilities, boats, tube-well, latrine, poultry, cattle, roads, embankment etc.) due to cyclones.

2.2.5 Salinity

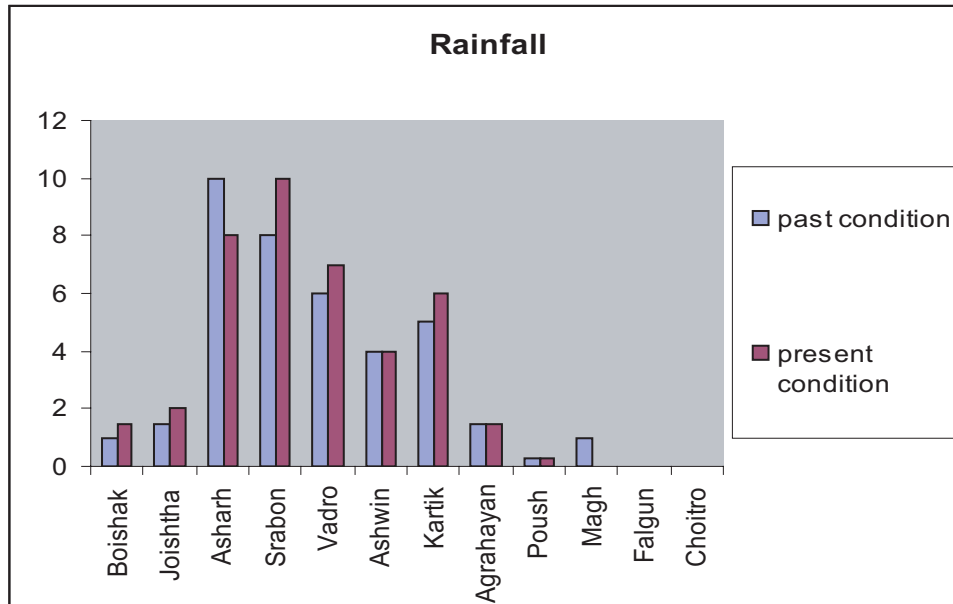
- o Salinity severely affects the potential to cultivate *Boro* crop. Prevalence of salinity in drought condition limits farmers' options for cultivation which also reduces their incomes.

2.2.6 Changes in Temperature

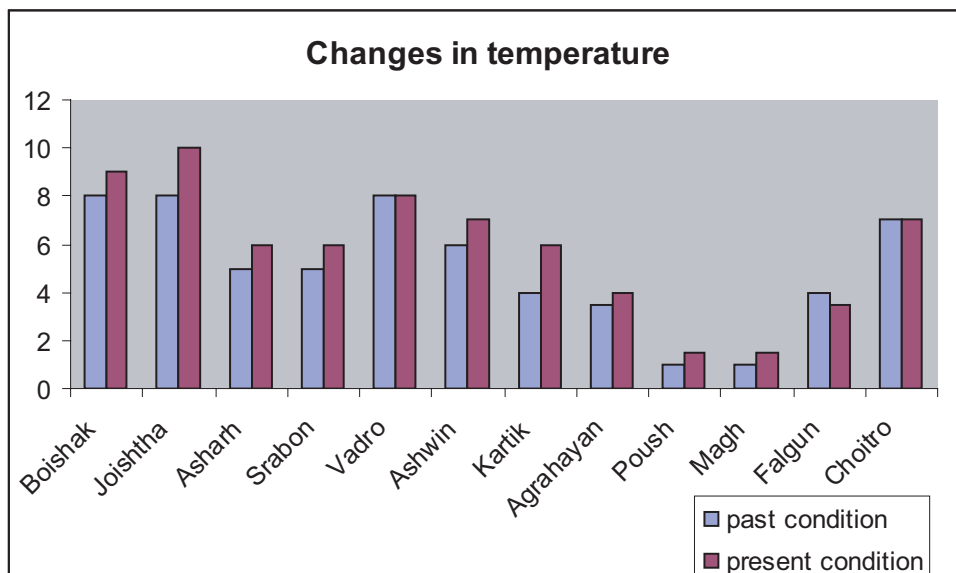
- o Due to heat stress during hot summer, people especially working as farmers and day laborers are worst affected.
- o The day laborers cannot work at a stress due to scorching heat in summer and in the month of *Bhadro*, leading to less incomes.
- o It is very difficult for the fishermen (both for capture fisheries and open water fisheries) to catch fishes in the middle of night or at the very outset of morning in winter. They cannot properly cover themselves with warm clothes while fishing, which lead to different health hazards for them.
- o Usually women and children fetch water from distant tube wells. It is more difficult to collect drinking water or biomass from common property resources in summer.

2.3 Understanding the changes in perception about different climatic events

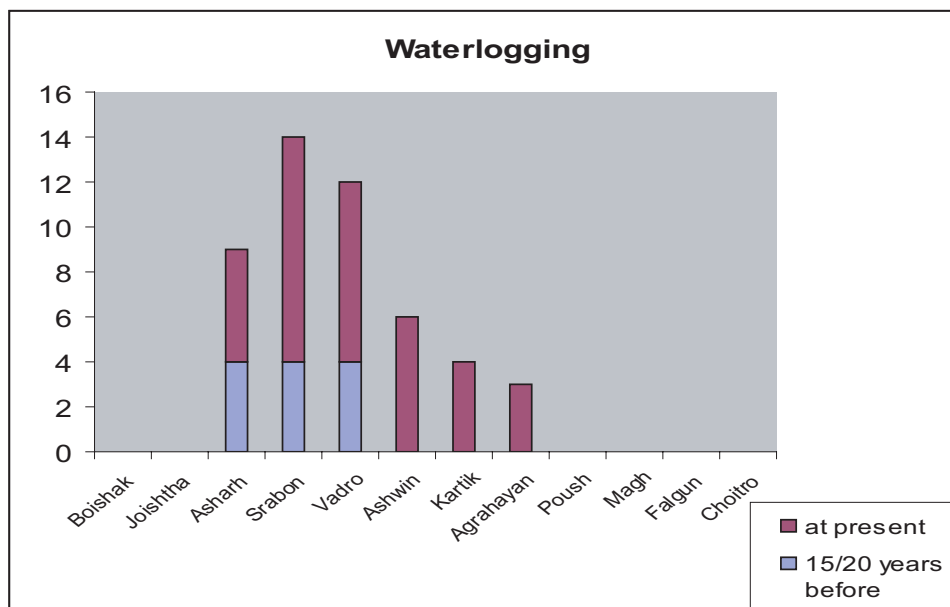
The next step was to encourage participants to draw histograms of monthly average rainfall for each month of a year that enables a comparison of rainfall distribution of present day with that of the past. Shy initially, and reluctant to be the first to step in, several participants without any prior formal background drew a comparative histogram showing the past rainfall patterns along with the present one, based on their perception/experience (Graph 1). In the same manner, participants drew a monthly spread of maximum temperature showing a comparison of the present day's maximum temperature (Tmax) with that of the past (Graph 2). The graphs exhibited here are representatives of all the FGDs conducted.



Graph 1: Comparison of Rainfall Conditions as Perceived: Past Vs Present



Graph 2: Comparison of Distribution of Temperature (in relative scale)



Graph 3: A Comparison of Water Logging Situation: Present Vs Past

According to the perception of the participants, both in Noakhali Sadar and Shubarnochar upazila, water logging problem has become a major one since the past 15-20 years. They were asked to score the problem within a scale of 1 to 10 (maximum water logging month being ranked with 10). 15 years ago the people of this community faced water logging during rainy season only (*Ashar* to *Bhadro*, mid June to mid August) and they scored this situation as 4, while they are now facing more intense water logging problem during this season and they now score this problem during rainy season as 10 (Graph 3). In addition, the duration for water logging in the area has also increased, which now lasts up to *Agrahayan* (December).

2.4 Climate Change Induced Social Problems

The overall chapter depicts the perception of the local community about the impact of climate change on various aspects of natural ecosystem, life and livelihood, food security and more. It is noteworthy, there are also some social issues often faced by the local community especially by women which are considered as the consequence of climatic variability as well.

- In char areas the social insecurity, especially for women, increases during water logging situation and law and order situation becomes worse.
- Salinity causes different health hazards, especially it leads to skin diseases. For unmarried women these skin diseases greatly hamper their process of marriage and sometimes it causes social problems.
- Women face serious domestic violence during summer. As reported by the women, the male members of their families get stressed working in lands or doing other laborious job in summer and often lose their temper. They often beat their wives or children and domestic coherence is affected seriously.

2.5 Some Prioritized Issues Perceived By Local Community

2.5.1 Food Insecurity

The term 'Food Insecurity' here refers to a situation when a person or the members of a household appears to be half fed (not having enough food for 3 times a day). The participants were asked to identify the months of food insecurity faced by the households.

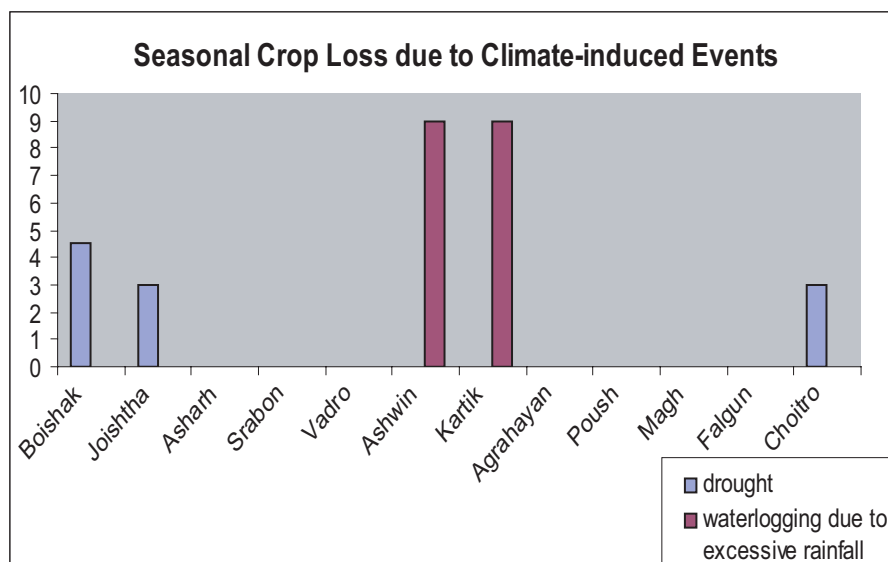
The farmers and fishing communities explained that their food insecurity occurs with non-availability of employment, seasonality of food availability, seasonality of fish catch etc. The farmers seem to be well off with

food during the post harvest period. Since *T. Aman* is the most important crop in Noakhali, farmers perceive to have food security during *Poush*, *Magh* and first half of *Falgun* (mid December to early March), just after harvesting *Aman*. Then they sell their crops and collect money to invest for growing Rabi crops. During *Ashar*, *Srabon*, *Vadro*, *Ashwin* and *Kartik* (June to mid October), they face tremendous food insecurity as the farmers actually do not possess any crop during this season, rather they get themselves involved in the preparation for *Aman*.

However, the seasonality scenario of food insecurity for fishermen is not the same as we have observed for farmers. Fishermen face food insecurity during dry seasons such as *Poush*, *Magh*, *Falgun* and *Choitro* (December to March). As the fishing beds get dry during this season, they do not get enough fish to sell. But for fish traders, they do not seem to have serious seasonality impact on their food security. These traders buy fishes from wholesale markets, not only from local markets but also from adjacent big markets and then sell to local markets.

2.5.2 Crop Losses due to Perceived Changes in Climate Variability

The participants were asked to identify the extent of loss of crops due to apparently changed climatic events, again based on their perception using the score ranging 1 to 10. The participants claimed high loss in crop production during the local months of *Ashwin* and *Kartik* (mid September to mid November) due to severe rainfall induced water logging. Since transplanting *Aman* paddy becomes difficult in inundated low-lying lands, farmers in Noakhali are facing a new phenomenon of crop (*Aman*) damage in these months. Graph 4 shows the histogram developed by participants to identify their seasonal risks in crop production.



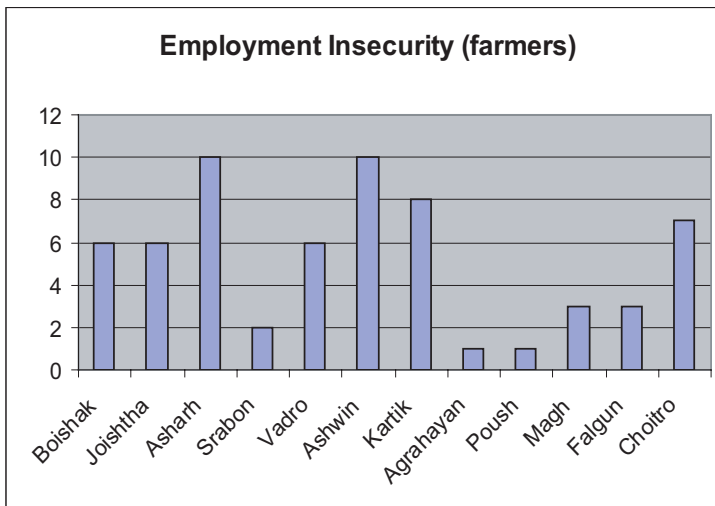
Graph 4: Seasonality of Crop Loss due to Climate-induced Events

The participants claimed crop loss was found to be rather low during the local months of *Choitra* (March-April), *Baishakh* (April-May) and *Jaistha* (May-June); these losses are incurred due to lack of adequate rainfall, drought condition, or because of hailstorms. The irony of the fact is that in a majority of the areas in Nokhali Sadar and Shubarnochar people cannot practice Boro Crop because the problem of increased salinity in dry season. In addition to that, because of lack of availability of sweet water in dry season, people in Noakhali cannot go for relatively high yielding variety of paddy '*Boro*'. But people over there identified *Aman* loss as a major crop loss, while they simply ignore the potential to practice different crops in winter/dry season except vegetable cultivation.

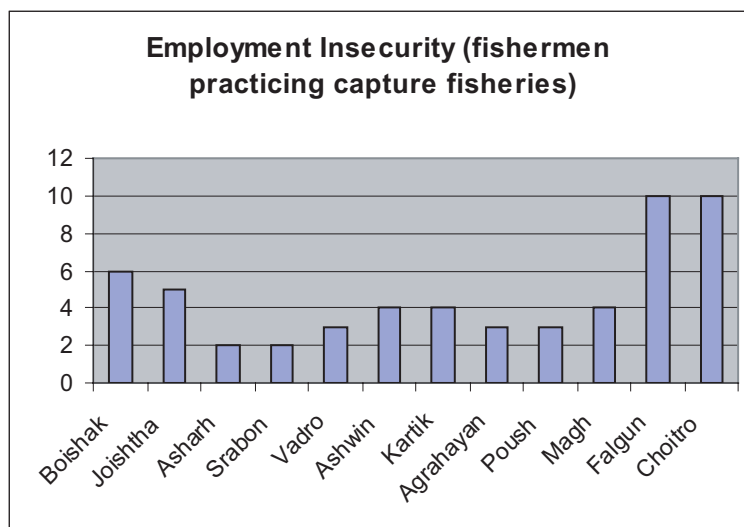
2.5.3 Employment Insecurity

The participants were asked to identify the periods when they do not have adequate employment security. In response, through a consensus, the farmers and the fishermen came up with two different histograms for these two different professional groups. A significant observation is that the months of *Ashwin* and *Kartik* (mid September to mid November) is regarded as least employment secure and this coincides with the period of food insecurity (Graph 5).

They also do not have enough employment during rainy season excepting for seedbed preparation in order to transplant *Aman* in the month of *Ashar* (mid June to mid July). For the fishermen who are involved in capture fisheries, hardly any sort of employment in the dry season is available and their food insecurity naturally overlaps the employment insecurity (Graph 6).



Graph 5: Distribution of Employment Insecurity (Farmers)



Graph 6: Distribution of Employment Insecurity (Fishermen)

Chapter 3

COPING MEASURES: INHERENT RESILIENCE

3.1 Livelihood Conditions

Coping practices are often spontaneous and immediate response of the vulnerable people to different shocks. People practice their coping with the assets they have. The livelihood conditions of the people largely depend on ownership of or access to capital by households which broadly determines their capacity, scope and survival strategy. Well being of people and in particular the freedom they have to choose their assets for income generating activities depend to a large extent on their vulnerabilities to changes in their environment that are beyond their control (sudden natural disaster, for example). The study team interacted with local people and summed up a list of assets people have. No attempt has been made to enquire assets of large landlords or large industrialists. The asset base is categorized as Human, Social, Natural, Physical and Financial Assets.

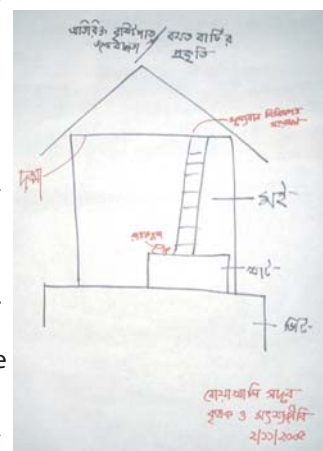
Table-1: Typology of Assets Identified by the Respondents which are Used for Coping

Cluster	Assets
Human	Household members, health, education, training
Social	NGO/cooperative groups, UP, network/connection
Natural	Land, water, CPR, homestead, wetland, pond
Physical	House, tube well, latrine, electricity, cattle, poultry, tools and utilities, boat, net
Financial	Savings, credit, food/cash assistance (social safety nets)

3.2 Coping starts with strengthening houses

At the very outset of the study the team made a reconnaissance visit in selected areas. Other than Pouroshova⁴, in most of the unions “kacha” houses made of bamboo (‘muli’ bamboo) and tin roof are very common; even jute sticks are also used as the walls and jute fabrics as ceiling. People who are very poor use mud as house material. These types of houses are more vulnerable to sudden shocks such as natural disasters than brick-built houses of comparatively wealthier families.

Every section of people tries to strengthen their houses before the cyclones start in monsoon. They do this in a manner which is within their capacity. Usually the foundations of all the houses of Noakhali Sadar and Shubarnochar Upazila are raised so that the rain water cannot enter into the house. Usually they raise the platform at a height which can protect the



⁴Urban Centre, where an elected body takes care of local level development and management issues.

Figure 1: Internal Arrangement of a house

houses from regular/average flooding with rain water. The families who have some extra money to invest on houses, raise their platform above the average height just in anticipation of excessive rainfall which causes devastating water logging condition. The kitchens are also placed on raised platforms.

When the waterlog condition deteriorates with excessive rainfall, they shift all the household utilities on a bed where the family members not only live but also cook. The internal structure of their houses have a provision for space on the false ceiling, what they locally call "Darma". Ceiling-like raised/high platforms, locally termed as "Darma", are built inside the houses to keep ownership documents/deeds of lands, other important papers/documents, dry food e.g. fried swollen rice ('Cheera', 'Muri' etc.), rice, and pulse, salt, sugar ('gur'), matches, candle, kerosene, quilt, 'kantha', etc. safe in the wake of emergency during the water-logged period. A staircase made of bamboo (locally called "Moi") usually connects people to this false ceiling. People themselves have drawn a sketch of the internal arrangements of their houses while conducting FGDs and the sketch is exhibited in figure 1.

Ovens are made using mud, tin, and cement and kept on "Darma" for use during waterlogged period/floods. Cooking is done on top of beds using those ovens, which the participants have learned to mimic from demonstrations in mass communication campaigns. Raised platforms are made of bamboo for urination and defecation purposes during that time.

Houses outside the embankments are usually raised on an even higher platform, allowing the regular tidal surges to flow without any protection. This platform is about 4-5 feet high. Then on this raised platform people again raise another platform, about 1-2 feet high, building houses on this secondary raised platform. This secondary raised platform helps to protect the houses from unusual tidal surges. They do post harvesting activities on the primarily raised platform. Other than this two-stage raised platform, the internal arrangements of the houses outside the embankments are almost the same as the houses inside the embankments. It can be sensed that the financial condition of habitats outside the embankments are the worse. Most of the houses there are built of mud. There are some latrines in a few houses, but the overall sanitation condition is not satisfactory at all.

People take some preparation before the cyclone season starts. Preparation again depends on their capacity to invest. Usually they tie the corners of their houses with strong ropes or still wires. To protect from rain they repair their ceiling almost every year. Walls made of mud and ceiling made of jute sticks or leaves are specially taken care of before rain comes or cyclone strikes. People who are very poor and do not even have money to repair the house with minimal efforts, take shelter in neighbor's house, adjacent schools, *madrasa*. During water logging due to excessive rainfall, cattle, chicken, ducks all take shelter under the same roof where the families live. Very few families have that luxury to keep a separate barn which is locally called "Goal Ghar".

3.3 Coping strategies for agriculture

As agriculture is the major sector in Noakhali Sadar and Shubarnochar Upazila, the changing practiced cropping pattern with changes in different climatic events were studied in detail. Different cropping patterns are followed in different unions of same upazila. The pattern depends on land inundation type, salinity, land quality, availability of irrigation facilities etc. Table 2 summarizes the practiced cropping behavior of the selected sample sites of Nokhali Sadar and Subarnachar Upazila.

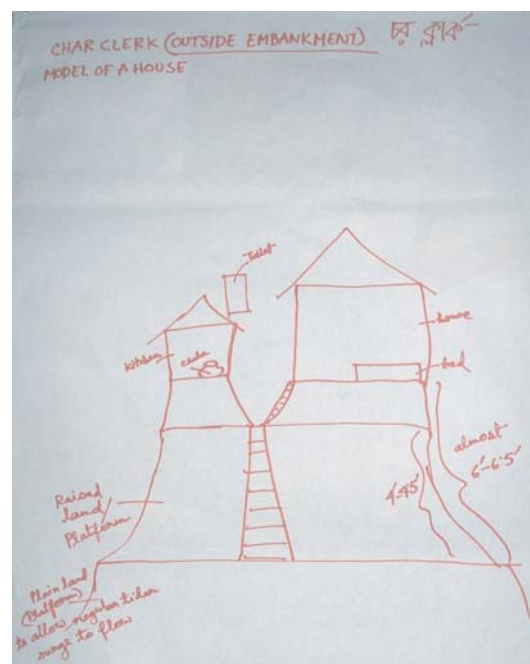


Figure 2: Houses situated outside the embankment

Table-2: List of Practiced Cropping Patterns in Different Unions of Noakhali Sadar Upazila

Unions	Cropping Pattern	Cropping Intensity
Dadpur	Aus + Aman + Vegetables Aus + Aman + Fallow Fallow + Fallow + Boro Aus + Aman + Boro	3 Cropped = 40% 2 Cropped = 15% 1 Cropped = 45%
Ashwadia	Aus + Aman + Winter crop Fallow + Aman + Winter crop Boro + Fallow + Fallow Fallow + Aman + Aman	30% 30% 10% 30%
Newazpur	Boro + Fallow + Fallow Boro + Winter crops + Fallow + Fallow	90% 10%
Kadirhanif	Boro + Fallow + Fallow Boro + Aus + Fallow Boro + Aus + Aman Vegetables + Vegetables + Vegetables	50% 25% 15% 10%
Binodpur	Boro/vegetables + Fallow + Fallow	100%
Noakhali	Aus + Aman + Boro/winter crop Fallow + Aman + Fallow Fallow + Fallow + Boro	40% 50% 10%
Kaladarap	Fallow + Fallow + Aman Fallow + Aus + Aman Winter crop + Aus + Aman Winter crop + Fallow + Aman	40% 15% 5% 40%

This pattern is greatly influenced by different climatic factors. As mentioned earlier, waterlogging is the most striking problem now-a-days, the crops which cannot withstand waterlogged condition cannot be practiced for all practical purposes. For example, the untimely excessive rainfall in October in 2004 caused serious waterlogging leading to severe devastation of *Aman* crops. This year people themselves are trying to sort out a method by which *Aman* paddy can be saved from untimely excessive rainfall in *Ashwin* and *Kartik*. Some strategies to protect *Aman* from being destroyed by waterlogging are mentioned here:

- o This year late varieties of *Aman* rice viz. *kazal-shail*, *raje-shail* (both black and golden), *chaprash*, *kartik-shail*, *dholamota*, *leiccha*, *nazir-shail* are sown with a view to coping with water-logging. These late varieties (sown in late *Shravan* or early *Ashwin*, instead of early *Shravan*) are more tolerant to standing water. The main disadvantage of these late varieties is that their yield is lower compared to the variety which can be sown in due time (*Shravan*).
- o The seedbed of *Aman* is always prepared on a raised land in the month of *Ashar*. If the seeds get destroyed with water or any other reason, people take extra initiatives to protect the seedbed and that is the reason for doing seedbeds on a higher platform.
- o Some people are practicing broadcast *Aman* a bit earlier, say in *Chaitro*. *IRRI-23* is popular variety of this kind. They have experienced that this early variety grows with stronger sticks of paddy and pests are manageable. The most advantageous part of it is that it can be harvested before the untimely rain of *Ashwin*, avoiding the risk of waterlogging.
- o In most of the *Aman* lands, farmers broadcast "*Khesari*" (one kind of pulse) at the end of *Kartik*, just one or one and half months before *Aman* harvesting. It is found that *Khesari* helps to keep soil nutrients intact and after harvesting *Aman* this *Khesari* lasts for another one month and then harvested. The decomposition of the residues of *Khesari* is a natural fertilizer. This strategy helps to compensate the loss of *Aman* crop.
- o People who are living within a subsistence level, are always risk averse. They do not have any practical reason to undertake risk which can destroy even their last resource. Due to an increased tendency in untimely excessive rainfall *Aman* crops sometimes face threats of devastation and people go for backup plans.

There is a popular cropping system in Noakhali, locally called “*Bajal*”. *Bajal* is actually not a distinct variety of paddy. Farmers mix up the seeds of *Aman* and *Aus* and broadcast it in *Chaitro Baishakh* when usually *Aus* is cultivated. In *Shravan*, *Aus* is harvested with *Aman* left in the land. This *Aman* can be harvested a bit early avoiding the problematic rains in *Aswin* and *Kartik*. As perceived by the people, almost 60% of the farmers practice *Bajal*. This cultivation technique does not require much effort and farmers can get two harvests with minimum effort.

- o In Noakhali an indigenous practice has developed that goes some way to solve the problem of poor crop yields. It is the *Aman* crop that is particularly vulnerable and often limited by flooding/water logging. The local farmers have developed a system known as *Bhadi*. It is a method of double transplantation of the rice seedlings providing them with greater tolerance to standing water, wind and pests. The seedlings are sown on high land and transplanted after 25-30 days (still on the highland) before being shifted to their final resting place in the main low lying fields.
- o Outside the embankments where regular tidal surges are a common phenomenon, people can not practice regular variety of any crop. They practice the varieties with higher salt tolerance, “*Raja shail*” for instance is the most common variety that people outside the embankment practice. But people become frustrated with the devastations caused by the tidal surges and very often leave their lands fallow, because they consider the investment for cultivation as loss.
- o Vegetable cultivations are largely practiced all over Noakhali. Commercial as well as domestic production of vegetables is very common here. Vegetables growing with a support of “*Macha*” are a common scene here. This *macha* based cultivations are not only practiced within the household, but also beside the surface of the adjacent ponds of their houses. *Macha* is a frame made of bamboo or jute sticks or woods collected from trees which helps protect vegetables from standing water or waterlogged situations. Almost every household practices this. They often use the ceiling of their houses as *macha*. All sorts of *Rabi* crops are cultivated here, especially soybeans, different types of nuts, chilli are highly potential. Some of the oilcrops, cereals, pulses, vegetables and others which are being practiced here are mentioned in Table -3.

Table-3: Major Variety of Crops and Vegetables Grown in Noakhali

Oil crops	Cereals	Pulses	Vegetables	Others
Soybeans	Wheat	Greengram	Chilli	Sweet potato
Sunflower	Maize	Groundnuts	Garlic	
	Triticale	Cowpeas	Onion	
		Mungbean	Tomato	

- o Another indigenous method for increasing crop production is practiced by some farmers involved in agro-forestry. There is much competition over the land use in a country where agro-forestry accounts for about 80% of the country's timber and fuel wood production. The practice of inter-cropping allows both of these needs to be met.
- o Crop-Fisheries mix-a new horizon of cultivation: Noakhali is a district where almost every household has its own pond adjacent to the homestead. Not for commercial purpose but for their own consumption they culture some fishes which grow in a natural way. Now days, crop-fisheries mix agriculture is very popular. Farmers dig a canal, not very deep, around the surface of their agricultural lands. They raise the land to some extent to culture *Aman/Aus/vegetables* over the raised lands. Fishes are released in the low surface of the pond where the canal is excavated, just before harvesting *Aman*. When excessive rain comes in, extra water can go to these canals without hampering the standing crop. After harvesting *Aman* farmers can grow vegetables in this land, even *Bajal* is being practiced here. Thus the farmers have arrangements to get rid of excessive water and benefit through the sale of fish.

- o For cultivation, farmers use fertilizers viz. gypsum, maids, potash, etc. to reduce salinity in land. The extent of salinity is different for different sections of an uneven land. Hence to make the extent of salinity equal all over the land the farmers first make the land even and then use various types of fertilizers mentioned above.
- o With the onset of drought, since lands become covered with a thin layer of salt farmers thoroughly plough their land upside down in order to reduce salinity. Since water becomes scarce and less available farmers bring water from ponds to use it in their lands for cultivation. Farmers usually use pitchers for fetching water from nearby ponds. Relatively well-off farmers use shallow machines for channeling water from ponds.

3.4 Strategies Taken By Fishing Community

For the past 15-20 years culture fisheries have been practiced by the fishers of Noakhali Sadar Upazila. In some areas of Shubarnochar, which are at the southern part of the Upazila and close to river Meghna, some people go for capture fisheries.

3.4.1 Employment Pattern of Fishermen

- a) Culture fishes in pond and sell it to local market;
- b) Capture fishes in open water/rivers/*khals* and sell it to local retail/wholesale market;
- c) Trading of fish-do not culture or capture fishes, rather buy fishes from local wholesale market and sell it to the local retail market;
- d) Trading of fish along with other small scale businesses in local market.

3.4.2 Problems Encountered by the Fishermen

The fishermen reported through a consensus that

- a) The availability of fishes has declined significantly;
- b) Not only the availability, but also the diversity of species of fishes in open water has drastically fallen; about 75% of the species available earlier are not seen now;
- c) For capture fisheries, fishermen have to go to deeper river/sea to get a good catch.

It is understandable that the problems of culture and capture fisheries are not the same; also the problems of the fishermen who only depend on fishing and do not have other trading or business have distinct problems. The fish traders can make their business throughout the year. But fishermen who culture fishes in ponds do face employment insecurity in dry seasons, especially in the month of *Falgun* and *Chaitro*. They then go for "crisis coping" which will be discussed later. Fishermen going to the deep sea must have some preparation to protect themselves from cyclones. They carry radios in the trawlers and go to the nearby shore following the signal declaration in radios. Fishermen are usually not alarmed before the signal number reaches to 8.

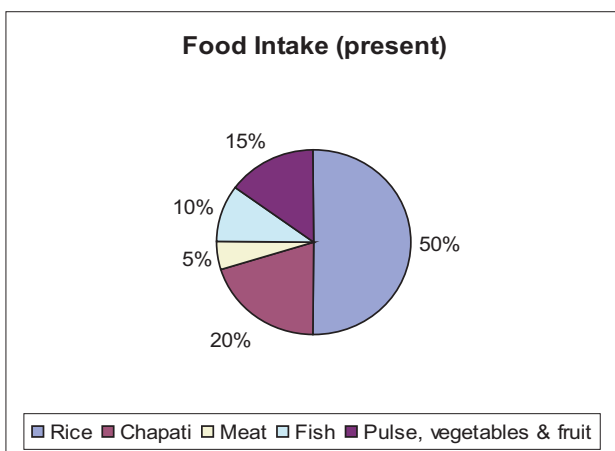
3.4.3 Ownership pattern

- a) Have own pond, culture fishes on their own, collect fishes from the pond with own net and own effort, sell in the local market;
- b) The owner of the pond is not directly involved in culture fisheries. Rather the owner hires somebody to capture fishes from the ponds. Sometimes the net can be owner's and sometimes the net can be hired labor's. The hired labor can earn 100-125 Tk. in the peak seasons;
- c) Sometimes fishermen arrange leased ponds and culture fishes there. They have to pay a certain amount for the lease to the pond owner; this payment is made usually on an annual basis;
- d) Usually the fishermen who go for capture fisheries have their own/collective nets. These collective nets are owned by the fishermen who go collectively (in the same trawler) for fishing; often they themselves make the nets. They do not have trawlers of their own. They go to the river/sea at least for 15 days at a stretch. They store food in their trawlers for these days. The cost of their food is partly borne by the trawler owners. Rest of the cost of fishing other than fuel (of the trawler) must be paid by the fishermen. They have to pay half of their earnings to the trawler owner. These fishermen suffer from serious insecurity which is caused by the pirates.

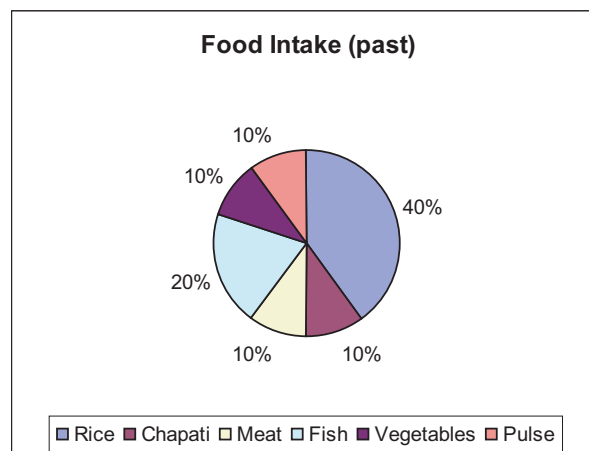
For the fishermen involved in culture fisheries, excessive rainfall and waterlogging cause severe devastation to their livelihoods. During the waterlogged situation in October 2004, each and every fisherman faced serious damage of their fishes, overflowing the banks of the ponds. One farmer at Shubarnochar reported that he invested about 3 lakhs taka in his own pond and leased ponds, but everything got washed away during the excessive rainfall in October 2004. Facing this reality, this year they are preparing for some protection, of course depending upon the resources available at hand. They have raised the banks of their ponds to a height which can withstand regular waterlogging as well as abnormal conditions. The fishermen, who are very poor, cannot raise the banks, are somewhat fatalistic, accepting the reality that they do not have any control over the situation. At this stage they think of alternate livelihoods like, day labor, rickshaw pulling, small trading etc. It is very common in pond fisheries to net the entire surface of the pond not to allow fishes to overflow with increasing height of the water. Of course, again, people who can afford netting can try for this coping strategy as an option.

3.5 Coping with Food Insecurity

As mentioned earlier people face seasonal food security/insecurity. By the word “security”, only the availability of food 3 times a day is meant. Here, the question about quality of food does not come in. The focus group discussants have come to a consensus about changes in their food intake both in terms of quantity and quality. As exhibited in figure the protein intake has drastically gone down in recent years, except for the families of fishermen. Lentil (*dal*) has been a major source of protein for poor people since time immemorial. The most preferred variety was ‘mung’, however people could easily afford ‘mosuri’, the most common lentil. Now “Mosuri” cannot be consumed by general people because of its high price. They take cow-peas (*Buter dal*) now, recognizing the fact with sorrow that cowpeas were provided to the cattle as a source of extra protein even a couple of decades ago. It is alarming that their protein intake has gone down substantially, causing serious nutritional problems, especially to the children and pregnant women. In the months of food insecurity, the families often experience a famine-like condition (locally known as *monga*). During *monga*-days they do not even have their usual 3 meals a day. For fishing households, the dry season of *Falgun-Chaitro/Ashwin-Kartik* for farmers, and *Ashar-Srabon* for day laborers-manifest serious food insecurity. Often they cope with extreme food insecurity by consuming lesser amounts, and most often by forfeiting one to two meals a day. In addition, they avoid unnecessary movement, thereby conserve energy and pass most of the time during the day sleeping. Starch (carbohydrate) constitutes a major part of their diet during times of food insecurity. Graphs 7 and 8 provide a comparative analysis of food intake with an indicative change in food-types.



Graph 7: Food Intake Present



Graph 8: Food Intake Past

Women were specifically asked how they manage this starvation. Often women collect vegetables from common property resources (“*Tokano*”). In most cases priorities are given to the male member of the household to give the food first. Then the remaining food is distributed among the elderly and children. Women come last in the scenario, eating the left overs.

To face the shocks/disasters, women of the households often store dried foods in polythene packs and store it on *Darma* in their houses.

3.6 Availability of Safe Drinking Water

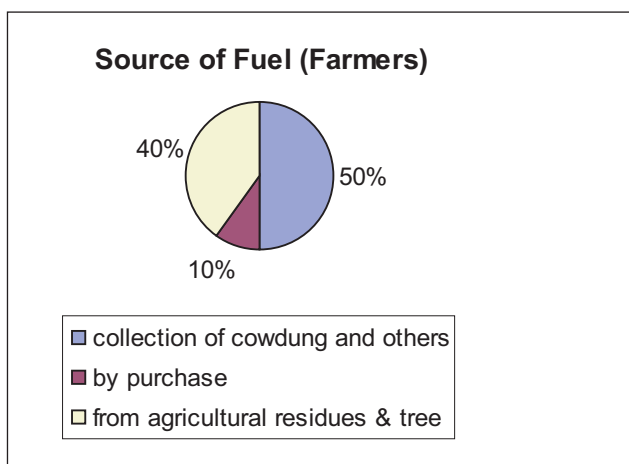
Both in Noakhali Sadar and in Shubarnochar people take water from tube wells for drinking. They are aware of the problem of arsenic. Every household does not possess a tube well. Those who do not have tube well in their houses have to go to nearby houses or schools or madrasas to fetch drinking water. Usually the women or children in the family are responsible for collection of water.

When there is excessive rainfall and waterlog condition prevails, sometimes polluted water enters into the water level of tube wells, and then it is extremely difficult to manage safe drinking water. During the waterlogged time, water is purified either by boiling or by using gypsum (*'fitkiri'*) People still try to boil water collected from surface in this situation. But as energy is not abundant, it is really difficult to boil water for drinking. Rainwater is harvested/collected as drinking water since all tube-wells go under water during the waterlogged period. Besides this measure, wood/branches of trees are stored on *"Darma"* to be used as firewood for boiling pond-water.

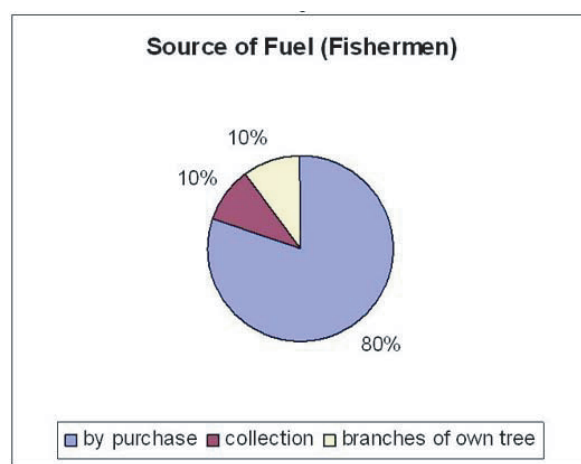
The inhabitants of the Subarnachar Thana in particular, previously used to drink water from shallow tube-wells. But now-a-days, with the dissemination of knowledge, they usually drink water from deep tube-wells since the chance of water being saline is much lower in the latter case. In the past, when they did not have any specific knowledge about salinity they used to drink water from ponds as well.

3.7 Coping with Energy Insecurity

As exhibited in graphs 9 and 10, biomass is still the most important source of energy for the inhabitants here. But as the common property resources are decreasing over time and agriculture tends to depend on power tillers rather than draft power, the availability of cow dung has gone down. In farmers' families agriculture residues are an important source of energy, while the families of fishermen are largely dependent on fuels bought from the markets. Dried-up maize tree, paddy straw, roots and branches/creepers (*'lata'*) of *"seem"* tree, left-over fences of *"seem"* tree, etc. are used as firewood for cooking. During water logged situation this fuel is stored on *Darma*.



Graph 9: Source of Fuel (Farmers)



Graph 10: Source of Fuel (Fishermen)

3.8 Crisis Coping

Households adopt a wide range of strategies to cope with crisis. Immediately after/during the crisis people take credits from relatives/neighbours, often they take loans from local *"Mahajans"* (i.e., rich persons) with high interest (usually 100 tk. interest per month for 1000/tk. of loan) to face the emergency needs. Specially, during/just after water logged situation or drought situation, diarrhea and other diseases break out and they go for informal loans. Often in this situation they sell their homestead trees, lands, jewelry and even their lands/assets.

Seasonal migration is very common here. Especially during the dry season when farmers cannot cultivate lands due to salinity or lack of irrigation facilities, people often leave their homes and go to nearby cities in search of job opportunities.

3.9 Best Practiced Hazard Specific Coping Strategies : Down to Earth Initiatives

3.9.1 Water-logging

- To cope with water-logging, houses are being built with fences made of bamboo (*'muli'* bamboo) and wood.
- The foundation floors of the houses are raised so that water does not enter very easily, until it reaches a certain level.
- In the case of crop-agriculture, late varieties of *'Aman'* rice viz. *'kazal-shail'*, *'raje-shail'* (both black and golden), *'chapraish'*, *'kartik-shail'*, *'dholamota'*, *'leiccha'*, *'nazir-shail'* are sown with a view to cope with water-logging.
- During the water-logging period cattle are reared/ kept by raising the floor. Seed-beds are also prepared by raising the piece of land with soil/ mud. In some places crop-land is raised to some extent for cultivating winter crops (*'rabi'* crops).
- As a precautionary and safety measure, the levees (sides) of the fishing ponds are raised up to a certain level so that fish are not drifted away from the ponds.
- Most of the fishermen catch fishes in the ponds, water reservoirs and to some extent in water-logged lands since almost all the canals have been filled-up with silts and the river (Meghna) has moved to a distant place changing its course.
- Ceiling-like raised/high platforms, locally termed as *"Darma"*, are built inside the houses to keep ownership documents/deeds of lands, other important papers/documents, dry food e.g. fried swollen rice (*'Cheera'*, *'Muri'* etc.), rice, and pulse, salt, sugar (*'gur'*), matches, candle, kerosene, quilt (*'kantha'*), etc. safe and stored in the wake of emergency during the water-logged period.
- Day labourers can store foodstuff hardly for 2-3 days. Those who live hand to mouth become compelled to borrow money from able ones. If they fail to borrow any money or food, they have to pass days unfed.
- Rainwater is harvested/collected as drinking water since all tube-wells go under water during the waterlogged period. Besides this measure, wood/branches of trees are stored on *"Darma"* to be used as firewood for boiling pond-water.
- During the waterlogged/flood time, water is purified either by boiling or by using alum (*'fitkiri'*).
- Dried-up maize tree, paddy straw, roots, branches and creepers (*'lata'*) of *"seem"* (bean) plant, left-over fences of bean plants etc. are used as firewood/ignitable biomass for cooking.
- Cow-dung collected either from own cattle-rearing or from somewhere else is another source of energy for cooking.
- Ovens are made using mud, tin, and cement and kept on *"Darma"* for use during waterlogged period/floods. Cooking is done on top of beds using those ovens, which the participants have learned from mimic demonstrations in mass communication campaigns.
- Raised platforms are made of bamboo for urination and defecation purposes during that time.

3.9.2 Salinity

- The inhabitants of the Subarnachar Thana, previously used to collect drinking water from shallow tube-wells. But now-a-days, with the dissemination of knowledge, they usually drink water from deep tube-wells since the chance of water being saline is much lower in the latter case.

- Now even when people drink water from shallow tube-wells, they purify it using alum (*'fitkiri'*).
- As a noticeable effect of salinity, the complexion of peoples' skin becomes darker. But people have become used to/adjusted to this phenomenon.
- For cultivation, farmers use fertilizers viz. gypsum, TSP⁵, potash, etc. to reduce salinity in land.
- The extent of salinity is different for different sections of an uneven land. Hence to make the extent of salinity equal (all over the land) the farmers first make the land even and then use various types of fertilizers mentioned above.

3.9.3 Drought

- With the onset of drought, since lands become covered with a thin layer of salt farmers thoroughly plough their land upside down in order to reduce salinity.
- Since water becomes scarce and less available farmers bring water from ponds to use it in their lands for cultivation.
- Farmers usually use pitchers for fetching water from nearby ponds to use for cultivation in lands. Relatively well-off farmers use shallow machines for channeling water from ponds.
- Throughout the drought period there arises a crisis for drinking water since water cannot be withdrawn using shallow tube-wells. People have to look for deep tube-wells in nearby locality.

3.9.4 Cyclone

- In a bid to reduce loss of lives and resources, Red Crescent Society does advocacy and announcements in particular, at the time of cyclones.
- Upon hearing these announcements and announcements of signals on the radio, people throng in hundreds to take refuge in cyclone shelters.
- In addition to cyclone shelters, people of nearby locality take shelter in homes of those who have strongly built houses.
- After 1971, another practice of taking shelter at the time of cyclone emerged; people with their cattle take refuge in a land made highly raised.
- The inhabitants usually tie-up their houses strongly so that these can withstand the severity of storms.
- They keep food underground in pots made of mud, by digging earth.
- People keep seeds in polythene bags and bury those bags underground.

3.9.5 Flood

No devastating flood (flood in actual sense) has occurred in the study area since 1970 attributable to the surrounding embankment providing protection from tidal surges. After building the embankment, there has only been severe water-logging. Hence, peoples' coping practices for flood in the area are similar to those for water-logging and cyclone.

⁵ Triple Super Phosphate (TSP), a phosphorous containing fertilizer. Single Super Phosphate (SSP) fertilizer was also observed in stores, bearing evidence that SSP was also being used as fertilizer.

Chapter 4

WOMEN'S VULNERABILITY TO NATURAL DISASTERS IN NOAKHALI

4.1 Introduction

Bangladesh being a traditional patriarchal society, upholds a widespread gender gap in all spheres and at all levels, as national statistics on health, nutrition, education, employment, wage rate, participation in public arena clearly demonstrate. Although the Gender Development Indicators (UNDP, 2003) in Bangladesh in recent years have shown encouraging improvements, the majority of women in coastal district of Noakhali are still outside the development fold. Specially, the women in "Chars" face extreme deprivation. Though both poor men and women in the coastal area have a common legacy of poverty and insecurity, the 'the image of poverty' is turning to look more and more 'feminine'- what social scientists today term as 'feminization of poverty'.

In Noakhali, the society portrays a rigid gender division of labor that perceives men and women's roles differently and distinctly sketches women's mobility, duties and responsibilities along with their sexuality. The traditional family constructs and gender equation in Noakhali is changing very slowly. Due to extreme poverty and the increased inability of families to provide protection to their women, this area shows somewhat an increased mobility of rural women in economic activity despite strong traditional forces that keep women at home. Other than the 'Pourashava' areas and some urban concentrates, the gender disparity imposed by the sex differences is usually considered as 'natural'.

4.2 Demography

The size of female population in Noakhali is 1.3 million compared to its male population of 1.2 million (BBS, 2003b). Here the sex ratio is 97.2. The male-female sex ratio in the 0-14 years is 110 and 14-49 years is only 82. The gender disparity in sex ratio in favor of boys in 0-14 years age group is a reflection of the social neglect of a girl child immediately after birth, perceived severity of the antenatal and post natal complications, poor delivery care, early marriage, lower nutritional status of girls.

Average size of household in Noakhali is 5.6, where the average number of female in any household is 2.83. As the national level scenario, Noakhali is also facing an increasing rate of female headed households (8.45%, in Noakhali Sadar it is 3.3%). Empirical studies across the country suggest that the number of households below the poverty line (lower poverty line is <1805 Kcal) is significantly higher for female than for male-headed households. According to family Planning Information Management System, 1999, the maternal mortality rate is 6.12. Needless to mention, women's reproductive health and health seeking behavior are leading factors causing higher mortality rate. Women's exposure to risk during childbirth is both evident from the low rate of access to doctors, high rate of home delivery with obstetric complications, and higher vulnerability of a 'child mother'. The factors known to lead to higher maternal mortality rate can be summarized as gender differentiation in food allocation, series of food taboos during pregnancy and poor reproductive health care.

4.3 Socio Economic Condition

4.3.1 Gender Division of labor

Noakhali is no exception; here the women's position is rooted in their social traits, patriarchy and gender division of labor. Men's activities are considered as income generating, while women's activities are mostly limited within its domestic domain. The table depicts the gender division of labor in Noakhali as revealed during FGDs with both men and women.

	Women	Men	Both
Private Domain	<ul style="list-style-type: none"> - Child care nurturing - Domestic tasks - Livestock-poultry rearing - Homestead gardening - Post harvest task - Seed preservation - Subsistence agricultural task - Collection of biomass within homestead 	<ul style="list-style-type: none"> - Build the house - Preparation for strengthening the house before the potential rain/cyclone period - Fishing in adjacent pond 	<ul style="list-style-type: none"> - Water fetching - Weaving - Fish processing - Domestic management during disasters
Public Domain	<ul style="list-style-type: none"> - Collect cow dung and other biomass - Domestic maid - School teaching - Egg selling by children 	<ul style="list-style-type: none"> - Farming - Fishing - Trading - Day labor - Rickshaw puller 	<ul style="list-style-type: none"> - Daily labor - Industrial labour - Earth cutting - Small trading - Fish selling at market - Vegetable commercial production - Milk selling services

Table 4: Gender Division of Labor

4.3.2 Wage Rate

Traditionally women's activities are sketched within private/domestic domain and mostly these are 'unpaid' family labor. This 'unaccounted for' labor do not reward women with wage/money, although these subsistence activities are very much needed to maintain a resource poor-poverty stricken family. Women's participation in semi-formal/formal labour market has greatly increased since 1980s, mainly after intervention of some NGOs, encouraging local women's participation.

'Lutfunnahar, a leading NGO female personality and the Executive Director of a local NGO, informed that she started working with 'DANIDA' in 1980 and since then she has been working with local women to encourage their participation in the formal sector. In early 80s, there were hardly any women who could come to work in public arena such as earth cutting, agriculture wage labor. But she and her team tried their level best to motivate the women. A time came when they succeeded; for one job, even about 50 women were interested.'

Today, still not comparable with their male counterpart, women are participating in the labor market, but there exists high wage rate disparities between men and women. Wage rates have their seasonal differentials, depending upon the demand for labor. In rural areas the wages reach their peaks during transplantation and harvesting periods of main crops (such as *T. Aman*). In char areas this wage exploitation is even higher.

4.3.3 Access to Resources

Women's access to resources in Noakhali is mostly confined within domestic domain (furniture, domestic utilities, cattle, homestead, adjacent ponds), only when they go to fetch drinking water from a distant tubewell they enter into public surface. Women have inherited landholdings (either from their father, or in case of widows from their husband). But in most cases women do not have right to make decision on the usage of these resources, whether to retain it and how to use or to sell it. Social norms, family values, law and order situation affect women's access to common property resources, infrastructure and formal and non-formal institutions. Women's claim on household resources is also secondary which actually undermine their contribution to sustainable livelihood.

In terms of access to financial resources, there is hardly any woman in Noakhali who goes to Krishi Bank or other banks to apply for loans. Only NGOs sometimes support them with micro credit, though a very limited number. It is very common that the male member of the household (father, husband, brother) have the control over this money.

So it is difficult to assess whether the increased access to borrowing from NGOs alone can improve women's access to financial resources or enhance their participation in private/family decision making processes. The question of who controls the resources is vital.

4.3.4 Access to Health Care, Safe Water and Sanitation

Women are mainly given the responsibility of collecting water. Every household does not possess tube wells and they have to fetch water from distant households or adjacent schools, madrasas, district board office etc. Women and children of the families face tremendous problems to collect drinking water in rains or even in droughts. There causes serious insecurity when women are compelled to go outside for water at night. People here are aware of arsenic, they do not use those tube wells on which DPHE has given red marks.

The health status of women, especially those who live in Char areas, is very disgraceful. Many women never go to visit a doctor for their recovery; their attitude towards medication is almost fatalistic. Most of the women in char areas do not prefer to consult a doctor unless it is a severe emergency. In such cases, women never go to local doctors; rather doctor comes to their houses to prescribe the remedy. In case of childbirth, almost every family prefers to give birth at home with the help of their female relatives. Sanitation situation is very poor, almost every houses in char area uses *kutcha* latrine which is dangerous for health. According to them, sanitation facility is the most neglected because no government or non government organization has worked for sanitation in this area.

4.4 Social Insecurities in Char Areas

Embankment (*Beribadh*) is a symbol of both environmental and social security for the people of Char Areas. People living on and outside '*beribadh*' are less secured than the people living within it. People outside the embankment are often attacked by the local terrorists. As women have to go outside for various purposes like fetching water etc. they feel insecure in this situation. People outside the embankment are poorer as they are more vulnerable to disasters and always have to fight with non conducive circumstances.



Chapter 5

A Synthesis of Present Capacity of Coping to Different Climate related Disasters/Hazards and Future Potential

5.1 Awareness: Enhancing Capacity of Vulnerable

There are some awareness issues which can immediately be communicated to the local vulnerable people and policy makers as well. Raising the awareness of direct stakeholders or vulnerable groups and policy implementing bodies, the resilience may be enhanced and coping strategies better managed. Some interventions are summarized below:

- During the months when employment insecurity overlaps food insecurity, local government and local NGOs can come forward to create some seasonal job opportunities.
- People can help each other in the process of preparedness and during disasters. A community based approach can be initiated through forming local communities to handle day to day activities regarding different climatic hazards. Local NGOs and member of the Union Parishad may act as catalysts in the process.
- There is much space to work on agriculture coping. Department of Agriculture Extension must be more proactive to disseminate proper technology among the farmers.
- To prepare seedbeds, community can collectively select raised lands, share costs and have the seeds accordingly. Local committees can handle and organize this activity.
- Often people cannot raise the platform of their household or raise the platforms around the pond because of inadequate funding capacity. People can help each other by rendering their labor vulnerability.
- People can help in digging local ditches and canals to channel out excessive water and lessen the problem of waterlogging. Local government can initiate this community based service where local people will participate in off-seasons (the seasons when there prevails food insecurity as well as employment insecurity).
- During disasters, people can collectively render some services, such as health care, giving water purifying tablets, vaccination of livestock, consciousness about social security etc.
- Local people can collectively help each other in finding a safe place to relocate during a disaster. These places can be educational institutes, mosques, madrasas, etc.
- Poor farmers cannot afford pumps for irrigation. A co-operative approach may help these farmers to collectively organize pumps. Bangladesh Agriculture Development Corporation (BADC) and local NGOs can help in these collective efforts.

5.2 Four components in managing risk

- Prevention
- Preparedness
- Response
- Recovery

Advanced preparation greatly increases effective coping. However, preparation for an imminent extreme water-logging situation depends on reliable information on local level hydrological features. People in the selected site of Noakhali seek advice from elderly people, they depend mostly on ancestral knowledge. They watch color of cloud; observe ants moving into homesteads, etc. to warn people in the neighborhood. Based on such rudimentary advanced warning, people decide to build temporary platform inside the house, store day food, prepare seedbeds on a land which is perceived as 'high', plan for safeguarding household assets, make rafts with banana stems etc. Ancestral knowledge-based warning cannot provide specific information on probability of occurrence of intense rainfall, rate of change of water levels with time and potential duration of rainfall in the area. People's coping could be greatly enhanced if rainfall/flood warning could be issued point by point daily, perhaps for each union, with a fairly long lead time and disseminated through the union level administration in local language(s).

Even if warning is issued early and disseminated properly, taking adequate coping measures may not be possible for every household, since the coping capacity greatly depends on the economic condition of that household. Although people know that using bricks/steels could help avoid destruction of a dwelling during different climatic hazards, placing the plinth of the dwelling above flood/water logging danger level could at least minimize damage to the unit, not all the members in a community do consider such measures. Financial constraint acts as a barrier to such coping measures. Even in case of fishermen, they know that if they can raise the platform around the pond, the risk of devation due to excessive rainfall can be reduced. But in most cases, they cannot go for it due to lack of finances. It may be recommended that the poor in these areas should be offered soft term credits to increase robustness of their dwelling units/ponds. These credits should be disbursed before the occurrence of disasters, so that people can have enough time for preparedness. The micro credit lending NGOs may come up with a program that ensures strengthening of credit recipients' houses.

There is community led active mechanism to relocate marooned people when a 'normal rainfall' suddenly takes the shape of an 'extreme rainfall' causing severe water-log situation. A household may take proactive part in voluntarily facilitating relocation of its neighbor; however, lack of coordination often reduces effectiveness of such voluntary actions. Moreover the authorities of local schools, *madrassa*, cyclone shelters (which are supposed to be on a higher platform) must take pioneering roles to coordinate and manage local people in such situations. There should be an organized community led disaster relocation program. Local youth may be provided with guidance in day to day operation and management of community-managed disaster shelters. If water inundates the dwelling, it becomes very difficult to safeguard homestead animals, poultry, vegetable gardens etc. The livestock are highly vulnerable to extreme water logging events. In these situation cattle sheds are inundated, the livestock is also subjected to various types of diseases due to prolonged exposure to pathogen-laden floodwaters. As a result the livestock either fall sick, or succumb to death. The animal feeds and fodder are also damaged by extreme rainfall, which lead the animals to starve. People generally find it difficult to safeguard their animals as well as animal feeds during high intensity rainfall, especially when the own lives and properties are at stake. The local government in cooperation with local people must take initiatives to relocate these livestock to a higher and safer place and arrange their fodder.

The local government officials must have the insight for preparation and responses to natural disasters. If a participatory management for safeguarding the animals is established, people can minimize large-scale losses during flood. Vaccination of livestock must be carried out in a 'package of emergency mitigation' program.

In Noakhali, excessive rainfall leads to waterlogging condition which inundates most of the latrines and gets contaminated with pathogens. Lack of potable water, especially lack of fuel for boiling, often forces people to drink contaminated water and succumb to water borne diseases. However, water related vulnerability to human health can be reduced significantly if community representatives are trained to prepare and use low cost water purifying techniques. To train community people, Department of Public Health Engineering (DPHE) and local NGOs can come forward and initiate training programs.

Coping with water logging-affected agriculture requires special skills as well as ability to invest in input-based cropping. Seedbeds are by choice prepared in raised lands; however this well practiced measure is generally out of reach of poor farmers. Coping in such a case is synonymous with ability to either purchase high lands or to pay more to purchase seedlings from highland areas, which may be located in other districts. The poor farmers,

due mainly to their inability to invest additional money for preparation of land, purchasing of seedlings, purchasing of fertilizer and other inputs, usually either wait for the water to recede and cultivate late growing low-producing local varieties of 'Aman' or keep the land fallow for the remainder of the monsoon season. Both the measures, specially the latter, affect their food security, especially during June-mid October (mentioned earlier in the report). Many farmers are forced to sell cheap labor during such a vulnerable period. Under climate change scenario, the demand for institutional assistance following excessive rainfall (causing water logging) for the distribution of seedlings will increase. The government should strengthen the existing extensive network to provide agricultural services to the grassroots level through the Department of Agricultural Extension (DAE).

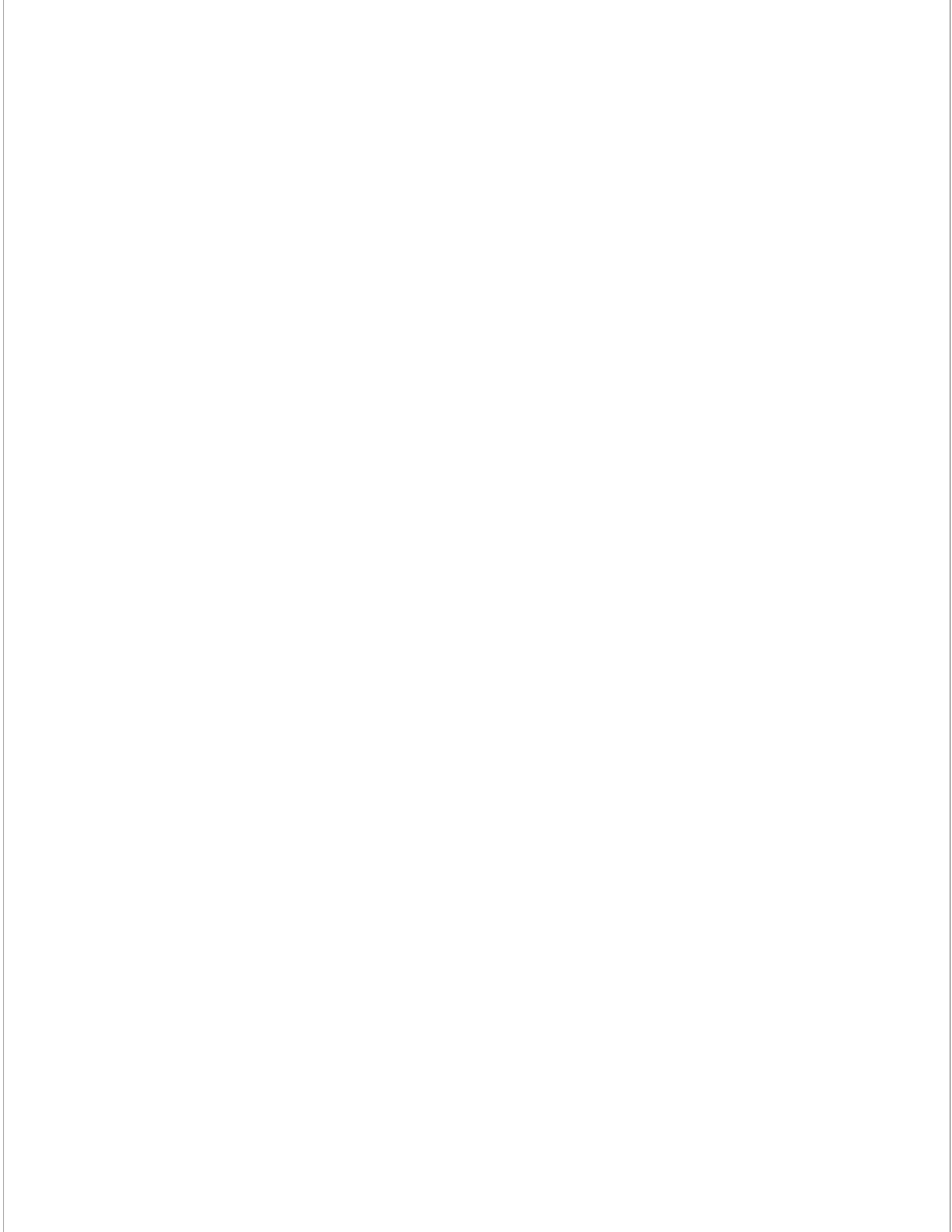
DAE officials may be provided policy guidelines to work with the Union Parishads (UPs) to identify non-affected high lands in the neighborhood and prepare them as seedbeds. Following recession of floodwater, the seedlings may be sold at reasonable price under the direct supervision of the UP leaders as well as DAE officials. Post disaster agriculture can also be boosted by providing soft-term credit to the poor farmers to invest in modern inputs. Credits may also be offered to the poor farmers in order to carry out non-farm income generating activities. Providing soft-term housing loan can also be considered as a measure which has high potential for adaptation.

Arguably, the best coping potential lies in moderation of the physical risk factors. If the bio physical condition of the selected area can be assessed through an institutional mechanism and adequate technology-driven environmentally safe solutions can be approached; overall hydrological features can effectively be moderated to reduce water logging-vulnerability of the area. The people of the selected area of Noakhali can apply their knowledge on disaster coping and safe-guard their livelihood. For the prevention of waterlog situation, proper drainage system, planned housing must be ensured. For this, local government can initiate different measures to drain out the water due to excessive rainfall and to structure a planned township. This approach and initiative entails on thorough analysis of the vulnerability to different disasters of the area and planning. Moreover, adequate financing needs to be mobilized in order to implement micro level disaster moderation measure, which largely depends on political will.

As a non-structural measure, community-based flood management (CBFM) may be given a high priority. Various approaches to CBFM have been tried in the past. Community-driven activities need to be streamlined and guided with a holistic Disaster Management Framework. A recent program of the government, the Comprehensive Disaster Management Program, may be considered as the first stepping stone to achieve increased resilience of the disaster-affected population including the ones with high vulnerability to floods.

In recent years the Government showed keen interest in taking part actively in the dialogues and negotiations under the United Nations Framework Conventions on Climate Change (UNFCCC). The National Water Management Plan (NWMP) offers a few programs focusing on reducing water related vulnerability. National Adaptation Programmes of Action (NAPA) and NWMP must be implemented on a priority basis.

Other than water-logging, drought, cyclone, salinity are the most devastating phenomenon in Noakhali district. To face cyclones, adequate multipurpose cyclone centers can be built under the supervision of red-crescent or LGED (Local Government Engineering Department). To renovate or rebuild the dwellings as a protection from cyclones, soft-term loans can be disbursed to local people. To face drought and salinity, research must be carried out in agriculture sector to invent crop variety (especially rice variety) suitable for this soil, which can be produced largely so that farmers can sustain their livelihoods through agriculture. Irrigation facilities are hardly present in the selected areas of Noakhali. Proper technical and financial assistance must be geared towards providing irrigation facilities to the farmers.



CASE STUDIES

CASE STUDY 1

- Water rises at least up to 4 feet each year in the courtyard of the house.
- There is a cyclone shelter in Samirhat (2 km from Charbata); but they have never gone to the center.
- The intensity of both winter and summer has been increased and even the time period and duration of these seasons have been changed a lot.

Health

- Major diseases are:
 - ☑ Fever
 - ☑ Cold
 - ☑ Cough
 - ☑ Indigestion and diarrhea
 - ☑ Itching and rash
- Diseases have been widespread for the last ten years. According to the respondent, her child often suffers from diseases but she (the respondent) had never suffered so frequently from diseases in her childhood.
- Mosquitoes are more prevalent now than before.
- As the hot summer is gradually intensifying itself for the last few years, the work efficiency of people is decreasing. With the increase in duration of hot weather, husbands get impatient and often beat up their wives. According to Afia Khatun, changing climate results in irrational behavior of husbands and also violence against women.
- When the child gets sick, the husband takes the child to the local doctor (whose chamber is in a local bazaar), 5 km away from Charbata. The doctor is not a MBBS.
- When adult female members of the family get sick, they are never brought to the doctor's chamber. Rather, local LMF doctor comes to their house in case of any emergency.

Extra Effort for Earning

Afia Khatun often involves herself in making 'Pati' (traditional mat) and 'Mora' (seat); though these are not for sale. She also has hens and ducks but she never sells eggs. Eggs help to meet the nutrition need of her family. Afia Khatun, however, does not have any personal savings.

Nutrition

Fish: once a month

Beef: once during Eid-ul-Azha.

Chicken: once in two months

Egg: once in a week

Pulse (Dal): Everyday; they eat 'but dal' as it is comparatively cheap.

Vegetables: 4-5 days a week.

Water: They consume tube well water which is not in their own house rather the tube well is situated in their neighbor's house. Basically women and children go there to fetch water several times in a day.

Conservation of Seeds and Fuel

During natural disasters they preserve their seeds in '*motka*' (huge pot) and '*Damdama*' (ceiling) of the house. They preserve their fuel long before rainy season in '*damdama*' so that it does not get wet with rain water.

Food Risk

During the interview, Afia Khatun was frequently asked about the time when they acutely suffer from food shortage. '*Ashar*' and '*Sraban*' are the two months when her husband hardly gets work due to floods. As a result, in the rainy season they suffer from acute food shortage and they have to remain hungry for couple of days. '*Vadro*', '*Ashwin*' and '*Kartik*' are the other three months when food risk still prevails. But according to the respondent, in the months of '*Poush*', '*Magh*', '*Falgun*' and '*Choitra*' they become self sufficient in food and this is the happiest time for their family in a year.

CASE STUDY 2

Name:	Manuja Khatun (widow); Charbata
Age:	60 years Dependent upon son's earning
Son's Occupation:	Farmer
Family members:	7 (own, son, daughter, daughter in law and 3 grand daughters)

Climate

- In last year's flood, water reached the height of up to 3 ft in the courtyard of the house.
- 10/12 years ago, floods were frequent in the area, but now sufferings from flood have decreased.
- During flood, they use flood water for cooking and bathing; but they used tube well water this time for drinking purpose as, according to the respondent, the tube well did not sink during flood.
- The intensity of summer and winter has increased; people are suffering from mosquito infestation more than before.
- Natural calamities take place untimely. For example, the time of '*kalboishakhi*' has been changed as it comes earlier than before.
- Frequency of cyclone has decreased.
- Now their homestead is protected by '*Beri Badh*' and as a result their house is not overflowed by the tidal surge during '*pu'nima*' and '*amabashshya*' as before.

Health

Itching and rash, fever, cold, cough, diarrhea etc are the common diseases. Women in the area are conservative and don't go outside for treatment. In case of sure emergency, doctors come home to give them treatment.

Source of Earning

Manuja Khatun's son has one *kuni* (40 decimal) land where he cultivates paddy (single crop). In the off season he tries to cultivate nut, '*kheshari dal*' and chilies. He also involves himself in earth cutting whenever possible for extra income, especially during the off season.

Extra Effort for Earning

Women of the house do not contribute to direct monetary income of the family. They don't even possess any savings, according to Manuja Khatun's daughter in law. Though they have some hens and ducks, the eggs are eaten by crow or other animals.

Nutrition

Fish: once in 15/20 days. (Mainly cheaper varieties like '*gura*', '*puti*' etc.)

Beef: Once in a year (during Eid-ul-Azha)

Egg: They can not afford eggs

Pulse (*dal*): everyday; mainly '*but dal*' as it is comparatively cheaper

However, during flood, they have to depend mainly on rice, pulse and potato for several days

Conservation of Seeds and Fuel

During flood they conserve seeds in '*motka*' and '*jute bag*' inside their rooms. Hens and ducks are kept in cages for several days.

Food Risk

According to Manuja Khatun, during '*Ashwin*' and '*Kartik*' they suffer from acute food shortage. On the other hand '*Poush*' and '*Magh*' are the two months when they have plenty of food.

Loan/ NGO Activity

Manuja Khatun's daughter in law is the member of 'Shagarika' Cooperatives. She borrowed different amount of loans such as 7000, 8000 and 10,000 Tk. from time to time. They are still repaying the loan by selling crops; through '*dadon*' etc. ('*Dadon*' is a process of loan schedule where people can take loan and repay in the form of goods or crops. For example, the family, borrowed 1000 Tk from cooperatives and repayed with 6 maunds of paddy; where as 1 maund paddy costs 300 tk. As a result they had to repay 800 Tk. more than they received.)

CASE STUDY 3

Name:	Tahera Khatun
Age:	40 years
Husband's Name:	Md. Nurunnabi
Husband's occupation:	'Borga Chashi' (landless farmer); besides paddy, he cultivates potato, chilies etc.
Address:	Idris Mollabari, Char Clark

Climate

- The intensity of cyclone has decreased.
- At present, tidal surge overflows the area once in a year, which is less frequent than before.
- Last year their courtyard was flooded for 7-10 days.
- The whole family moved to 'cyclone shelter' 10-12 years ago during a cyclone. After that they did not need to go there. According to the respondent, they did not feel any social insecurity in the cyclone shelter.
- The intensity of summer has increased in the last ten years.
- The frequency of flood has decreased. The number of fish in the ponds are also decreasing.

Health

Vulnerability to diseases has increased in the last 10 years. For example, the 10 year old daughter of the respondent has suffered from diseases less than her younger daughter. The younger daughter often suffers from fever, diarrhea etc. When kids get sick, mother herself takes her child to the local doctor.

There is a tube well in the house which is free from arsenic but the water is saline and contains lots of iron. During floods, flood water is used for the purpose of cooking and bathing.

Extra Effort for Earning

The family has 2/3 ducks and one cow. They often sell eggs to local market and also sell 1-1.5 kg milk per day at the rate of 16 Tk. per kg. Generally, children go to the nearby local market for selling milk and egg. Tahera Khatun uses this money later in case of children's diseases and for buying vegetables etc.

Nutrition

Pulse (Dal): Everyday

Beef/meat: Once a month

Potato: Everyday

Vegetables (Shak): twice a week

Fish: During tidal surge, they get plenty of fish from water; rest of the time they can't afford it.

Conservation of Seeds and Fuel

During rainy season, seeds and fuel are kept in the room. Seeds are kept in jute bags and boxes.

Food Risk

The sufferings start from the month of 'Vadro' and it becomes acute during 'Ashwin' and 'Kartik'. Tahera Khatun's husband, like all other farmers, brings crops at home in the month of 'Agrahayan' and as a result the following four months (Poush, Magh, Falgun, Choitra) they can serve plenty of foods to their family.

CASE STUDY 4

Name: Rufia Khatun
Husband's Name: Delwar Hosen
Husband's occupation: Fisherman
Address: Anwar muhurir bari, Char Clark

Climate

- Flood water rises up to 2 to 2.5 ft each year in the courtyard.
- Last year flood water remained in the homestead for 12-14 days.
- After 1991, cyclone did not hit the area.

Health

Common diseases are rash, itching, diarrhea etc.

Water

There is a 900 ft deep tube well which is situated 2 km away from their house. Children of the house fetch water 2 to 3 times a day. It should be mentioned here that the tube well water is used only for drinking. In case of bathing, washing and cooking they always use pond water.

Extra Effort for Earning

The family has 5 hens, 5/6 ducks and 2 goats. After every two or three days they sell eggs in the nearby local market. They also have a few papaya trees and sell papaya in market and also consume themselves. However, the family is not involved in any cooperatives.

Nutrition

Meat: Once a month

Fish: Everyday (as it is a fisherman's family)

Pulse (dal): 'boot' and 'moshur' (4 days a week).

Egg: 3 days a week

Food Risk

To avoid food risk, the husband works as a day laborer in the off season. In the months of 'vadro', 'ashwin' and 'kartik' the family faces acute food shortage.

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