FINAL REPORT
On
Baseline Study of SUFAL Project Funded by ECHO "Supporting Flood Forecast-based Action and Learning in Bangladesh" (SUFAL)

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BANGLADESH CENTRE FOR ADVANCED STUDIES
House-10, Road-16A, Gulshan-1, Dhaka-1212, Bangladesh
Tel: (88-02) 9852904, 9851237, 9848714, Mobile: 01730 058826, 01730 058827
Fax: (88-02) 9851417, E-mail: info@bcas.net;   Website: www.bcas.net

Baseline Study of SUFAL Project funded by ECHO
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Professional Team for the SUFAL FbA Study:

Study Team Leader

Dr. Mohan Kumar Das
Early Warning System Specialist (Hydro Meteorologist)

Contributed by:
Dr. Mohan Kumar Das
Team Leader and Early Warning System Specialist (Hydro Meteorologist)

Dr. Dwijen Mallick
Sociologist

Mohammad Abdur Rahaman
Climate Change and DRR Expert

Ms. N.R. Musfika Laiju
Gender Expert

Md. Belayet Hussain
Communication and Documentation

Shekhar Kanti Ray
Senior Research Officer

Design
Md. Jamshed Ali

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Acknowledgment

Dr. A. Atiq Rahman
Executive Director
BCAS

Acronyms

BCAS	Bangladesh Centre for Advanced Studies
BMD-	Bangladesh Metrological Department
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
CARE-B	Care Bangladesh
CSO	Community Service Organizations
CW	Concern Worldwide
DAE	Department of Agriculture Extension
DDM	Department of disaster management
DDMC	District Disaster Management Committee
DMB	Disaster Management Baruae
DMC	Disaster Management Committee
DoF	Department of Fisheries
DoL	Department of Livestock
DPHE	Department of Public Health Engineering
DRR	Disaster Risk Reduction
DSS	Department of Social welfare
ECHO	European Civil Protection and Humanitarian Aid Operations
FbA	Forecast-based Early Action
FDL	Flood Danger Level
FEA	Flood Early Action
FEW	Flood Early Warning
FEWS	Flood Early Warning System
FF	Flood Forecast
FFWC	Flood Forecasting warning Committee
FFWC	Flood Forecasting and Warning Center
FGD	Focus Group Discussion
HHS	Households
INGOs	International Non government Organizations
IRB	Islamic Relief Bangladesh
KAP	Knowledge, Attitude and Practice
KII	Key Informants Interview
LGED	Local government Engineering Department
LGI	Local Government Institutions,
MoDMR	Ministry of Disaster management and Relief
NGOs	Non government Organizations
ODK	Online Data Kit

PAR	Participatory Action Research
PIO	Project Implementation Officer
RIMES	Regional Integrated Multi-Hazard Early Warning System
SOPs-	Standard Operating Procedures
SPSS	Statistical Programme for
SQ	Structured Questionnaires
SUFAL	Supporting Flood Forecast-based Action and Learning in Bangladesh
ToR	Terms of Reference
UDMC	Union Disaster Management Committee
UHC	Upazilla Health Complex
UN	United Nations
UDMC	Union Disaster Management Committee
UzDMC	Upazila Disaster Management Committee
WFP	World Food Programme
PWD	People with Disability

Glossary and Terms

Char: Char a tract of land, any accretion in a river course or estuary. It includes all types of bars including both lateral (point-bars) and medial (braid-bars)

Flood plain: A flood plain is an area of flat land alongside a river. This area gets covered in water when the river floods. Flood plains are naturally very fertile due to the river sediment which is deposited there. This sediment is good for growing plants on the flood plain.

Forecast based early action (FbA): Forecast based early action (FbA) entails the release of funds for taking pre-determined actions in advance of a shock before acute impacts are felt. The early actions and forecast based triggers for action can be agreed in advance and on the basis of an analysis of the risk, setting thresholds for the forecast and the likely impact of the actions.

Kobbo: KoBo Toolbox is a free open-source tool for mobile data collection, available to all. It allows you to collect data in the field using mobile devices such as mobile phones or tablets, as well as with paper or computers.

ODK: ODK is free and open source software that helps millions of people collect data quickly, accurately, offline and at scale. The software is in active ODK: Open data kit was started to make mobile data collection tools for resource limited settings over the last decades.

River erosion: River Erosion is the river erodes away the bed and banks of its channel vertically and laterally.

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Executive Summary

Supporting Flood Forecast-based Action and Learning in Bangladesh (SUFAL) is being studied in 4 unions (Chinadulli, Kulkandi, Noarpara, Shapdhari) of Islampur Upazila of Jamalpur district, 4 unions (Bhartkhali, Ghuridaha, Haldia, Saghata) of Sagatha Upazila of Gaibandha district and 4 unions (Begumganj, Buraburi, Hatia, and Saheber Alga) of Ulipur Upazila of Kurigram districts by BCAS with the support of Care Bangladesh and the consortium members including Concern Worldwide, Islamic Relief Bangladesh, and the Regional Integrated Multi-Hazard Early Warning System (RIMES) and financially supported by ECHO. SUFAL will set up a Forecast-based Early Action (FbA) system in three northern flood-prone districts: Kurigram, Gaibandha, and Jamalpur. There are many char land in the study area which are the propensities of disaster. The inhabitants of Char land are the most vulnerable and poorest community who are in search of livelihood. Their daily life is full of uncertainty.

- The purpose of the study is to analyze community response to flood early warning of the targeted community people.

- The objectives of the baseline study were to identify and document the prevailing situation of communities regarding livelihood, health, WASH, shelter, DRR, and the present practice of Flood early warning.

- A complete of 834 household surveys are conducted by using KOBO Toolbox with a well-organized questionnaire. In this baseline study, altogether 12 FGDs and 15 KIIs were also conducted. Due to the sudden pandemic situation of COVID-19, some FGD and KIIs are conducted over audio/video and online platforms.

Major Findings:

- From the study, it is analyzed that Gaibandha, Jamalpur, and Kurigram districts which are naturally flood-prone and affected by flood almost every year.

- Most of the respondents are engaged in wage-earning activities. Day labor and agriculture are the main occupations in local communities. People are getting engaged with secondary occupation and in many cases changing their primary occupation due to recurrent flood and associated disasters like river erosion.

- In the study area, most of the community people don't understand Flood Early Warning (FEW) and partially rely on the FEW contents. There is no specific arrangement for giving support to understand the FEW messages. The absence of community volunteers is also an important limitations. The common channels for receiving the FEW are TV, known friends, relatives, miking, and radio.

- There is a lack of Flood Early warning message dissemination to the affected community. Even they have received EWM they are very reluctant to take necessary precautions which make their life more vulnerable.

- As per the study, about 42% of respondents take the necessary initiative to save their lives and properties. There are many reasons are identified for not taking precaution measures.

Significant causes are unbelieving the warning, remote communication, lack of flood shelters, fear of stolen household belongings, security concerns.

- The study finds that flood is a common disaster in the study areas. From 2015 to 2019, in each year, the study areas have faced a mighty flood due to heavy monsoon rainfall and upstream flow.

- Community people are not much familiar with early warning and flood management. They get flood situation news through radio and Television.

- The floods have adverse effects on the environment and socio-economic systems which increasingly creating major challenges for communities in Gaibandha, Jamalpur, and Kurigram.

This study finds that the following sectors are the topmost loss and damaging sectors in the studied areas:

- ✓ Homestead is the topmost damaging sector in the study area.

- ✓ In Kurigram, poultry is the second topmost damaging sector and livestock is the third topmost damaging sector due to flood.

- ✓ In Gaibandha, health is the second topmost and wage-earning source is the third topmost damaging sector due to flood.

- ✓ In Jamalpur, agriculture is the second topmost, and health is the third topmost damaging sector due to flood.

- ✓ In the three study areas, health is severely damaged due to floods.

- In Gaibandha, 53% of people overcome their loss through loans which are 64% at Kurigram and 63% at Jamalpur.

- It is found that in Gaibandha, 77% of people pay below 1000.00 BDT which is 58% for Jamalpur and 67% for Kurigram to recover health. Some people of the studied districts invest above 200.00 BD Taka for health recovery which is 4% for Gaibandha, 14% of Jamalpur, and 8% for Kurigram.

- There is a mentionable difference between monthly income and expenditure, especially during the flood time. Around 46% of families of all-region have over expenditure compared to their income during flood time. Local people undertake various coping mechanisms to overcome the livelihood crisis during the flood.

- Divers coping options have not been observed in the study area. Getting personal loans from different sources is the main coping strategy for the respondents.

- Though Social Safety Net Programs (SSNPs) are the vital measures to manage floods. But the study found that there is no specific SSNP to address flood in the study areas.
- Some SSNP is administered under the Ministry of Food and Disaster Management along with the Ministry of Social Welfare and the Ministry of Women and Children's Affairs. Most of the SSNPs is administered in collaboration with NGOs.

- In the study areas, during the field study, it is found that Vulnerable Group Development (VGD), Vulnerable Group Feeding (VGF), Relief Service are actively performing but there is no disaster insurance in place.

- Relief service is actively performing in the study areas which is being operated by District Relief and Rehabilitation Office (DRRO) along with NGOs and national and local volunteer groups during disaster which is found in the household study.

- In the Gaibandha district, 168 respondents mentioned that they receive relief during the flood which is 97 in Jamalpur and 198 in Kurigram. Frequent flood creates a financial burden to around 64% of respondents of Kurigram followed by 63% of respondents of Jamalpur and 53% of respondents of Gaibandha.

- In the study it is found that the highest number of death was calculated in Kurigram which is 13 by the respondents. In Jamalpur, 27 people were injured in the last flood due to riverbank erosion, house collapse, and tree over rooted.

From the study, a good number of recommendations were identified for the implementation team. To mobilize the understanding gap of Flood Early Warning messages and activate an appropriate dissemination mechanism of early warning and forecast are user demand. To minimize the knowledge and attitude practice limitations, it is needed to organize several discussion meetings, awareness workshops, drill training in the pilot study area.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Monsoon flooding is common climate induced disaster in Kurigram, Gaibanda and Jamalpur district. These districts are susceptible to floods, sometimes severe floods occur in these districts during the southwest monsoon season. In some years, these districts are affected recurring floods in the same year. In 2016, 2017 and 2019, severe floods occurred in Bangladesh and almost 7 month was flooded. In 2017, Gaibandha was the worst hit district in Bangladesh. According to BWDB, the water level in the Brahmaputra rose by 49 cm during the period and it was flowing 78 cm above its danger level at Fulchharighat point of the district (BWDB, 2017). According to Flood Forecasting and Warning Center (FFWC) as on August 22, 2017, of the 90 stations under monitoring, 37 stations are rising, 49 are falling and 4 stations are steady. At 26 points, rivers have been running above the danger level (Relief Web, 2017). In 2016, rivers in the north started to rise in early July and by the 20th of July nearly all of them started to flow over the danger level. It caused floods in Kurigram, Gaibandha and Jamalpur. In these districts, flood water entered in, put together 17 numbers of upazilas. It inundated crop fields and dwelling areas, washed away standing crops, houses and households assets, livestock and displaced the affected people.

Forecast-based Early Action (FbA) enables communities to take actions in anticipation of a hazard or disaster. This innovative approach depends on locally applicable and reliable forecasts, pre-defined triggers or thresholds for action, a set of protocols with clear roles and responsibilities, and pre-identified set of early actions linked to financing mechanisms. Although gaining traction, the FbA agenda still needs to gather substantial evidence of its benefits to institutional and community risk reduction and resilience; and, as a result, reduction in the impacts of disasters. With the aim of strengthening the case for early action, the project "Supporting Flood Forecast-based Action and Learning in Bangladesh" (SUFAL) will setup a Forecast-based Early Action (FbA) system in three northern flood-prone districts: Kurigram, Gaibandha and Jamalpur. The project will be implemented from August 2019-January 2021 in a consortium led by Care Bangladesh and including Concern Worldwide, Islamic Relief Bangladesh and the Regional Integrated Multi-Hazard Early Warning System (RIMES) and financially supported by ECHO. Flood forecasting and early warning systems will be strengthened through facilitating impact-based forecasting to contextualize forecasts and early actions; and developing an institutionalized mechanism to initiate FbA through Standard Operating Procedures (SOPs). SOPs will guide how early action is systematically tied to triggered threshold levels and provide guidelines on the roles and responsibilities of government, local stakeholders, and communities in taking early actions, emphasizing the protection of vulnerable groups. The project will partner with national and local governments to address technical, economic and institutional barriers limiting uptake of FbA. (Annex-1: TOR of the study area).

1.2 Objectives of the baseline study

The baseline study accumulated data and knowledge of the chosen communities on what the community people know and do practice in regard to flood, sanitation, resilience, DRR; hygiene; livelihood; health, water, and shelter. The purpose of this baseline study is two-fold:

(a) Provide a baseline for all level indicators to serve as a point of comparison for a final evaluation, and

(b) Inform project targeting and, where possible, project design. As a part of the baseline, the study will carry out a survey to assess the Knowledge, Attitude and Practice (KAP) of institutions and

community for implementing forecast-based early actions. Results of baseline survey will be shared with relevant stakeholders for evidence-based advocacy.

The Baseline Study covered the following focus areas:

- Impacts of floods on livelihoods and assets of communities (can be physical, social, economic)

- Access, interpretation and use of forecasts by institutions and community (timeliness, quality)

- Response to flood forecasts at the institutional level (process, decision-making, triggers)

- Early warning dissemination by institutions and community (channels, quality, content, coverage)

- Access, understanding and use of early warning information by institutions and communities

- Early actions to floods at the institutional, community and household level (impacts, successes, challenges) and associated costs

These focus areas, particularly ones at the community and household level, need to be examined using gender, socio-economic and cultural lens. Further consideration can be made to compare areas with varying exposure to floods; and, those targeted and not targeted by FbA interventions.

1.3 Study area of the baseline study

The baseline study will be conducted at 3 Districts. Details are as follows:

Table-1.1: Study Locations

Sl. No.	Districts	Upazilla	Unions
1	Jamalpur	Islampur	Kulkandi Chinadulli Noarpara Shapdhari
2	Gaibanda	Saghata	Bhartkhali Saghata Ghuridaha Haldia
3	Kurigram	Ulipur	Hatia Begumganj Buraburi Saheber Alga
Total	3	3	12
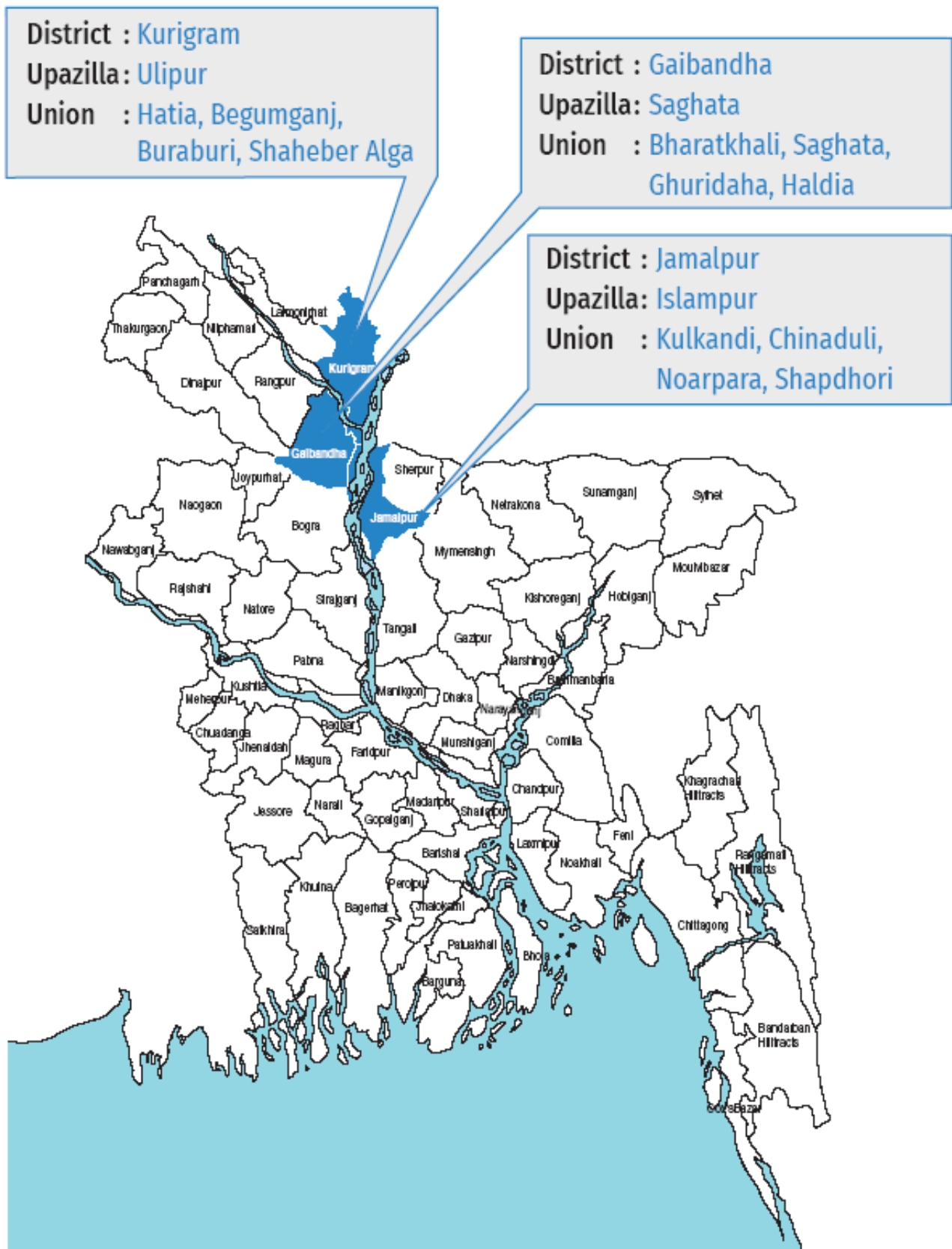
Figure-1.1: Map of the study area

1.4 Scope of the study

The BCAS study team performed the following activities.

- BCAS reviewed the relevant documents of CARE Bangladesh Project as a prerequisite and acquaint themselves with all relevant project documents.

- BCAS submitted an inception report with detailed work plan to CARE Bangladesh along with timeframe, a detailed questionnaire for interviews and responsible person for this assignment.

- BCAS prepared interview guidelines, questionnaire, a checklist and other data collection tools for the study in consultation with CARE Bangladesh. BCAS. The concerned staff members of CARE Bangladesh Project reviewed each stage of tools and technique finalization to ensure that the project's specific parameters and indicators are being addressed.

- BCAS engaged required number of qualified enumerators and train them on the study subject, methodology, data collection tools and techniques, quality control and data management, and needs to prepare a detailed training schedule for the enumerators.

- BCAS organized training sessions for the enumerators followed by field practice. The duration of training depended on methodology, tools and technique of the study to ensure that enumerators have in-depth understanding of the study subject and methodology.

- BCAS collected data from the respondents of the study area as per the sampling list using prescribed tools and technique.

- BCAS shared field findings with CARE-Bangladesh within the one week of completion of data collection.

- BCAS prepared the data analysis and tabulation plan in consultation with CARE Bangladesh before the completion of data collection and prepare output tables.

1.5 Limitation of the study

In this study, the most vulnerable people are focused by targeting flood impact and early action. This baseline study gives us an idea of what is happening in the most vulnerable population area who are representative of entire population of the union.

The study area situated mostly in hard to reach area at Jamalpur, Gaibandha and Kurigram districts. The research team worked with the help of field officers of SUFAL consortium partners' organization and local community.

At the last stages of field work for data collection field movement was getting some problems following the COVID-19 situation.

BCAS research team has overcome the stressed situation and finally completed the data collection process with the proper guidance from the consortium and support of the respected field officers of SUFAL project.

CHAPTER TWO: LITERATURE REVIEW

It is important to take the necessary study initiative for achieving community resilience of the recent flood-affected regions. Many government and non-government organizations are working to ensure community resilience. To ensure a beautiful livelihood in the disaster-prone region it is important to have a continuous capacity building program and awareness activities that are recommended by many studies (Biswas et al., 2019; Coirolo and Cristina, 2013). The CARE was undertaken Flood baseline study initiative in Jamalpur, Kurigram, and Gaibandha districts so that the targeted community people can achieve resilience capacity to cope with the flood situation. The baseline was conducted to get the data that will be helpful for implementing the program until February 2021. In this regard, a lot of literature was examined before conducting the baseline study. The literature review becomes helpful to understand the flood vulnerability and community resilience in the context of regional to the global scale.

Fenton et al. (2016) study describes a global disaster scenario. According to the report, "On an average, every year, floods engulf roughly 20.5% of Bangladesh, or about 3.03 million hectares (around 30,000 km). In extreme cases, such as the huge floods of 1988 and 1998 inundated as much as 70% of Bangladesh. A combination of geographical locations (as the drainage area for three huge river systems with their origins in China, India, and Nepal), high rainfall, flat topography with very low elevation and extreme climate variability, make Bangladesh vulnerable to floods. In addition; high population density, poverty, and a predominantly agrarian economy make Bangladeshi communities less resilient to climatic shocks"

Mohapatra and Singh (2003) study indicates that in the years 1953 and 2000, floods have affected approximately 33 million people in India. Floods are the most frequent among all-natural disasters to be faced in India. The rapid growth of the population may have a more adverse impact on people's lives and livelihoods.

Nott (2006) study shows that usually a normal level of flood events is not considered as a disaster until their lives and livelihood threatens are incorporated.

The available literature suggests the key socio-economic features and causes of and measures to mitigate social vulnerability of the study areas.

Sharif and Opola (2017) have suggested that the socio-economic status is far lagged behind in rural areas compared to urban areas. Women development imperatives including women empowerment, literacy rate, health situation and employment are at worst condition. The socio economic factors are interlinked and the socio economic development needs a well-coordinated and concerted efforts involving all development factors.

Tanzina, et al., (2018) has examined that social vulnerability of the poor, women, religious/ethnic minorities and char dwellers in the four river basins in the Hindukush Himalayan (HKH) region is heavily bounded by some key factors including economic classes, gender and social norms and living in geographically marginalized areas. And the situation becomes worst due to poor governance and lack of access to resources and services. The study has given emphasis on an inclusive and well-coordinated development plan to address growing social vulnerability which social protection measures, enhancement of human capitals and livelihood diversification with propoor and gender responsive adaptation and socially inclusive policy.

Ferdous et.al (2019) have studied that the people in the Jamuna flood plain area lose their income and asset to recurrent floods and they can partially recover it causing them poorer and less capable to make structural adjustments.

Kamal, Sabkat (2011) has examined that the physical and social components of char are highly dependent by river characteristics and the livelihoods is shaped by poverty, remoteness, poor economy and migration. Disaster has a big impact on the livelihood which make the char people more vulnerable.

The disaster situations of Bangladesh briefly stated in the study done by Béné et al (2016). As per the study, "Bangladesh is one of the most at-risk countries to climate change with cyclones, flooding, saltwater intrusion, and river erosion expected to increase in frequency and severity over the coming decades. People living in the southern coastal belt and north-west flood plains of Bangladesh are particularly vulnerable".

Bangladesh Red Crescent Society's Strategic Plan (2017) study shows that in northern Bangladesh is situated in Brahmaputra, Dharla, and Teesta river basin along with 30 rivers where people face monsoon flood and pre-monsoon flash floods almost every year. Usually, the flood-affected regions are inundated for about 5 to 15 days causing adverse damage to the lives, livelihoods, properties, and crops. These adverse effects make community people's life insecure and vulnerable.

The 1998 floods in Bangladesh is described in the Ninno, et al. (2003) study. This flood event severely damaged the rice crop and threatened the food security of tens of millions of households.

The Flood plain management in Australia's (1998) and Living with Risk (2002) study suggests that the many flood victims' emotional behavior was shocking and they went through serious emotional trauma.

The factors that increase insecurity and vulnerability in the flood and flash flood regions are lack of roads and transportation, mismanagement in the flood shelters, poor sanitary situation, and inadequate public health services. Unfortunately, flood management and flood shelters are not women-friendly at all.

For more than 40 years, Bangladesh has been working seriously on disaster management and rehabilitation like floods, storms, and cyclones. But while the situation has changed in some areas like relief, rehabilitation, setting up of shelters, communication system, agriculture, food management, etc., but then again women's condition as beneficiaries remains unchanged. And as a result, the desired goal of disaster management is not being achieved. The main reason for this is a strong position and inviolable influence of the patriarchal social system in our country. So even today, the results of any research show a clear picture of discrimination against women. Among the many reasons, the main reason gender issue is not considered, unchanged gender roles and norms.

By neglecting half of the women population of the country, disaster authority makes a huge development plan. Sometimes they had shown women participation in name only. But it is clear though that the country will never reach the expected heights about the flood management program.

We are proud we are independent and developing countries, and we are aware and internationally focused; but still, women are reluctant to take refuge in shelters during floods due to lack of security. Sometimes even they despise their life. They think that if they go to a shelter and something bad happens to them, they may have to spend the rest of their lives in filth. In our society, patriarchy and religious blind values have tied the fate of women in all directions.

Women are still victims by the labor of division. During the flood and aftermath flood, women work more than a man at home and in the family. Women are deprived only because of gender. During floods, Women are victims of rape and sexual violence. And after flood women are more likely to suffer from malnutrition as women consume food after providing food for everyone in the family and water-borne diseases also, which causes them to come more in contact with water. Women have fewer clothes for wear compared to other family members, so most of the time they wear wet clothes until they finished all domestic work for on that day as result women suffer more from cold-related diseases (Ahmed, 2012).

Some women have abandoned their husbands due to floods. After the flood, unemployed men moved to the city in search of work. Most of the time men remarry and never return to the village. Unearned women with children suffer the most. Way fewer women are sometimes forced to secretly sell sex. The government or the non-government sector often does not have a separate plan for them. Even if there is a system of overall rehabilitation or relief activity but the overall good, cannot be expected unless each problem is identified separately and a solution is found (Pulla and Das, 2015).

Planners should keep in mind that a small hole is capable of sinking a strong boat.

As per IPCC, WG2 AR5 (2014) report "Poor planning which only focuses on short-term solutions or which is incapable to assess longer-term consequences will likely result in maladaptation, which in turn will increase the vulnerability of already vulnerable groups, and limit future choices by locking vulnerable people into cycles of dependence".

There are very limited studies related to Flood's early warning and its reliability assessment. Batel et al. (2018), Annual Flood Report (2014)and Hossain et al., (2017) study stated in Bangladesh the Flood Forecasting & Warning Centre (FFWC) has been established by the Bangladesh water development Board (BWDB) for hydrological aspects. The FFWC generates and provides flood forecasts and warning information by using the appropriate scientific principles, real-time data, weather forecast information, and mathematical models. Hydrological data comprise of discharge, rainfall records, and water level.

By reviewing the literature it is found that there are significant flood management gaps in terms of disaster preparedness and early action.

CHAPTER THREE: APPROACH AND METHODOLOGY

3. 1 Approach and methodology

In order to implement the tasks enshrined in the study objectives the methodology consisted of different quantitative and qualitative tools and methods. **Both qualitative and quantitative data** from the study locations acquired through household questionnaire survey, Focus Group Discussion (FGD) and Key Informants Interview (KII) at the study location.

The study applied a participatory and multi-disciplinary approach of data collection and analysis to deeply understand the multi-dimensionality of flood, its impact and consequence (social, economic and physical vulnerability), institutional response as well as to develop appropriate strategies and actions for flood resilience. The study make for triangulation of qualitative information and perspectives with quantitative data for understanding the flood vulnerability; its impacts on human life and livelihoods, flood management paradigm, potentiality and options of forecast based early warning system for flood management, institutional arrangement for forecast based flood management, impacts, successes, challenges of forecast based early warning system, impact of early warning system etc.; integration of social data and perceptions.

To understand the complex relationship and interface between flood factors with socio-economic conditions and development process (population and poverty, marginalization, social exclusion, food security and livelihoods) as well as to substantiate people's perspectives (about flood impacts, vulnerability and forecast based management needs) with long term scientific data and evidence for policy recommendation, the study applied both bottom-up and top-down approach. The approach and methodology however included the following step/components.

- Initial discussion with CARE Bangladesh and its local partner NGOs.
- Collection and review of literature and documents.
- Collection and analysis of secondary data.
- Collection of primary data.
- In designing the study tools and instruments (questionnaire, checklist).
- Compilation and processing of data generation of statistical outputs.
- Analysis and report preparation incorporating the findings and results of the study.
- Finalization of the report.

3.2 Sampling design/Sampling strategy

Data collection initiative by BCAS enumerators moving to field after training on survey tools for conducting HHS survey, FGD and KIIs in selected unions of Jamalpur, Gaibandha and Kurigram districts. During survey enumerators investigated and explored to collect the available lists and information on the community, such as locations of households that have faced loss due to flood in the last 5 years, have hardcore poverty, children under 5 years, elderly, people with disability, female household head etc. In the target unions comprising char and mainland, the sampled proportionate to population size. Similarly, unions where settlements are located both near and far away from the river/embankment proportionately sampled. Informed written consent collected from all respondents for the survey and KIIs. The selection criteria for survey respondents were the most vulnerable groups of the community such as poor, disadvantaged households.

Table-3.1: HHS Respondents Sample Distributions: criteria-wise and union-wise number(s)

Upazila (District)	Union (Total Population*)	Farmers		Fisherman		Landless/ day labor		Women		Children under 5 years family		Students		Women headed family/PWD		Small traders		Grand Total	(%)
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
Sagatha (Gaibandha	Bhartkhali (23292)	2	4	2	2	2	6	0	0	3	4	2	5	2	8	3	4	**49**	5.9%
	Saghata (22539)	7	13	4	5	5	10	0	1	4	11	5	10	1	21	6	5	**108**	12.9%
	Ghuridaha,(26110)	7	7	2	6	6	7	0	2	1	10	3	6	0	13	3	6	**79**	9.5%
	Haldia (21862)	6	4	2	2	5	4	0	5	3	3	3	1	0	6	4	3	**51**	6.1%
	Total	**22**	**28**	**10**	**15**	**18**	**27**	**0**	**8**	**11**	**28**	**13**	**22**	**3**	**48**	**16**	**18**	**287**	**34.4**
Islampur (Jamalpur)	Kulkandi (10825)	6	4	6	1	6	2	0	0	5	3	7	1	1	3	3	0	**48**	5.8%
	Chinadulli (25744)	13	5	9	4	9	8	0	0	6	10	9	7	2	6	5	3	**96**	11.5%
	Noarpara (25599)	15	5	8	4	13	4	0	1	7	8	9	6	1	6	5	3	**95**	11.4%
	Shapdhari,(4570)	8		3	0	4	1	0	0	2	2	4	2	0	3	2	3	**34**	4.1%
	Total	**42**	**14**	**26**	**9**	**32**	**15**	**0**	**1**	**20**	**23**	**29**	**16**	**4**	**18**	**15**	**9**	**273**	**32.7%**
Ulipur (Kurigram)	Hatia (28933)	7	7	1	7	4	6	2	9	0	10	1	9	1	8	2	6	**80**	9.6%
	Begumganj (17309)	8	3	3	2	2	6	0	8	2	5	1	7	2	4	3	4	**60**	7.2%
	Buraburi (33090)	6	9	5	4	3	9	1	12	2	9	3	8	1	5	6	4	**87**	10.4%
	Saheber Alga (20427)	3	6	2	3	1	7	0	6	0	4	2	4	1	3	2	3	**47**	5.6%
	Total	**24**	**25**	**11**	**16**	**10**	**28**	**3**	**35**	**4**	**28**	**7**	**28**	**5**	**20**	**13**	**17**	**274**	**32.8%**
	Grand Total	**88**	**67**	**47**	**40**	**60**	**70**	**3**	**44**	**35**	**79**	**49**	**66**	**12**	**86**	**44**	**44**	**834**	
	%	10.5%	8%	5.6%	4.7%	7.2%	8.4%	0.35%	5.3%	4.2%	9.5%	5.9%	7.9%	1.4%	10.3%	5.3%	5.3%		
	Male (%)	338 (40.53%)																	
	Female (%)	496 (59.47%)																	

*BBS-2011

Table-3.2: Summary of Key Tools and Sample Size

Data collection tools	Method	Number Beneficiaries	Level
Questionnaire	HH Survey	834	Household
FGD	Flood situation analysis, KAP analysis,	24	Union level
KII	Institutional Analysis	30	Union, Upazila(Sub-district), district and national level

3.2.2 Survey Questionnaire

Questionnaire survey conducted with community people to explore in-depth the trends and effects of flood on livelihoods and food security, with particular focus on how flood reshapes the livelihoods of the poor and marginalized section of the population in this area and also to understand community needs and priority of forecast based early warning system, institutional response, social safety net issue. Three teams consisted of four enumerators (with female and male in each group) carried out the HHS for twelve days. The enumerators also proportionately selected among from the previous working experiences and locality of the concern areas that gave them a sense of ownership to the study. It will also help the study team to get easy access to the local community and ensure quality of data and information. Household survey anchored using Kobbo Toolbox or ODK.

3.2.3 Guidelines and Tools for FGD & KII

Focus Group Discussion (FGD)

Focus group discussions conducted with community people including farmers, women, children, fishermen, poor and marginalized people in order to explore to explore in-depth the trends and effects of flood with particular focus on how flood reshapes the livelihoods, forecast based early warning needs and priority, financial and institutional arrangements to deal with flood. A total of 15 FGDs (5 in each upazila and rest 9 FGDs will conducted soon) conducted with Project beneficiaries and stakeholders such as farmer, fishermen, landless/day labour, women, children/students and small traders. A Detail FGD Checklist and list of FGDs given in Annexes.

Key Informants Interview (KII)

Key informants interviews conducted with key stakeholders of the target institutions (partner NGO, LGI, Beneficiaries, local level government agency, national institution, government service provider, disaster management committee) in order to explore the technical, financial and human resources available as well as institution's and personal capacity to deal with flood hazards. A total of 18 (rest KIIs will conduct soon) KIIs conducted at different stakeholders such as DAE, DRRO, BWDB, PIO, DPHE, DoF, DOL, DPHE, NGOs andINGOs. A Detail KII Checklist and list of KIIs given in Annexes.

3.3 Training to the Enumerators

BCAS organized two days training programmes with the relevant experts in Dhaka (BCAS H.Q) level for enumerators (12 enumerators) for the household interview. The training sessions are divided into two parts. In the first part/session the enumerators received theoretical lessons on the general rules of conducting surveys, sampling and a hard copy of the questionnaire. In the next sessions, the enumerators practiced using the actual ODK

questionnaire forms on the tablets with role-plays and mock tests. After two days class room training, the enumerators did field practice at field sites (Jamalpur) areas. The tools finally adjusted after the field practice for questionnaire survey. The training was conducted 8-9 March, 2020. Following were the specific topics that were covered in the Enumerators training:

- Brief program overview and the objectives of the surveys
- General rules, norms and guidance on survey implementation
- Survey methodology – team composition, sampling, household selection process
- Detailed discussion of the questionnaire form(question-by-question)
- Use of questionnaire on the tablet
- Apply mock procedure for more clear understanding of questionnaire
- Role play to show the technique of asking some sensitive questions
- Data quality, management and transfer

A detail Enumerators Training Programme attached in the Annex

3.4 Quantitative data collection:

Qualitative data about flood impacts on food and livelihoods, perspectives vulnerable communities and different stakeholders as well as responses collected from the local communities through structured questionnaires. The target population for the Household Survey (HHS) of this research are flood vulnerable people. The research made use of probability sampling in order to select the respondents for investigation. This helped us to obtain the necessary data for the flood scenario synthesize with minimum cost and time. This study used structured questionnaires (SQ) as a quantitative tool for collecting data. The sample size estimate to ensure the representation of all the indicators set forth in the ToR. The sample size determined using the formula considering 95 percent confidence level with 5 percent level of errors. The questionnaire for the household survey developed during the inception phase and included in the inception report for approval.

3.5 Qualitative data collection:

A wide variety of literatures including peer reviewed journal articles, technical reports, projects documents, disaster management plans, flood related information from Water Development Board, Disaster Management Bureau, livelihoods information from Department of Agriculture and other relevant sources reviewed to have the primary scenarios of c floods, impacts, risk, and vulnerability.

3.6 Smart tools and equipment for data gathering and processing/ data analysis

Data collected using a pretested structured questionnaire through Kobbo/QUALT/ODK by trained and experienced data field researchers.

CHAPTER FOUR: SOCIO-DEMOGRAPHIC INFORMATION

4.1 Introduction

The study districts are highly bounded by rivers courses of Teesta and Bramhaputra. According to Household Income and Expenditure Survey (HIES)[1] and poverty map[2], these three districts are among the top 10 poorest districts of the country. The highest number of poorest people has been reported in Kurigram (71%) while the number of poorest people in Gaibandha is 47% and in Jamalpur it is around 53%. The changing pattern and intensity of natural disasters is the major reason behind the deteriorating poverty situation of this regions. Lack of institutional supports and resources; absence of livelihoods option, remoteness are some other key contributing factors to this poverty situation. Due to high poverty the improvement in other human development indicators has always been a challenge to the local community and concerned stakeholders.

Key Findings

- These three districts are among the top 10 poorest districts of the country.

- Female respondents were higher (59%) compared to male respondents (41%). The highest number of respondents (32%) came from the age group of 25 to 35 years.

- Around 98% household in the study area have been appeared to be kucha house (made with earthen basement, bamboo and straw/iron shit made roof and wall).

- The monthly income of the respondents in all three upazilas were upto Tk. 25000. Day labour and agriculture are the two main occupations to the local community.

- Around 46 % families of all region have over expenditure than their income during flood time.

- People are getting engaged with secondary occupation and in many cases changing their primary occupation due to recurrent flood and associated disasters like river erosion.

- During the lean period ranging from May-June to November, the local people face hardship to run their families due to occupational crisis. During this time getting personal loan from different sources is the main coping strategy to the respondents.

4.2 Age of the respondent

The age of respondents ranges from 14 to 55 years. Among the three districts the highest number of respondents (32%) fall under the age group 25 to 35 years. And according to district wise dataKurigram is at the top (38%) of this age group followed by Gaibandha (35%), and Jamalpur (24%). The second highest number of respondents (28%) fall under the age group of 35 to 45 years with a district wise distribution of Jamalpur (30%), Kurigram (27%) and Gaibandha (27%). Jamalpur is also ahead from other two districts in context of the highest number respondents (23%) form the age group of 45 to 55 years. Among the

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[1]Why is Poverty Increasing in Some Regions?https://bids.org.bd/uploads/events/cc2019/D1_S2_ZA.pdf

[2]The other side of growth: North sees rise in the poor
https://en.prothomalo.com/bangladesh/The-other-side-of-growth-North-sees-rise-in-the

participants a considerable percentage (12%) were from elderly persons while small portion of respondents were from 14 to 25 years age group. Age of the household survey respondents depended on their availability during the survey period and also their willingness to participate in the survey on behalf of their household.

4.3Biological identity of the respondent

Among the respondents of baseline survey female respondent constitute higher percentage (59%) compared to male respondents (41%). The percentage of female respondent became higher due to the absence of male respondents at their households as they were outside their locality for occupation. There were also many women headed households which were given priority for interview due to their level of vulnerability to the impacts of flood and other associated disasters. In the district level distribution female participants are higher at Kurigram (71.50%) followed by Gaibandha (67.20%) and Jamalpur (38%). One the other hand male participants were higher in Jamalpur (61.50%) compared to female participants.

4.4 Spatial distribution of the respondent

Type of respondents housing by Unions

Around 98% household in the study area have been appeared to be kucha house (made with earthen basement, bamboo and straw/iron shit made roof and wall). The major factor behind the highest number of respondents found with katcha house is the sample respondent selection criteria which comprised of poor, vulnerable and women headed household from the extreme remote and vulnerable areas like char lands along the rivers. The respondents also respondents also represent some important occupational groups including fishing community and day labourer who face financial and social hardships due to flood induced disasters.The respondents of Shaheber Alga (Kurigram), Ghuridaha (Gaibandha) and Kulkandi (Jamlapur) unions have been found with 100% kutcha houses. Around 2% respondent of Islampur union of Jamalpur have mentioned that they live in Jhupri houses. And these houses are mostly concentrated in two unions, namely Noapar and Shapdhari. A very small portion (2%) of houses of Kurigram were noticed semi pucca.

4.5 Educational status of the respondent

Education Status by Unions

The highest number of respondents have been found with education level illiterate and semi-literate in all the unions under all three districts. In Ulipurupazila of Kurigram the percentage of illiterate and semi illiterate respondents is same (32% respectively) and the situation is worst in saheberAlega union form other three districts with highest number of illiterate (40%) and semi illiterate respondents (40%). This situation has been appeared further aggravated in IslampurUpazila of Jamalpur with 41.40% illiterate respondents and 34% semi illiterate respondents. Again illiterate respondents were high in Noapara union (46.30%) while semi illiterate respondents were high in Shapdhari union (50%). However the percentage of illiterate respondents and semi illiterate respondent are far better (25% and 32% respectively) in ShaghataUpazila than other two upazilas. Union level data shows that illiterate respondents highest in Saghata union (32.40%) while semi illiterate respondents are higher in Bharatkhali union (44%). The highest of level of education (completed secondary level education) has been found with very less number of respondents in the study area. And it is 1% among all respondents of Ulipur (Kurigram), 1.70 % in Saghata of Gaibandha and 1.80% in Islampurupazila in Jamalpur. However, a mentionable number of respondents (13% in SaghataUpazila, 10% in UlipurUpazila and 6% respondents in IslampurUpazila) have been

appeared with not completing secondary level of education.

The local community people identify disaster specially flood as the major hindrance towards education system in their locality. *In the FGD discussion with the students atBegumganj union in UlipurupazilaofKurigram district, the participants reported that, "In last flood (2019) our education facilities were severely affected. We lost books and other educational materials to flood. We couldn't take proper measures to protect our study materials from flood due to not getting early waring timely and lack of awareness, financial crisis and poor communication and transport system."*

4.6 Occupation of the respondent

4.6.1 Primary Occupation

Housewife constitutes the largest occupational groups in the study areas (27% in Islampur, 63% in Saghata and 16% in Ulipur). Women have important role in other occupations. In Ulipur livestock rearing has been appeared to be the primary occupation to the highest number of respondents (32%) and it has been observed that women are highly engaged in this occupation. Day labour appeared to be the second largest occupation to the respondents in the study area. Upazila wise data suggests that 21% respondents in Islampur (Jamalpur), 11% respondents in Saghata (Gaibandha), and 19% respondents of Ulipur (Kurigram) are engaged in daily wage-earning occupation. Paddy cultivation is another major occupation where a good number of people are engaged. And the percentage of respondents in this sector by upazial is 19% in Islampur (Jamalpur), 7% in SaghataUpazila (Gaibandha) and 11% in Ulipurupazila in Kurigram. Apart from primary occupations people are also engaged in some other occupations or secondary occupations which are more of a seasonal occupation.

4.6.2 Secondary Occupation

Key secondary occupations include construction worker, artisan, fishing, home gardening, hotel and restaurant business, rickshaw-van puller. Fishing is an important occupation to the respondents (6%) of UlipurUpazila of Kurigram. A very small portion of the respondents was found with service/ job occupation in Islampur (1%) and Saghata (2.40%). It is worth noting that occupational diversity has not been observed in the field data. People are mostly engaged in agriculture related occupations.

4.7 Household Demography

Number of Children in the family

The highest number of respondents of Ulipur (32%) and Saghata (33%) have been identified with two children per household while in Islampur the highest number of respondents (28%) have been identified with onechild per household. Families with three children have been appeared in Islampur (19%), Saghata (18%) and Ulipur (16%). And Families with four and more than four children have largely been found (6%) in UlipurUpazilaSaheberl Alga union has been marked with the highest number of families (12%) with is four or more children per household in the Upazila.

Number of Elderly persons in the family

The field level data shows that around 80% families/households in three upazials don't have elderly persons. Families with one elderly person has been found in mentionable percentage in Ulipur (16%) followed by Saghata (15%) and Islampur (12.50%). And only 3% families in Ulipur have been identified with 2 elderly persons per family.

Number of people with disability in the family

Ulipurupazila has the highest percentage (10%) of People with Disability compared to two other upazilas. Begumganj union of this upazila has been appeared with highest number (11%) of People with Disability. On the other hand,Begumganj union (12%) of UlipurUpazila, SaheberAlega union (8.30%) of SaghataUpazila and Shapdhari union of IslampurUpazila have been appeared with highest number of persons with disabilities.

4.8 Monthly income of the household

Monthly income from primary occupation: The average monthly income of the respondents in all is up to upto Tk. 25000. The mean or average income of IslampurUpazila (Tk.8626) is higher than Ulipur (Tk.4181) and SaghataUpazila (Tk.3410). The average income of Ulipur and Saghata is far below form that of the Islampur due to poverty, disasters and lack of adequate employment opportunities. The highest number of respondents (57%) in Ulipur falls in the income group of Tk. 100 to Tk. 5000, while it is 48% in SaghataUpazila who mentioned that they don't have any monthly monetary income. It is worth noting that the highest number of respondents (50%) in IslampurUpazila falls in the income group of Tk. 5000-Tk.10000. In SaghataUpazila 29% respondents fall in the same group. In a given month (January, 2020) it is noticeable that the womens' income in Gaibandha is much higher than men and little lower than men in Jamalpur and Kurigram. Women's involvement in agriculture, wage earning and other sectors has been highly noticeable in the study areas. **(Figure-4.1).**
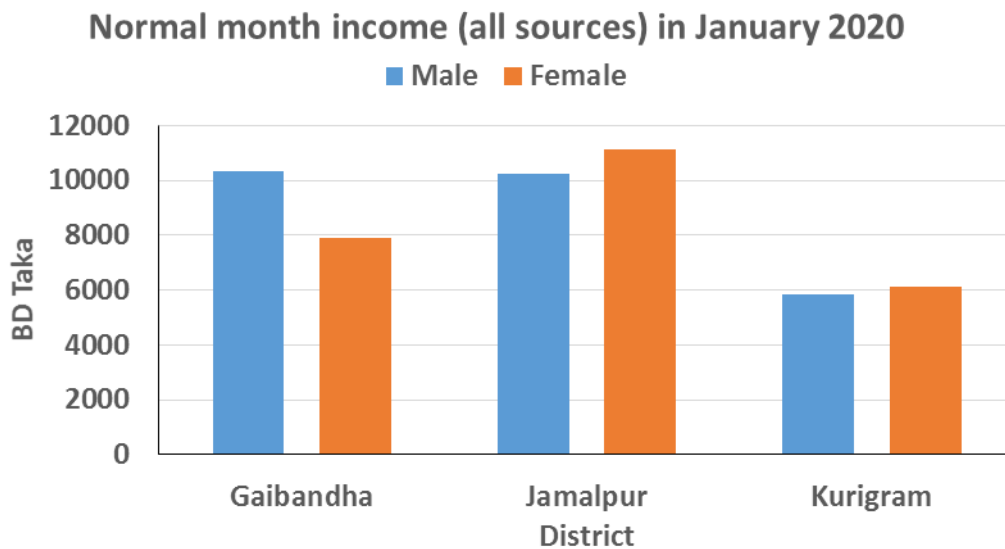
Figure 4.2: Income in a normal month (BD Taka)

4.9 Monthly expenditure of the household

The monthly expenditure of a normal month and of a flood affected month of recent times has been collected from the respondents on recall method. The average expenditure in a normal month of all region is around TK. 7125 and during a flood affected month it is Tk.6751. The field data shows that 46 % families of all region have over expenditure than their income during flood time and it is highest among the respondents of Gaibandha (64%) followed by Kurigram (43%) and Jamalpur (31%) compared to their normal time.

It is noticeable that the expenditure of women in normal time is almost same in Gaibandha and Kurigram and little lower in Jamalpur than men. (Figure-**4.2**) But during flood time the expenditure of women increases in Kurigram and Jamalpur and decreases in Gaibandha. The women of Gaibandha might have better option for their asset management but in Kurigram and Jamalpur they don't have much better options to manage their asset. (**Figure-4.3**)

Normal month expenditures (all sources)
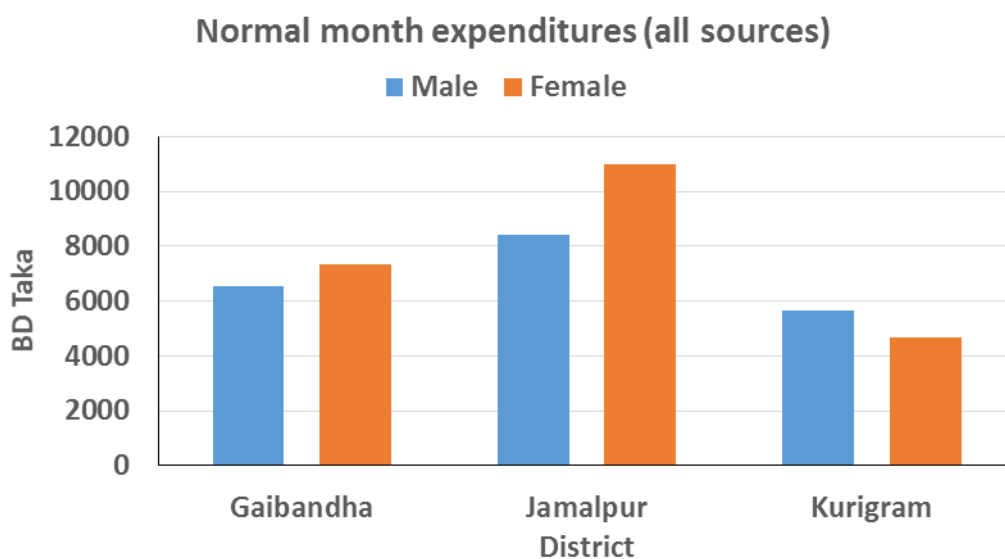
Figure 4.2: Expenditure in a normal month (BD Taka)

Expenditures in Flood Time (BD Taka)
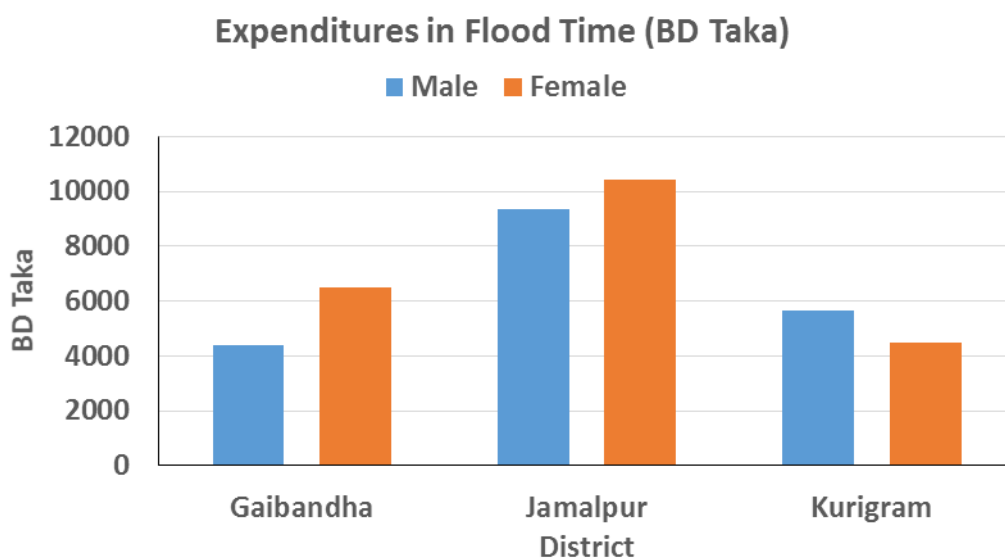
Figure 4.3: Monthly expenditure in flood time

4.9 Income source of the family

4.9.1 Primary income sources

Women are ahead of men in day labour work in Gaibandha (34%) and Kurigram (31%) district. (**Figure-4.4 &Figure-4.6**) These two districts are also ahead of Jamalpur in terms of women employment (16% and 24% respectively) in agriculture (farmer) which include farming home gardening, day labouring in agriculture sector. Fishing is another key

occupation for women in Gaibandha (5%) and Kurigram (10%). In Jamalpur primary occupations of women are not highly dependent on one particular sector. And it is because they might have different options due to operation of different organization in their area and the connectivity with some big cities including capital city Dhaka. **(Figure-4.5)**

(a)
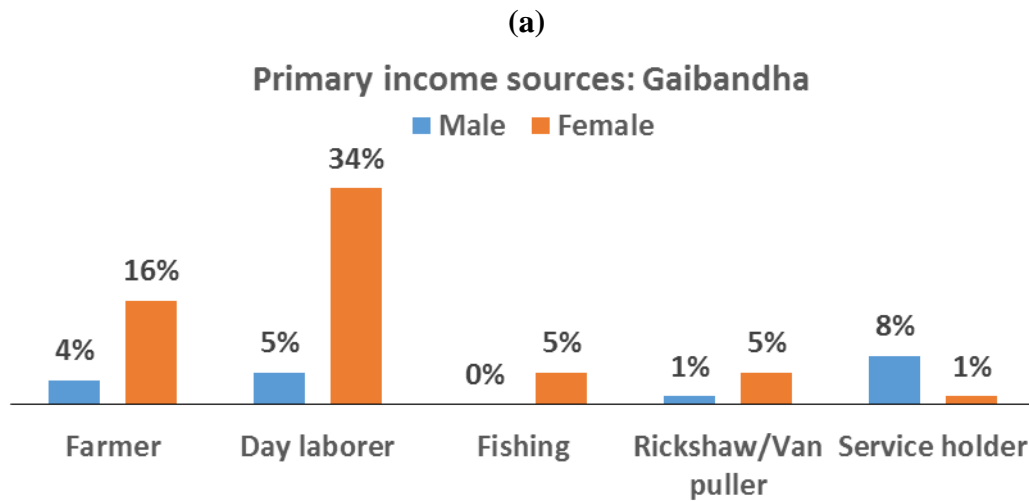
Figure 4.4: Primary income sources (Gaibandha)

(b)
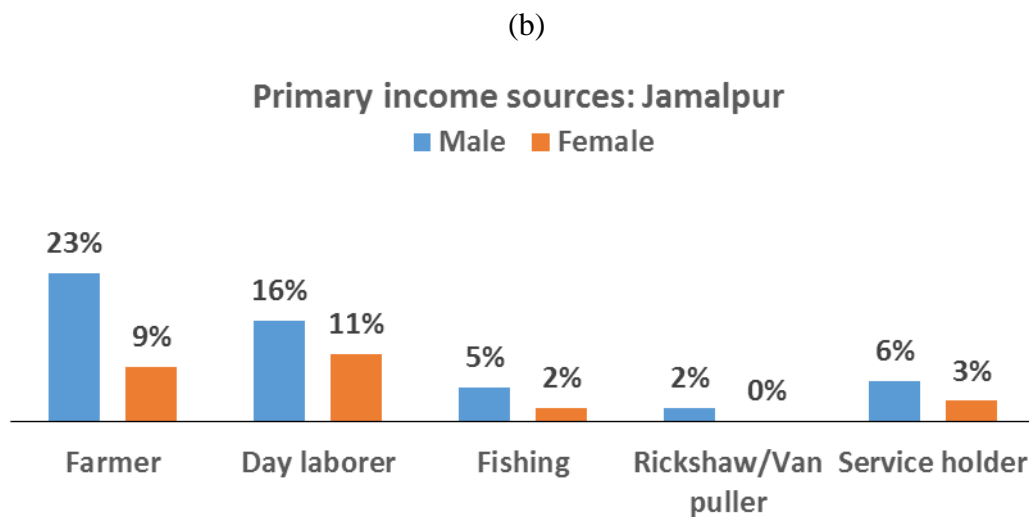
Figure 4.5: Primary income sources (Jamalpur)

24

Primary income sources: Kurigram
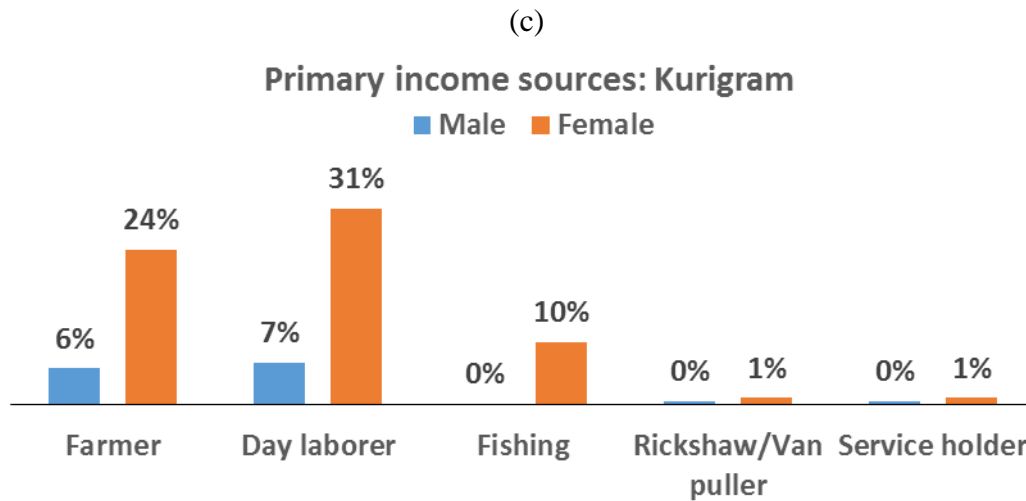
Figure 4.6: Primary income sources (Kurigram)

4.9.2 Secondary Income Sources

Among the respondents women are ahead than men in getting engaged in secondary occupation in day labour in Kurigram (21%) and Gaibandha (6%). (**Figure-4.7 &Figure: 4.9**) Women's participation in farming and agriculture is also higher than men in all three districts (Gaibandha-1%, Jamalpur-3%, and Kurigram-6%). Livestock rearing is an important income sources for women in Gaibandha (2%) and Jamalpur(1%) (**Figure-4.8**). The women of poor families in char areas rear livestock of rich men on the condition of profit sharing. And it has potential of diversification of occupation for the community. In Jamalpur the ratio of man- women participation in secondary occupation is different in fishing and day labour sectors.(**Figure-4.8**)

(a)

Secondary Occupation: Gaibandha
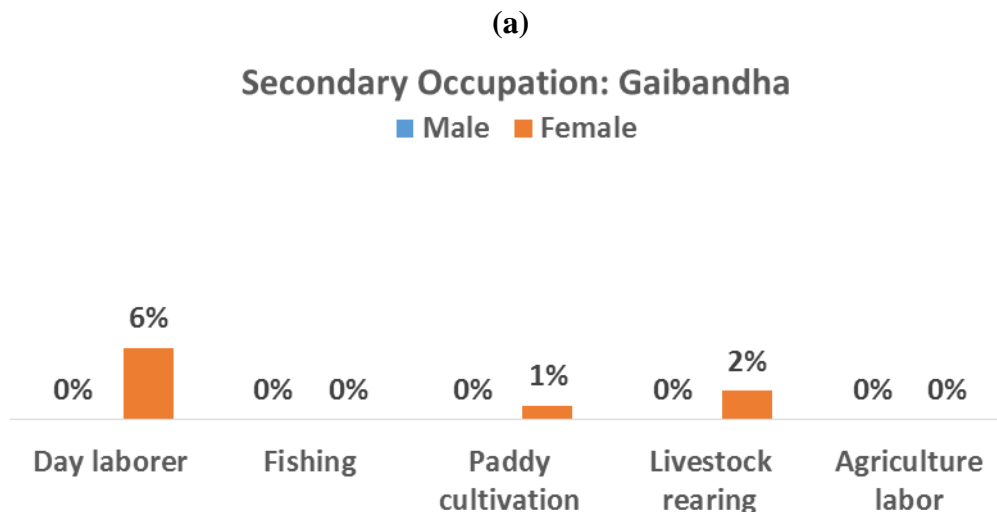
Figure 4.7: Secondary income sources (Gaibandha)

(b)

Secondary Occupation: Jamalpur
■ Male ■ Female

	Day laborer	Fishing	Paddy cultivation	Livestock rearing	Agriculture labor
Male	4%	5%	2%	1%	0%
Female	1%	1%	1%	0%	2%
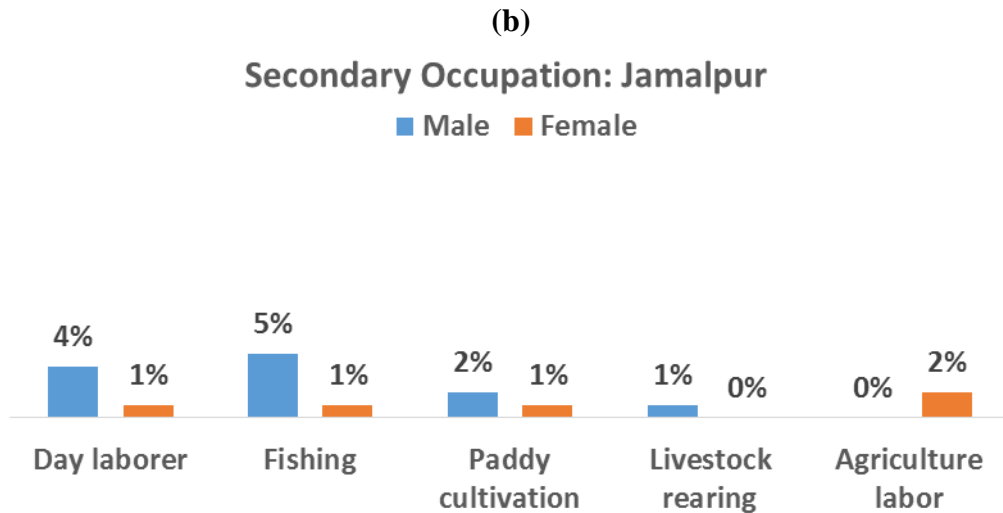
Figure 4.8: Secondary income sources (Jamalpur)

(c)

Secondary Occupation: Kurigram
■ Male ■ Female

	Day laborer	Fishing	Paddy cultivation	Livestock rearing	Agriculture labor
Male	2%	0%	0%	2%	0%
Female	21%	3%	4%	1%	2%
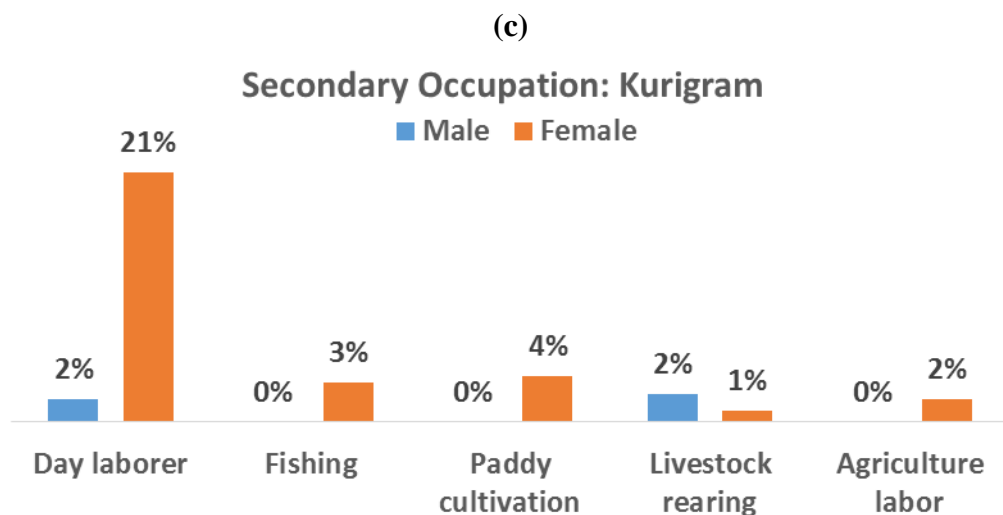
Figure 4.9: Secondary income sources (Kurigram)

4.9.3 Tertiary income sources

A very small section of the respondents (3%) have been found engaged in tertiary income activities and all most all of them are women and are from Kurigram district. It is worth noting that they preferred not to mention the occupation rather theymentioned that, they are engaged in different other occupations.

4.10 Changing scenario of primary income source

The respondents recalled that five years ago wage earning was their major occupation. If we see the current occupational status, we find that wage earning is still the most important occupation to the respondents. However, people of these three districts are engaged in multiple occupations and they adopt different occupations in context of disaster and better opportunities. It is to be mentioned that in many cases local people migrate from rural to urban but they might continue same occupations like wage earning in different sectors compared to their previous ones. **(SeeFigure-4.10).**

Causes behind change of primary occupation

Legend:
- Flood
- Riverbank erosion
- Skill development
- Better Opportunity

Gaibandha: Flood 52%, Riverbank erosion 4%, Skill development 0%, Better Opportunity 30%

Jamalpur: Flood 54%, Riverbank erosion 34%, Skill development 1%, Better Opportunity 22%

Kurigram: Flood 12%, Riverbank erosion 0%, Skill development 2%, Better Opportunity 6%

District
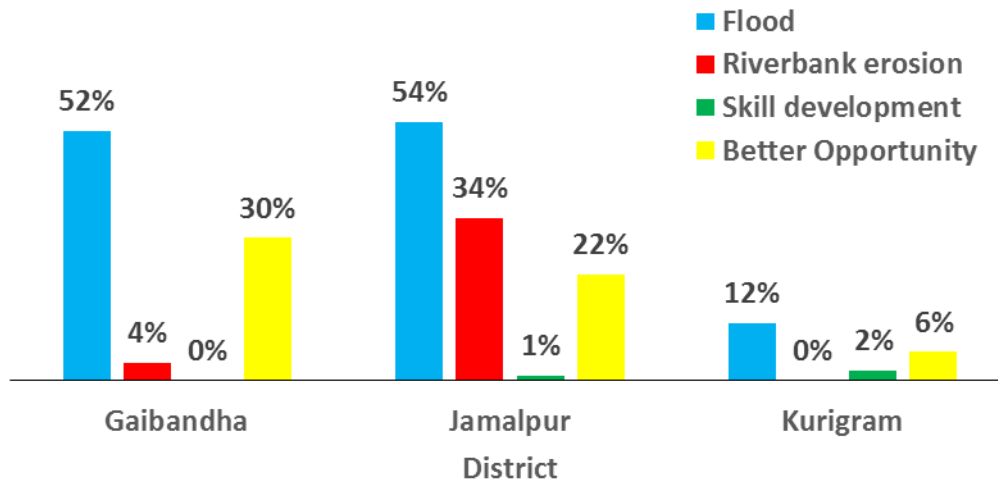
Figure 4.10: Causes behind change of primary occupation

It is interesting that the proximity with the capital city or big city is a big factor for changing occupation for the victims of flood and river erosion. Around54% respondents of Jamalpur have mentioned of changing primary occupation due to flood, while 52% respondents of Gaibandha and 12% respondents of Kurigram have mentioned flood as a big reason for changing their primary occupation. Flood and river bank are interlinked and river bank erosion is termed as flood induced disaster. River Bank erosion has been identified as big reason for the respondents of Jamalpur (34%) and Gaibandha (4%) to change their primary occupation. Better opportunity has become a big reason for changing the primary occupation to 30% respondents of Gaibandha, 22% respondents of Jamalpur and 6% respondents of Kurigram. It has been observed that the respondents of Gaibandha and Jamalpur have some scope of works in wage earning and other sectors like Readymade Garments in Dhaka, Gazipur, Narayanganj and other cities.Only 2% respondents of Kurigram and1% respondents of Jamalpur have mentioned skill development have helped them to change their primary occupation. Last year (2019) the mighty flood forced many people to change their occupation which was a big reason to get large number of respondents who had changed their primary occupation due to disasters.

4.11 Income scenario in lean period

During the lean period ranging from May-June to November, the local people face hardship to run their families due to occupational crisis. Lack of adequate employment opportunities triggered by the flood force the people, poor in particularpassing days without works or little employment opportunity. Local people in all three districts have good income in the months of October to March. But their income starts declining form April to Septembers. These six months are considered lean period for them. From October and November the situation gradually improves and these two months also considered as lean period.Among the three districts the people of Kurigram have less income during the lean period than two other districts and the people of Gaibandha is in better position compared to two other districts. (Figure-4.11).

In the FGD discussion with the traders at Chinaduli union at Islampurupazila of Jamalganj district the participants reflected on their business status during flood, "In last flood in 2019 our business faced very difficult time and was stopped for almost one and half month. Our

livestock and poultry were also died. Grocery items in ours shops were also destroyed. We couldn't bring new grocery items to our shops. We lived on our savings, loan and selling off livestock and poultry. We lack flood management system in our locality. We don't get any early warning. We usually get news on flood situation of the country through radio and television. If we get early warning then it would be helpful to our lives and asset."

Table 4.1: income during normal and lean period (In BDTaka)

District	Amount in BD Taka											
	Jan.	**Feb.**	**Mar.**	**Apr**	**May**	**Jun**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
Gaibandha	5114	4613	5851	4823	4737	3960	3337	5316	7543	6464	7596	7400
Jamalpur	8302	8764	5885	5679	4286	2872	3514	4588	4976	5833	4955	4786
Kurigram	3861	4000	3593	4735	3179	2543	2412	2249	2168	3439	5035	4000
Grand Total	**6525**	**6775**	**5052**	**4995**	**3862**	**3014**	**3105**	**3588**	**4696**	**5492**	**6200**	**5920**

4.12 Coping mechanism with low income

In all three districts personal loan has become major coping mechanism for male (59%) and female (58%) during flood and post flood situation. The local community collect loan mostly from money lenders and other individuals at high interest rate. The second major coping strategy is the reducing family expenditure and men are ahead (35%) than women (28%) in this context. The third major coping strategy is personal savings and women are in better position (28%) than men (27%). Usually women make a savings from their family income which become big support during disasters. Women are also ahead than men in other coping strategies including loan from MFI (4%), local people support (5%) and supports from NGOs (4%). Women are getting engaged in different livelihood interventions initiated by Government departments and NGOs.
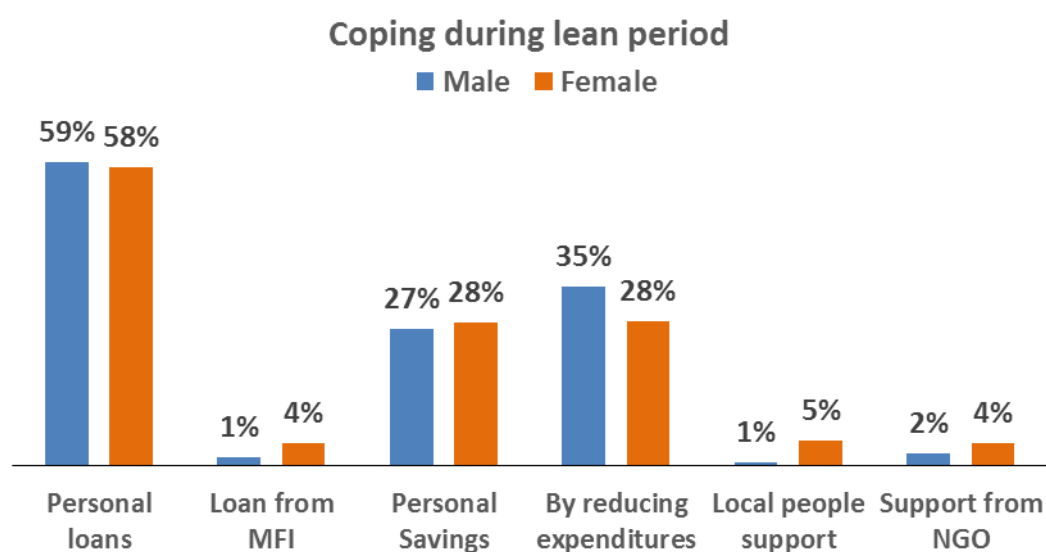
Figure 4.11: Coping during lean period in overall district

In the FGD discussion with wage earners at Chinaduli union in Islampurupazila of Jamalpur district the participants explained their losses to flood coping strategies, "In last flood in 2019 we couldn't work for a month and we had income loss of Tk.15000 to 25000. We also lost our family asset to flood. We lived on loan, reducing number of family meals and taking dry food, and went to other cities in search of work. We don't have any flood mechanism system in our locality. We were not provided with any information relating to flood. We didn't any early action preparation.

4.13 Conclusion

Based on the study analyses the following conclusion can be drawn-

- The key findings of the socio-economic survey are marked with higher number of women respondents (59%) compared to male respondents (41%);

- Female participants were higher in Kurigram district (71%) and which suggests that male members stay outside or migrate for certain times for making an income mostly from off farm activities.

- Around 98% respondents live in kutcha house which shows a poor living condition of the local community. Health and other basic facilities and services are not satisfactory.

- Poor literacy rate and lack of diversified employment opportunities increase the social and financial burden of the respondents;

- Most of the respondents are engaged in wage earning activities. Day labor and agriculture are the main occupation to local communities. People are getting engaged with secondary occupation and in many cases changing their primary occupation due to recurrent flood and associated disasters like river erosion.

- There is a mentionable difference between monthly income and expenditure especially during the flood time. Around 46% families of all region have over expenditure compared to their income during flood time. Local people undertake various coping mechanisms to overcome the livelihood crisis during flood.

- Divers coping options have not been observed in the study area. Getting personal loan from different sources is the main coping strategy to the respondents.

- Community people are not much familiar with early warning and flood management. They get flood situation news through radio and Television.

- Due to lack of institutional supports and resources, local community cannot adopt proper coping strategies during flood. An inclusive, collaborative and well-coordinated development approach is essential for the development of the local community.

CHAPTER FIVE: FLOOD VULNERABILITY AND RISK-REDUCTION

5.1 Introduction

Floods have had an impact on society from time immemorial (Kundzewicz & Takeuchi, 1999), and it is neither a new nor a recent phenomenon in Bangladesh. Floods are the most significant natural hazard causing suffering to a large number of people and damage to property in Bangladesh. For the people of Jamalpur, Gaibandha and Kurigram district, flood is a major threat for economy, life and livelihoods. Due to surrounded rivers Jamalpur district is prone to floods.

Key findings

- Due to geographical location, flood and flood induced river bank erosion are common scenario in Jamalpur, gaibandha and Kurigram district
- Almost every year, the studied district are affected by flood.
- Agriculture, homestead, livestock and poultry are the top most damaging sector in the studied areas
- Loan burden is increasing to recover flood induced loss and damage in where Kurigram is the top most lost burden area among three districts.
- Asthma, diarrhea, dysentery, RTI are frequent diseases during and after flood.

5.2 Flood scenario in the last five years

Flood is common phenomena in the three studied districts as well as Jamalpur, Gaibandha and Kurigram. "We experience flood almost all of the years in the last 30 years" said Chairman of Sapsdhari union of Islampur Upaliza of Jamalpur district. Not only Jamalpur but also Kurigram and Gainbandha district as well as Saghata upazila of Gaibandha and Ulipur Upazilia of Kurigram are similar to Islampur upazila of Jamalpur. In the studied period (2015-2019), heavy monsoon rainfall and upstream regions adjacent to Bangladesh border, a flow of large-scale water have been leading to a massive flooding situation in low lying areas of Northern Bangladesh including Gaibandha, Jamalpur and Kurigram during 2016, 2017 and 2018 (BDRC, 2018; NIRAPOD, 2016; NIRAPOD, 2017). During the filed study, it is also found that the inhabitants of Jamalpur, Kurigram and Gaibandha experienced deadly flooding during the studied period (2015-2019). During the focus group discussion among farmers in Water has seeped into every house. People with homes made from cement or tin are okay, but poor people like me are taking shelter along the rail tracks."

5.3 Flood induced loss and damage

The adverse effects of flood on the environment and socio-economic systems are increasingly creating major challenges for communities. Addressing these challenges is also adding to the difficulties of development, particularly for the low income people. Jamalpur, Kurigram and Gaibandha districts are susceptible to flood. Estimating flood induced loss and damage is therefore, a pertinent issue for development actors and policymakers. For empirical purposes, this study attempts a loss and damage assessment of studied districts as well as effective study area for different sectors including livelihoods, health and wellbeing etc. This study finds the following conclusions in terms of flood induced loss and damage in the study areas:

Homestead is the top most damaging sector in the study area

- In Kurigram, poultry is the second top most damaging sector and livestock is the third top

most damaging sector due to flood.

- In Gaibandha, health is the second top most and wage earning source is the third top most damaging sector due to flood.

- In Jamalpur, agriculture is the second top most and health is the third top most damaging sector due to flood.

- In the three study area, health is similarly damage due to flood.

The figure 5.1 shows that in Gainbandha homestead is the top most damaged sector which is mentioned by 62.96% male where is by the opinion of women health is top most damaged sector which is expressed by 29.85% women. On the other hand, in Jamalpur, according to the opinion of men and women, homestead is the top most damaged sector which is expressed by 44.69% men and 47.31% female respectively. Like Gaibandha and Jamalpur, in Kurigram homestead is the top most damaged sector which is also mentioned by 30.24% men and 24.81% women respectively (Figure 5.1).
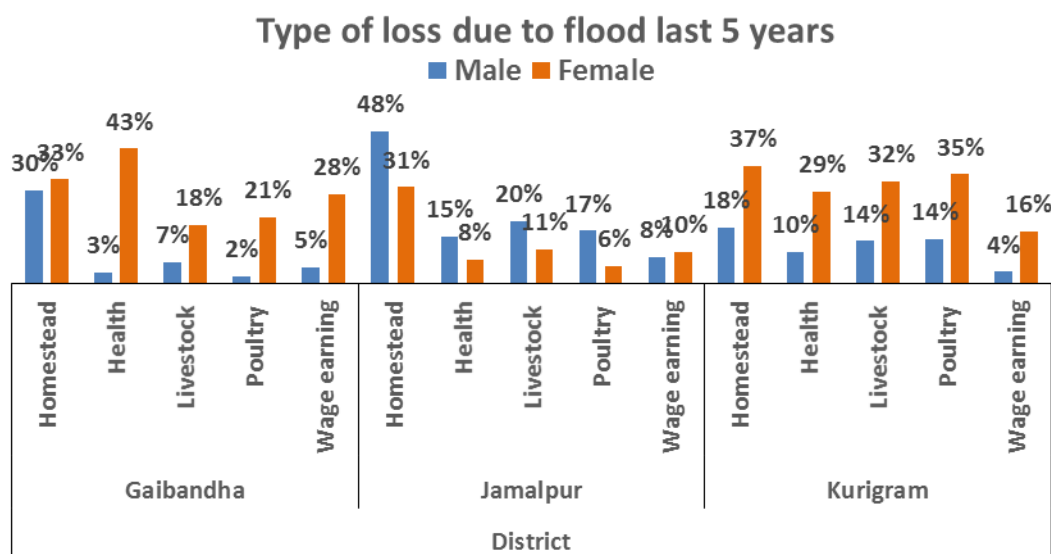
Figure 5.1 Sector of flood induced loss in study area for the period of 2015-2019

5.4 Economic loss induced by flood

Despite individual and institutional efforts to cope with flood, the majority of households in the study area still experiencing negative impacts from flood. The loss and damage experience by communities as a result of floods come from agriculture, homestead, livestock, vegetable and crop land, poultry, fish firm, natural fishing, health outcome, water and sanitation infrastructural damage and disease burden, educational damage, shrinking wage earning sources and job opportunities and also from damaging domestic utensils as well as important documents and logistics. The major loss and damage come from impacts on agricultural livelihoods in general and crop production in particular. Being lowland area, crops suffer serious damage from flooding in the study areas. There is a clear indication that loss and damage from the agriculture sector from Jamalpur district is highest than other districts. The study made an effort to estimate the loss incurred by flood from Chinaduli, Kuklandi, Noapara and Sahdhari union of Islampur upazila under Jamalpur district and the study illustrates that highest number of respondents (22.60%) of Chinaduli union losses on an average 40001-50000 BDT in each year for the period of 2015-2019 from agricultural sector

due to flood whereas it stands for Kulkandi union at 33.30%. In the Noapara Union, the highest number of repsondents (32.10%) losses 7001-1000 BDT on an average for the period of 2015-2019 due to impact of flood. It was found that Sapdhari union losses the lowest amount which is below 1000 BDT on an average for the period of 2015-2019 due to flood and it is the highest number of respondents (26.10%). Being char area, most of the inhabitants of Shapdhari are not engaged with agriculture. They depend on homestead farming and also fishing for their livelihoods so economic losses from agriculture in this union is minor (Figure 5.2).
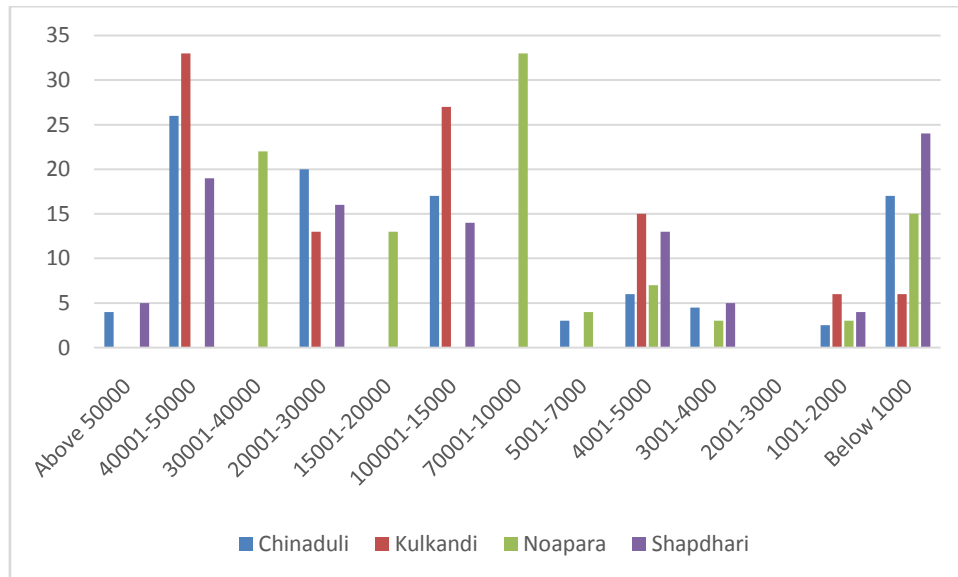
Figure-5.2: Economic loss from agriculture sector incurred by flood2015-2019) in BDT ((Y axis represents the percentage of respondents)

In the Kurigram, the figure 5.3 illustrates that homestead sector is one of the top most sector from where economic loss comes due to flood. Most of the respondents lost in the last five years from homestead on average below 1000.00 BDT in each year. In Begumganj union, it is 45.00%, in Buraburi union it is 33.00%, in Hatiya union it is 34.60% and in Saheber Alga it is 39.80%. Begumganj loss highest from homestead and Saheber Alga union is the second highest economic losing sector from homestead.
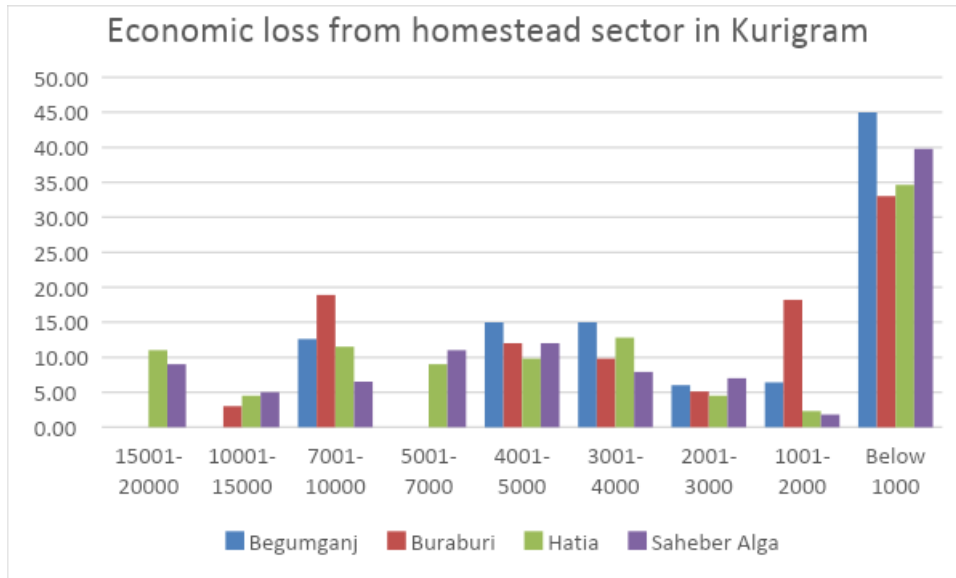
Figure 5.3: Economic loss of homestead in Kurigram (BDT) (Y axis represents the percentage of respondents)

From the livestock sector, the study finds the highest economic loss comes from Gaibandha district and highest loss comes from Ghuridaha union which is 20001.00-25000.00 BDT mentioned by 19.8% respondents. Second highset losses also comes from Ghurdaha union which is on average 7001.00-10000.00 BDT mentioned by 18.70% respondents during the study (Figure 5.4). The DLS of Saghata Upazila says "During flood, most of the livestock wash away. Not only so due to flooding, many goat and cow suffer from diseases for long time and die after flood." In the focus group discussion at Saghata union, we found that 9 cows have washed away during the flood of 2018. Participants also mentioned that after flood 3 cows and 5 goats have died due to diseases.
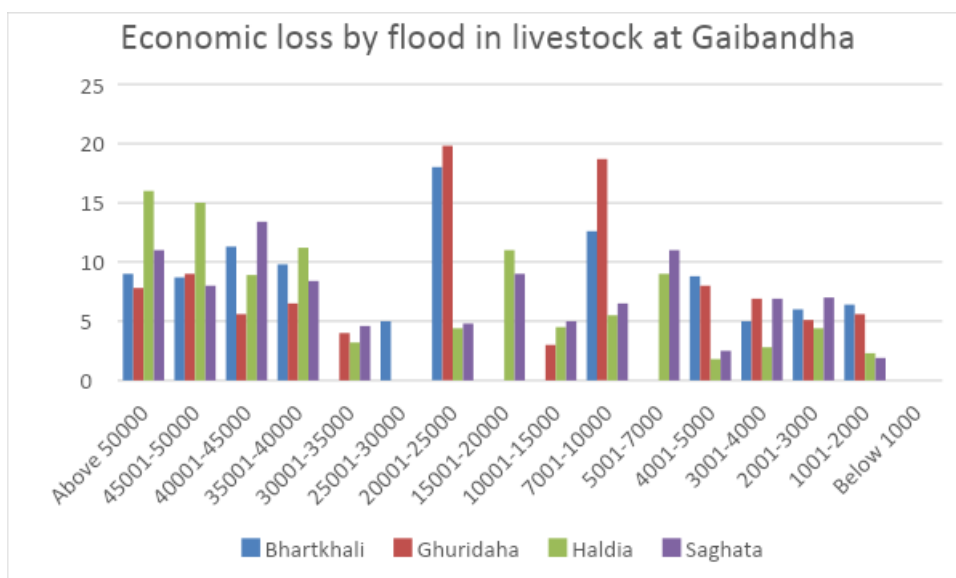
Figure 5.4: Economic loss by flood from livestock at Gaibandha in BDT (Y axis represents the percentage of respondents)

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5.5 Housing type of respondents

In the study areas, jhupri, kutcha, semi pacca and some other housing types were identified. In Bharatkhali union of Gaibandha, there was only kutcha hoses were found whereas in Saghata union, most of the houses are kutcha. From the observation and focus group discussion, it may be concluded that Saghata union is most vulnerable in terms of flooding. Flood level rise higher than any other unions of Saghata upazila so why people constructed kutcha houses raising plinths to refrain flood water. In Chinaduli union of Jamalpur and Ghuridaha union of same upazila, a small portion of other (one storied building) was found which is 8.3% in Chinaduli and 1.7% in Ghuridaha union. Jupri is found in Noapara union and Shapdhari union of Jamalpur. Both of the unions are at erosion prone char areas and so why people do not construct permanent houses for their dwelling. In each year, due to flood and river bank erosion, inhabitants of those unions have to migrate one place to another places. In Saheber Alga union of Kurigram all of the houses are semi pacca which is similar to Bharatkhali union of Gaibandha (Figure 5.5).
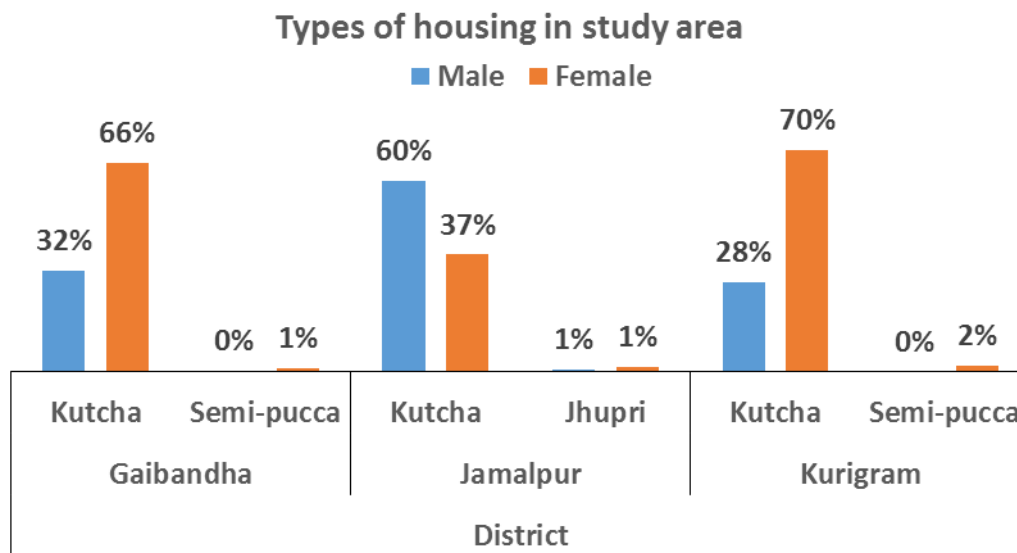
Figure 5.5: Types of housing in study area

5.6 Migration scenario of the respondents

Due to flood and river bank erosion, migration scenario is common in the study area. In the studied period (2015-2019), the study reveals that 93% respondents have migrated temporary form one place to another and 7% of the respondents have migrated as well as permanently displaced from their residence (Figure 5.6).
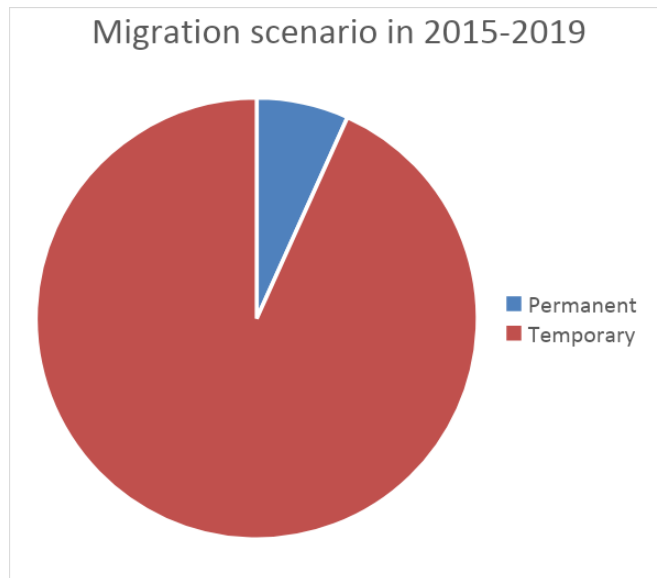
Figure 5.6: Migration scenario in the study are during 2015-2019

The figure 5.7 reveals that migration statistics of women are almost similar to men. The women respondents express that 94% women have to migrate temporary from one place to another place within this period due to flood whereas 6% have displaced permanently due to flood and river bank erosion.
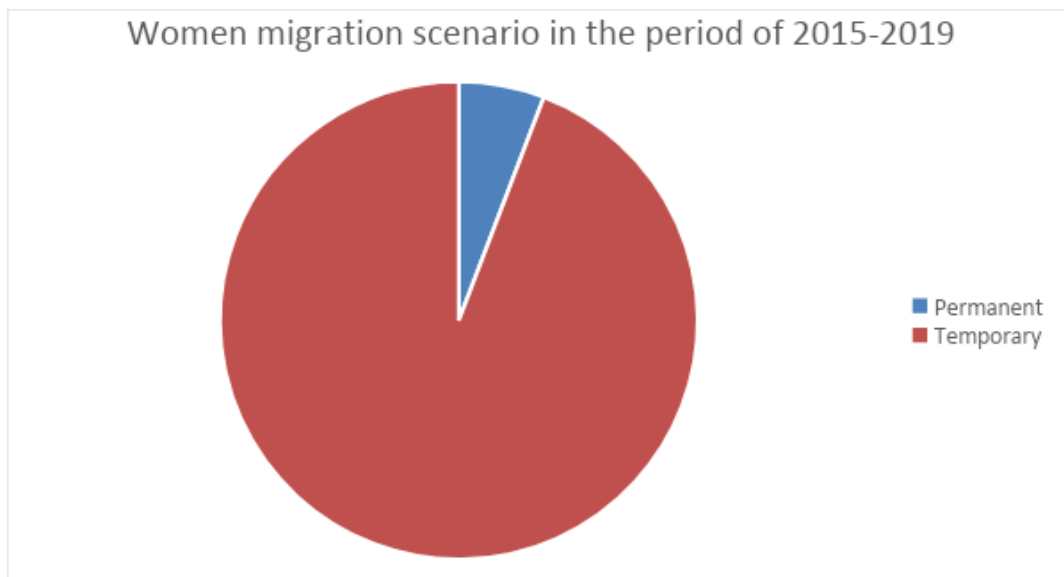
Figure 5.7: Women migration scenario in the study area during 2015-2019

5.6.1 In migration

Migration is common scenario in the study area. Due to flood and river bank erosion, inhabitants of the study area cannot live in a similar place for long time. On the other hand, some of the inhabitants migrate from one district to another district which is common phenomena in the study area. From nearby districts or nearby villages, in-migration is tremendous. In Gaibanhda, 77.89% of the respondents migrated from another places and

residing in the current location which is found 43.28% for Jamalpur and 72.26% for Kurigram (Figure 5.7).
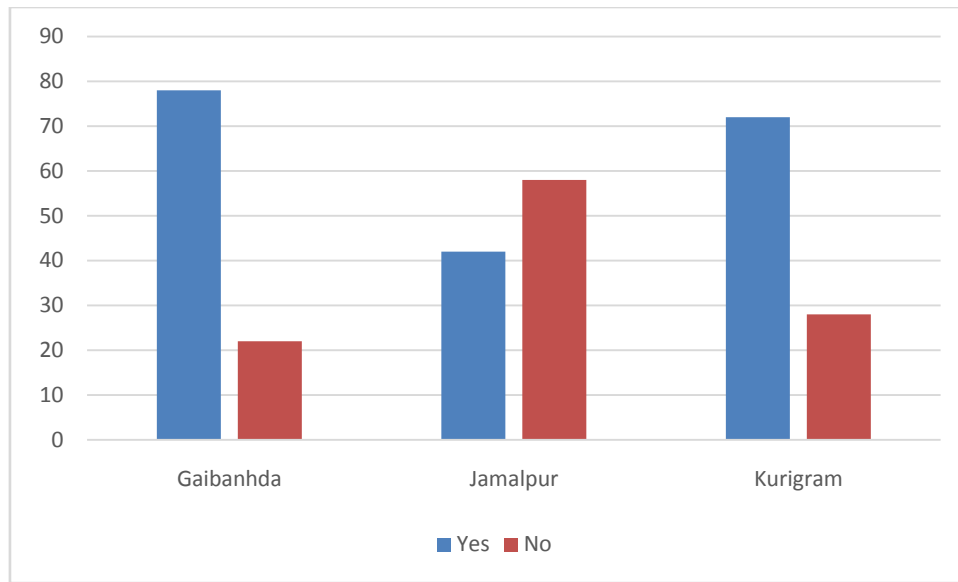
Figure 5.7: In migration scenario in the study area

5.6.2 Out migration

As like as in-migration, out migration also common scenario in the study area. Sometimes the whole family migrate to the nearby areas which is flood and river bank erosion free and also sometimes, earning members of the households temporally or permanently migrate in search of wage earning. In Gaibandha, 4.20% female and 16.43% male earning members as well as household head have migrated to the another places whereas it is 6.41% female and 4.28% male for Jamalpur and 1.38% female and 2.15% male for Kurigram (Figure 5.8)
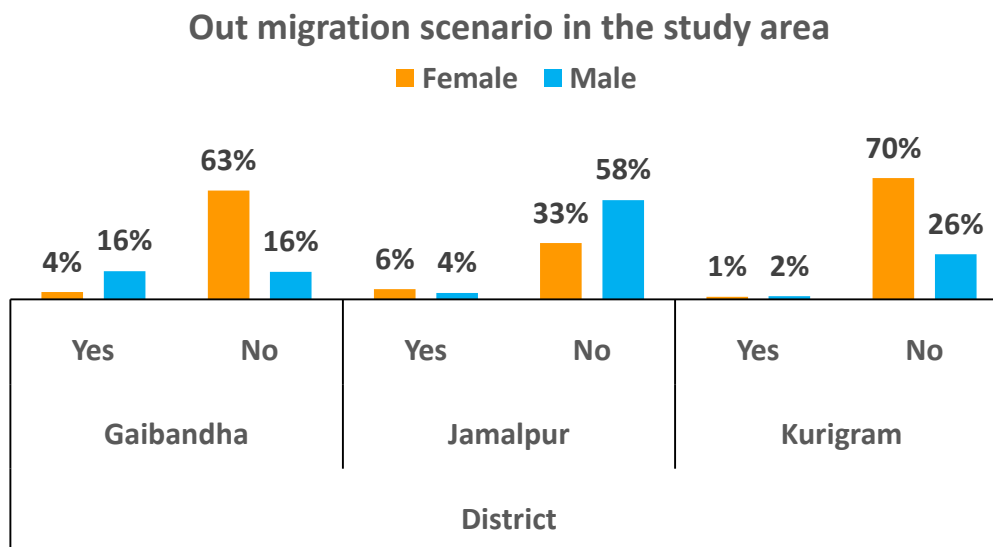
Figure 5.8: Out migration scenario in the study area

5.7 Rescue problems during flood

Flood is an overflow of water that submerges usually the land, embankment and homestead. Flood occurs due to heavy rainfall and upstream flow which have great impact on the flooded area. During flood people face several problems including rescue related problem. During flood, trees are uprooted; buildings are destroyed; road are destroyed and whole region submerged under water. An attempt has been made to explore the problem faced by flood affected people during flood to rescue themselves with resources. The responses are calculated by out of total response frequency. For example, in the first response 49.7% for "No road" in Gaibandha is for 142 out of 286 respondents of Gaibandha. This is why, 127 for "No road" in Jamalpur yield 71.8% out of 177 data of Jamalpur. No road is second top most problem for the three studied area in where no flood shelter is the top most problem to rescue the respondents during flood. Along with unavailable road and absence of shelter center, the respondents have argued that there is no security in the shelter. 44.44% response comes from Gaibandha that they don't have security in flood shelter. On the other hand, 26.2% response come from Gaibandha that they don't have bridge or culvert on the road to ensure access to safe side during flood. A mentionable number of responses come from respondents that they don't get sufficient information on actual time and duration of flood as well as disaster and it is the third top most problem to rescue themselves and resources which is 37.4% response for Gaibandha, 36.7% response for Jamalpur and 60.6% response from Kurigram (Figure 5.9a, 5.9b & 5.9c).
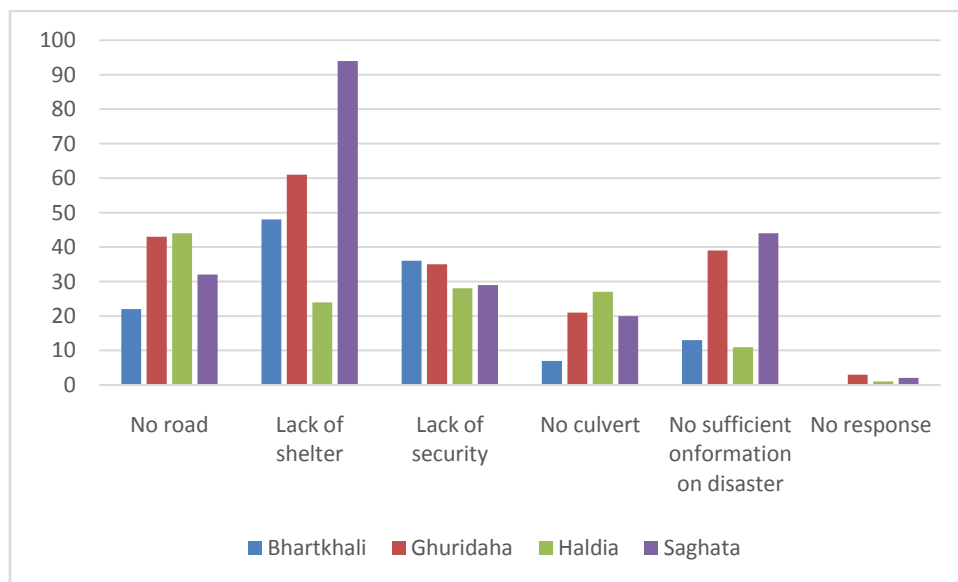
Figure 5.9a: Rescue problem during flood in Gaibandha
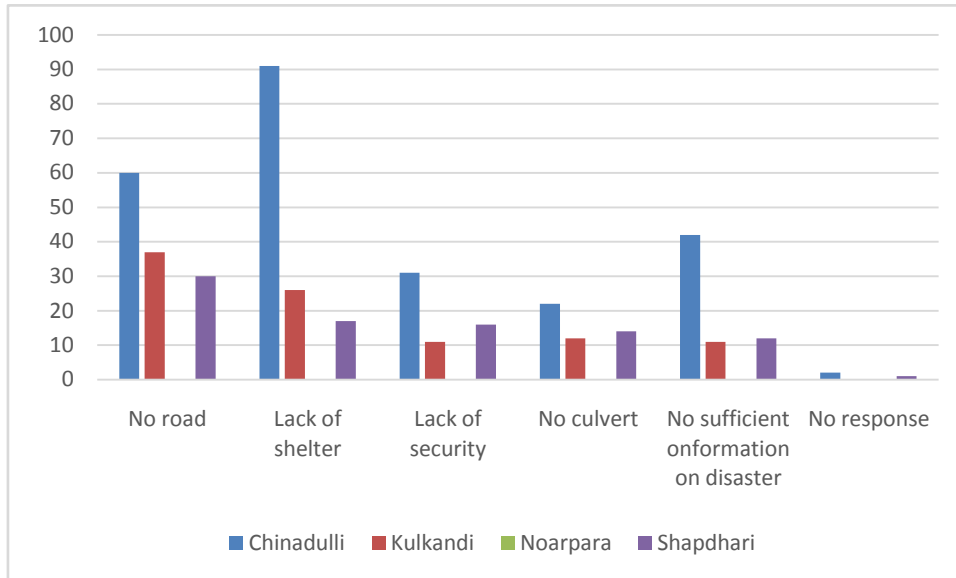
Figure 5.9b: Rescue problem during flood in Jamalpur
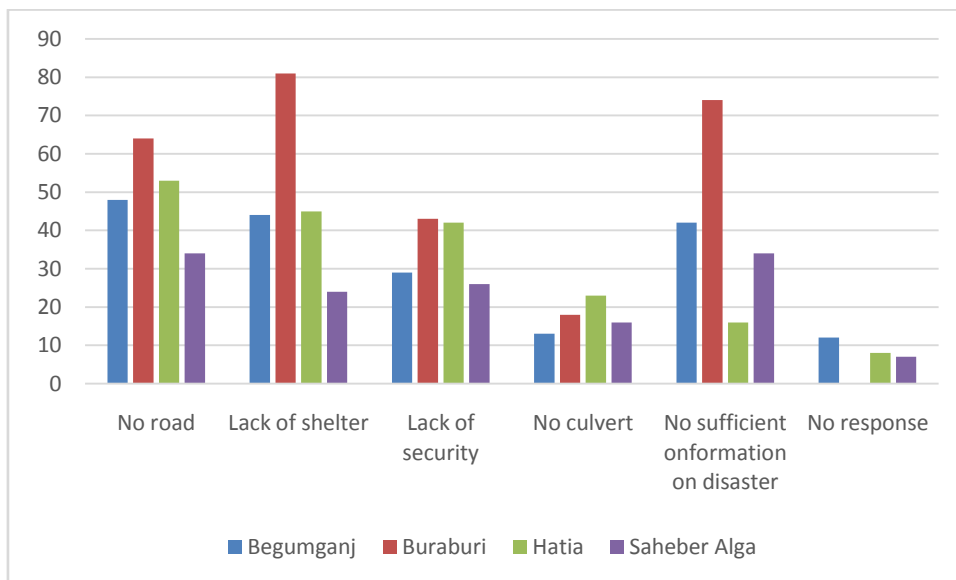
Figure 5.9c: Rescue problem during flood in Kurigram (Y axis represents the percentage of respondents)

Comparative analysis was done by male and female in terms of rescue problem during flood in the study area which is provided in the figure 5.10. The study reveals that highest number of women in three districts faces insufficiency of flood shelter which is 53% for Gaibandha, 21% for Jamalpur and 50% for Kurigram. The other remarkable problems faced by women in the study areas are lack of security and unavailable road for communication.
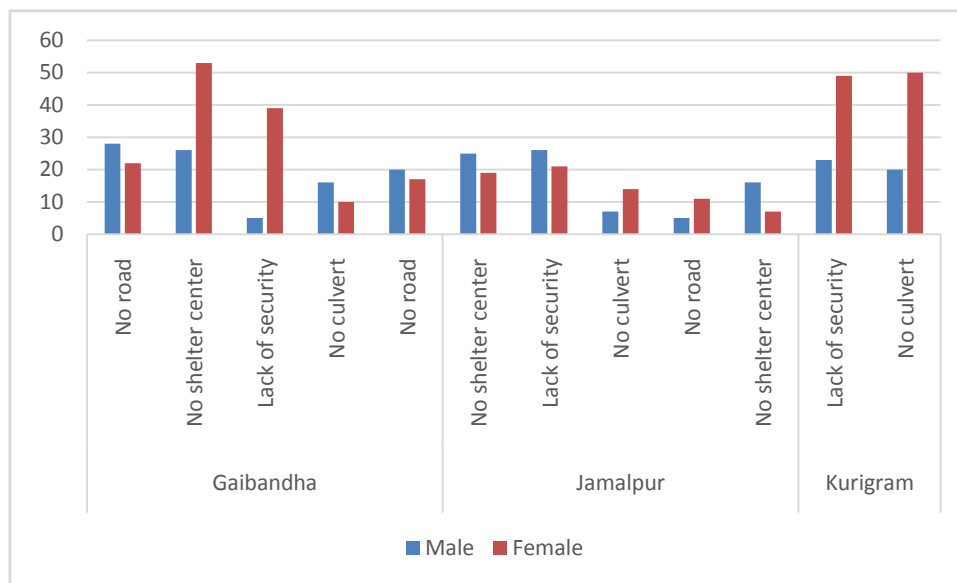
Figure 5.10: Gender segregated problems during flood rescue (Y axis represents the percentage of respondents)

5.8 Problems in flood shelter

In Bangladesh there is not designated flood shelters like cyclone shelter. In the flood prone areas, flood affected people like to take shelter in school-cum-shelter, embankment, nearby upraised land or individual homestead. But in some cases, people face a lot of problems in the flood shelter which are included accessibility to shelters, land availability, protection of lives and livelihoods, basic facilities and services, safety and security of women and children. The findings show that the shelters are not almost safe and accessible for the flood affected people. The identified problems by respondents are unavailable toilet facilities, absence of drinking water facilities, insufficient space to take shelter, lack of privacy for women and adolescent, gender based violence etc. In Jamalpur, designated flood shelter is going to construct by the name of Mujib Kella and the District Relief and Rehabilitation Officer (DRRO) mentioned that by the initiative of government, 17 Mujib Kella is going to construct within 2020 to ensure safe shelter during flood (Figure 5.11).
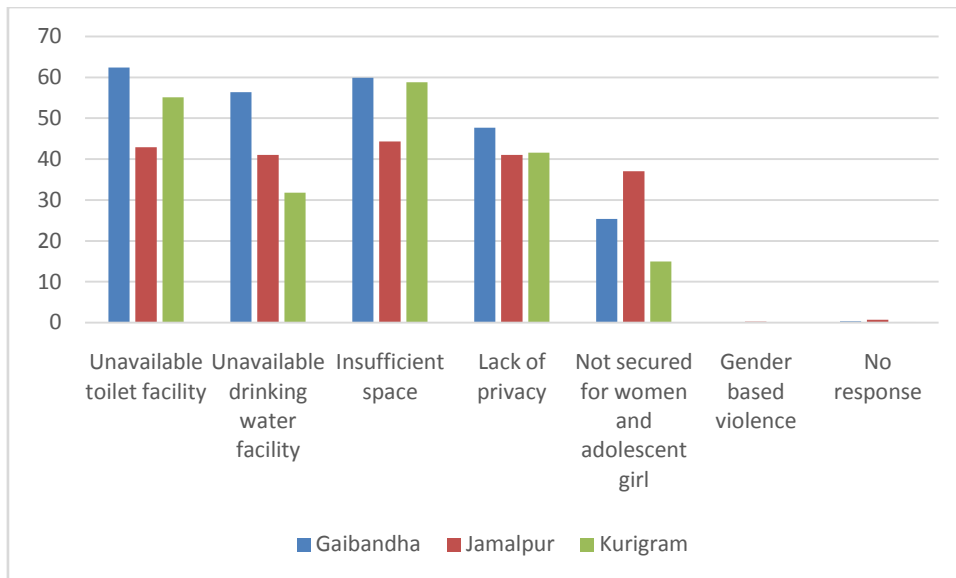
Figure-5.11: Problems in flood shelter

There is no designated flood shelter though Kurigram, Gaibandha and Jamalpur districts are regularly flooded area in Bangladesh, People take shelter nearby road, embankment, school, college for safe shelter. But women faces a lot of problem in those temporary flood shelter. Women don't have privacy and none of the shelter is safe for women and adolescent which is found during the study. Most of the women of the study areas mentioned that they don't have privacy which is mentioned by 92.10% of Gaibandha, 95.30% of Jamalpur and 98.20% of Kurigram. On the other hand 100% women respondents of Gaibandha mentioned that security problem is the top most problem faced by them in the shlter which is mentioned by 98.50% of Jamalpur and 99.20% of Kurigram which is illustrated in figure 5.12. Gender based violence though mentioned as lowest problem but during the focus group discussion in there studied district, it is found that GBV is common problem in the shelter but due to social conservativeness they cannot express it.
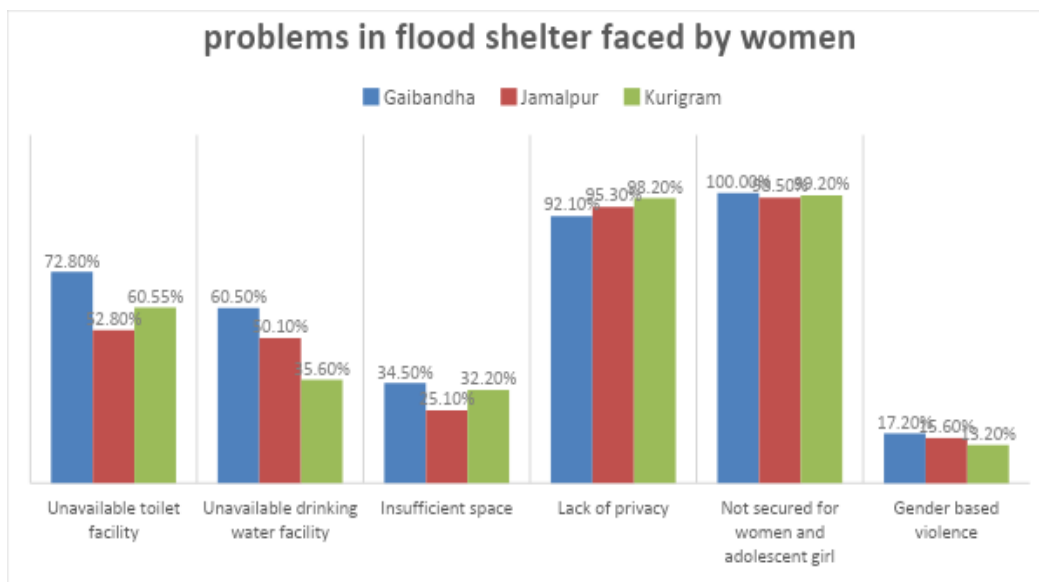
Figure 5.12: Problems in the flood shelter faced by women

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5.9 Drinking water sources and crisis

Water is an important element for living being. Drinking water is most important for health. Drinking water can be obtained from surface sources or groundwater sources. In Bangladesh, groundwater is mostly used for drinking water through shallow tube well and deep tube well. In some cases, surface water like canal or pond water is used for drinking through different purification process. In the rural areas of Bangladesh, consumers receive their water from private tube well or community tube well. In the flood prone areas, drinking water crisis is alarming. During the flood, all of the drinking water sources submerged under inundation and being polluted which causes health problems for the flood affected communities. Flood affects the quality of drinking water of tube wells when it becomes inundated. In the normal period, people usually collect drinking water from deep and shallow tube well form the study area. But during the flood, due to contamination and submergence, people depends on alternate drinking water sources. The study reveals that during the normal period, 7.40% of respondents collect water from deep tube well which stands at 6.60% of Gaibandha. At the same time, in Jamalpur, 4.40% of respondents collect drinking water from deep tube well which stands at 2.90% during flood period. There is a surprising information found from the Kurigram from the household survey and also from focus group discussion. In the normal time, there is none who can collect drinking water from deep tube well but during flood period, 3.20% respondents collect drinking water from deep tube well. Community people argues that due to ground water depletion, during normal period they cannot extract water using deep tube well but during flood period, ground water table increase and they are able to extract drinking water using deep tube well. The study explores that most of the people of study area depends on shallow tube well during normal period and flood period for their drinking water which is shown in the table (5.1). Though rainwater harvesting is environment friendly but there is none who is involved with rain water technology to reserve drinking water. In Gaibandha, 0.40% people depends on bottled water for their drinking purposes thought it increase at 4.50% during flood season. In Kurigram and Jamalpur, 8.80% and 7.30% depends on bottled water for their drinking purpose respectively but in normal period, no one is dependent on bottled water. The Executive Engineer of DPHE, Gaibandha says that during the flood though we expect to serve the whole flood affected communities but due to lack of resources we cannot provide safe drinking water and water purification facilities to the people. We need more support to serve the whole flood affected people which is found during KII.

Table-5.1: Drinking water sources and crisis

Sources	Gaibandha		Jamalpur		Kurigram	
	Normal period	Flood period	Normal period	Flood period	Normal period	Flood period
Deep tube well	7.40%	6.60%	4.40%	2.90%	0.00%	3.20%
Shallow tube well	92.20%	89.50%	95.20%	82.80%	100.00%	86.90%
Canal	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
River	0.00%	0	0.40%	5.50%	0.00%	2.60%
Rainwater	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Well	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bottle water	0.40%	4.50%	0.00%	8.80%	0.00%	7.30%

5.10 Disease in the flood affected area

Flood increases outbreak of infectious diseases. Flood affected areas become prone to disease outbreak during and after the flood. Flood victims frequently report feeling depressed and isolated (Tapsell, 2000). In the aftermath of a flood deaths and injuries not only result from the physical characteristics of the event but are also determined by the prevailing socioeconomic and health conditions of the community and any endemic infectious diseases. Increased rates of diarrhea (including cholera and dysentery), respiratory infections, hepatitis A and E, typhoid fever, leptospirosis, and diseases borne by insects have been described as occurring after floods in developing areas (Howard eds, 2000; CDC, 1986). Typhoid, cholera, hepatitis A, conjunctivitis, leptospirosis, dengue jaundice, etc are common disease occur during and post flood. Flood water literally increase the risk and transmission of vector-borne and water-borne diseases. Vector-borne diseases like dengue, malaria, chikungunya, etc. transmit through several parasites and pathogens such as mosquitoes. On the other hand, water borne diseases like cholera, typhoid, jaundice, leptospirosis, etc. cause by contaminated water. The study made an attempt to investigate insight of comparison of suffering from diseases during and post flood of the respondents by district. The percentages calculated out of total frequency of every disease of a district. For example, in Gaibandha there were total 342 (100%) cases of diarrhea, out of this total 342 cases 171 (50%) were found to be during flood and 171 (50%) were found to be after flood. In Gaibandha, during flood; dysentery and asthma are at alarming situation because all of the respondents suffer from dysentery and jaundice. In Jamalpur district, jaundice is pandemic after flood and 100% of the respondents suffer from jaundice in this district. Like jaundice, pneumonia also pandemic in Jamalpur because 100% of the respondents also suffer from pneumonia after flood. Worm, typhoid and jaundice also become pandemic in Kurigram after flood which is found in the study (Figure 5.13a and 5.13b). According to the Upazila Health Office of Islampur, Jamalpur. "Dysentery, diarrhea, cholera and jaundice is the common disease in the area during and after flood." He also added that we cannot accommodate diarrhea patients after flood. He also said that the people of char areas suffer mostly from diarrhea during and post flood. During flood, people cannot move elsewhere and drink polluted water. After flood we in collaboration with Department of Public Health (DPHE) provide water purification table, bottled water but it becomes pandemic. He mentioned that in the last year (2019), in each day on an average 50-60 patients have admitted in the hospital from water borne disease.
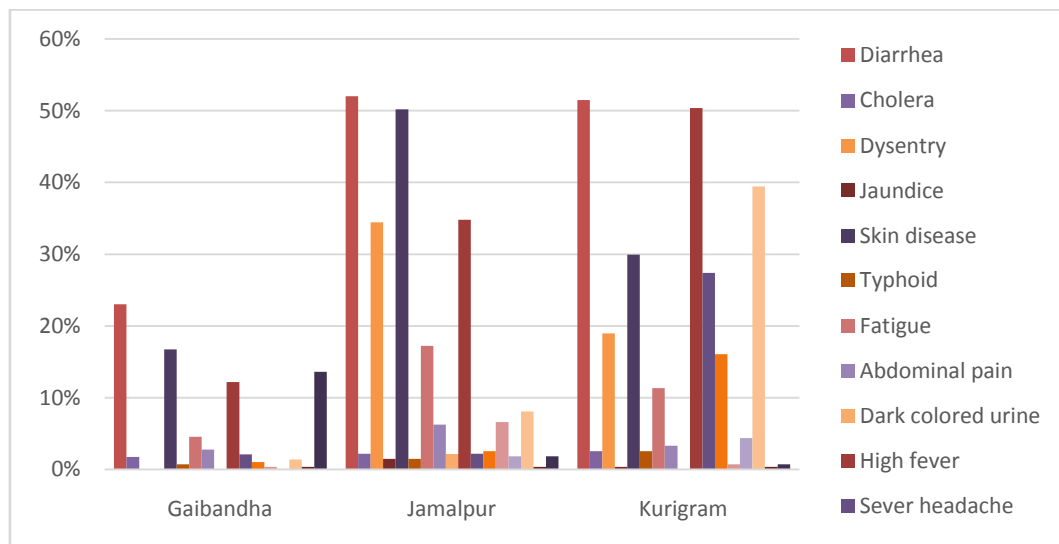
Figure 5.13a: Disease burden during flood
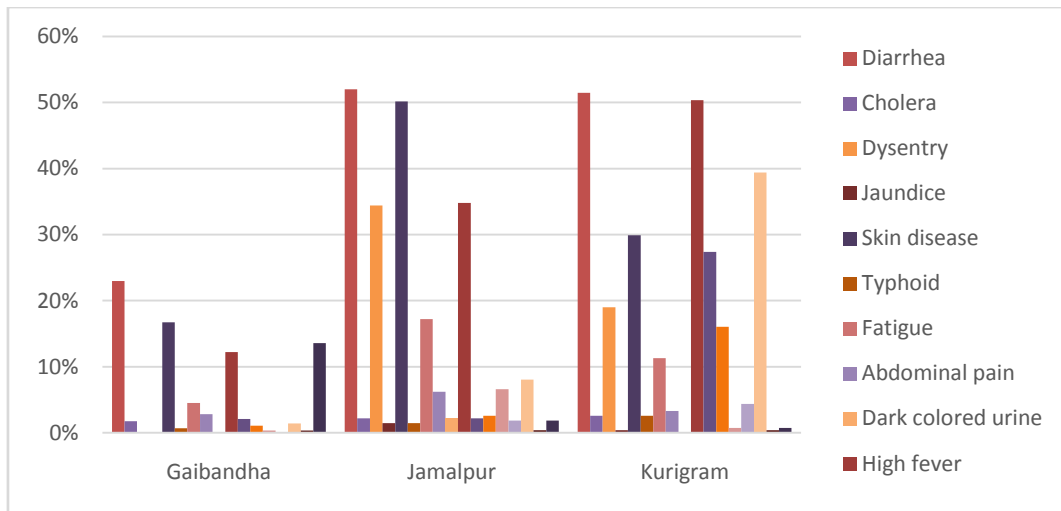
Figure 5.13b: Disease burden after flood

It is found that during flood, highest number of women (32%) suffer from high fever in Gaibandha whereas in Jamalpur, highest number of women (11%) suffer from diarrhea and in Kurigra, it is 25% for high fever and diarrhea is 20%. In Gaibandha, dirrehea is second highest suffering diseases for women which is 17% (Figure 14).
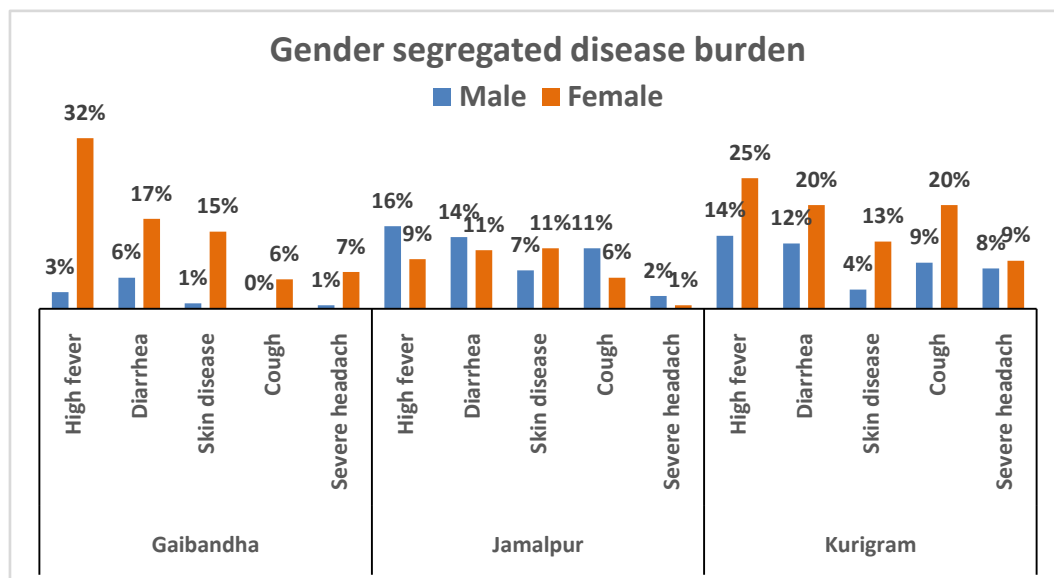
Figure 5.14: Gender segregated disease burden

5.10.3 Health recovery cost after flood

Due to flood, most of the people of the flood affected areas suffer from several diseases including vector borne and water borne diseases. After controlling of disaster situation, the affected populations participate in activities to restore community life and rebuild the environment and health as well as infrastructures. There is great emphasis on recovery of health by the own efforts and medicinal support. To recover the human health, flood affected communities invest money which is almost burden for the poor people. It is found that in Gaibandha, 77.20% people pay below 1000.00 BDT which is 57.50% for Jamalpur and

67.30% for Kurigram to recover health. Some people of the studied districts invest above 200.00 BDT for health recovery which is 3.50% for Gaibandha, 14.30% of Jamalpur and 7.60% for Kurigram (Figure). The Upazila Health Officer of Islampur Upazila of Jamalpur says different thing and he mentioned that to recover the health after flood, each person almost pays minimum 10000.00 BDT but this is not being count because all of the poor family get support from Upazila Health Complex (UHC). He also added that not only government hospital but also non-government organization provide medical support to the flood affected people. Similar comment also provides the Executive Engineer of Dept. of Public Health Engineering (DPHE) of Gaibandha. He says that DPHE provides water purification support during and after flood. This is totally free support for the flood affected people. Each household of flood affected communities needs almost 3000.00 BDT for water purification support in each year which is not counted. During the Focus Group Discussion with flood affected people in Kulkandi union of Islampur Upazila under Jamalpur district and Hatiya union of Ulipur Upazila under Kurigram district with farmers, it is found that they get support from UHC, DPHE, NGOs and some volunteer groups during and after flood on medical and health support (Figure 5.15).
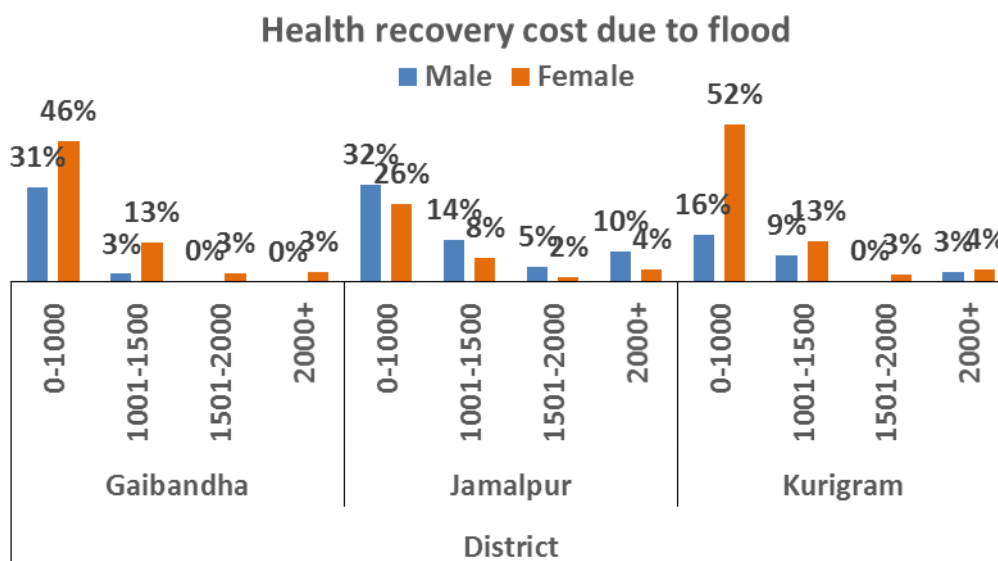
Figure 5.15 Health recovery cost (Y axis represents the percentage of respondents)

5.11 Death toll/injury by flood (during and after)

Flooding and water logging cause disease, death toll and injury during the flood and after flood. This cause further death and sickness due to snack bite and injury beyond the flood period. The study has emphasized to count the injury and death toll during the last flood and after the last flood as well as flood of 2019. The DDRO of Kurigram district says, in the last year, during flood we have counted 17 death among those 7 people have washed away with flood water. The District Civil Surgeon also mentioned that they have found four death due to diarrhea disease in the hospital during the last flood. But in the field study, it is found that 9 people have died in the Jamlapur district as well as Islampur upazila which is the second highest number of death among three upazila. The highest number of death was calculated in Kurigram which is 13 by the respondents. In Jamalpur, 27 people were injured in the last flood due to river bank erosion, house collapse and tree over rooted (Table). In the study area,

total death was counted 25 and injury was 30 among those 15 people were died due to flood oriented diseases, 10 were died due to washed away by flood. On the other hand, 4 people were injured due to snake bite, 18 were injured by diseases, 7 were injured by washed away and 1 were injured by electrocution.

Table-5.2: Death toll/injury by flood (during and after)

Causes	Gaibandha		Jamalpur		Kurigram		Overall	
	Death	Injured	Death	Injured	Death	Injured	Death	Injured
Snake bite	0	1	0	3	0	0	0	4
Flood borne disease	2	2	9	16	4	0	15	18
Washed away by flood	1	0	0	7	9	0	10	7
Electrocution	0	0	0	1	0	0	0	1
House/tree collapse	3	3	9	27	13	0	25	30

5.12 Early systems and local actions

Early action can reduce damage during flood. Early action plays a vital role in protecting resources and save lives of human and animals. By the indigenous knowledge, flood affected people practice a number of early actions before flood and during to rescue their lives and assets. Highest number of people found in Gaibandha who practice preservation of food and other documents in polythene before and during flood as early action. In Jamalpur, higest people preserve foods in mait to preserve foods, seeds and documents before flood. They also carry the foods and other essential documents, seed in mait during flood as early action. In Kurigram, during flood the highest number of flood affected people practice polythene preservation to protect foods and documents as early action (Figure 5.16a, 5.15b, 5.16c, 5.16d, 5.16e, 5.16f, 5.16g, 5.16h & 5.16i). During the focus group discussion in Saheber Alga union of Kurigram with farmers group it is found that seed preservation, food preservation and rescue of livestock are most important for farmers during flood. They usually practice some traditional interventions to preserve food, seed and rescue livestock. Most interesting intervention was found in livestock rescue. The farmers make vela which is made of banana tree to float livestock, children and age old people to rescue and transfer one place to another. DRRO of Kurigram says that in the char areas people preserve seed, important documents under soil. Most of the people of char lands dig well and during flood they preserve seed, important documents in the well and fill-up the well by mud and sand. After flood they come back and collect their seed and important documents by digging again. Sometimes they don't get back these but most of the times they get it without damage.
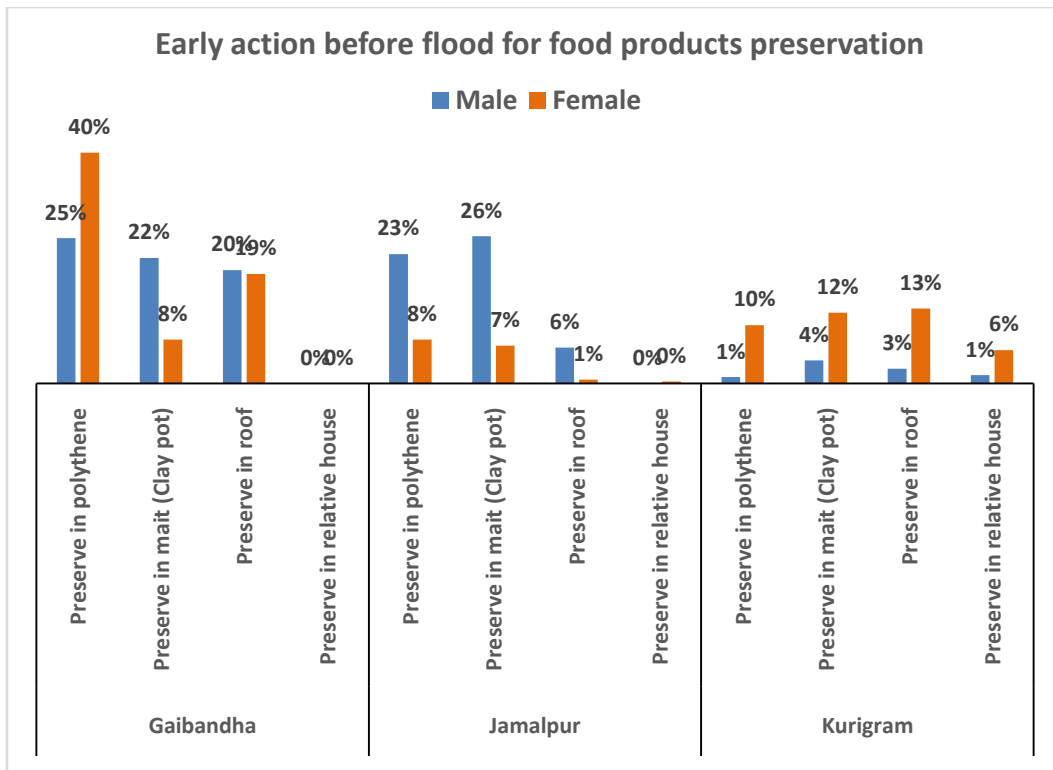
Figure 5.16a: Early action before flood for food products preservation
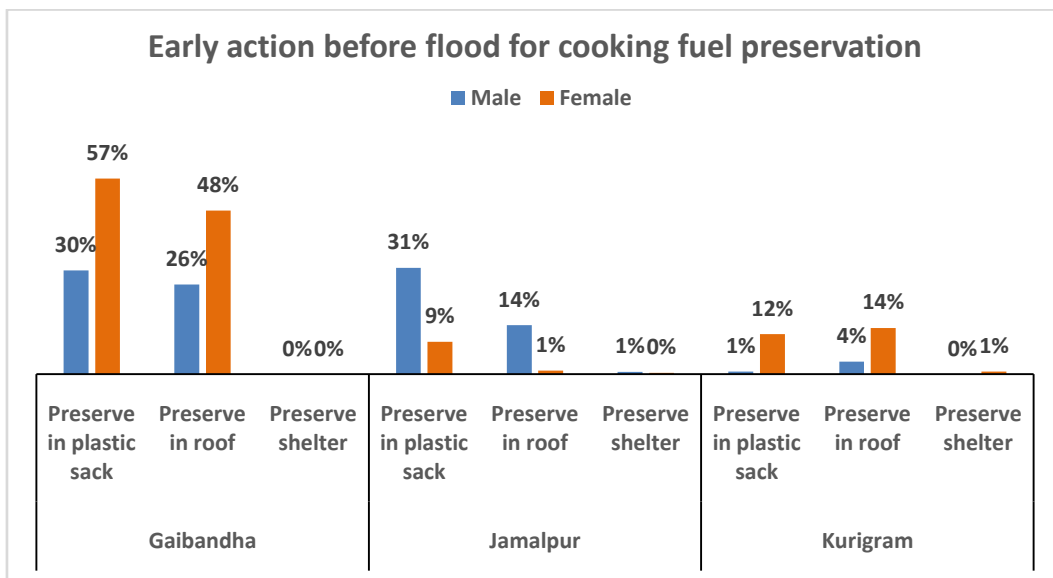
Figure 5.16b: Early action before flood for cooking fuel preservation
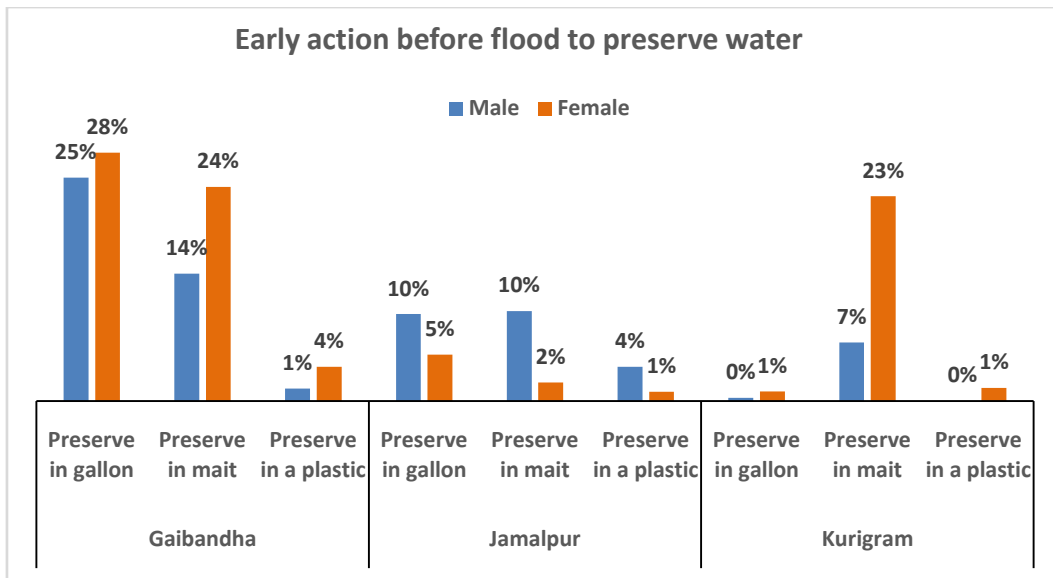
Figure 5.16c: Early action before flood to preserve water
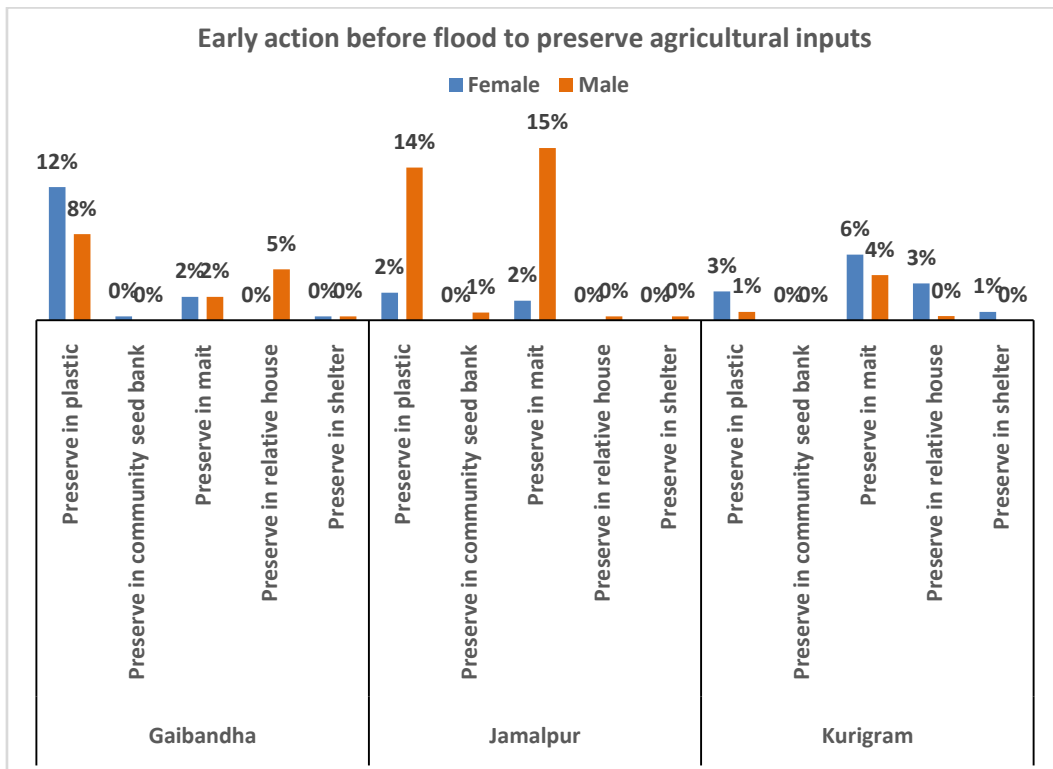
Figure 5.16d: Early action before flood to preserve agricultural inputs
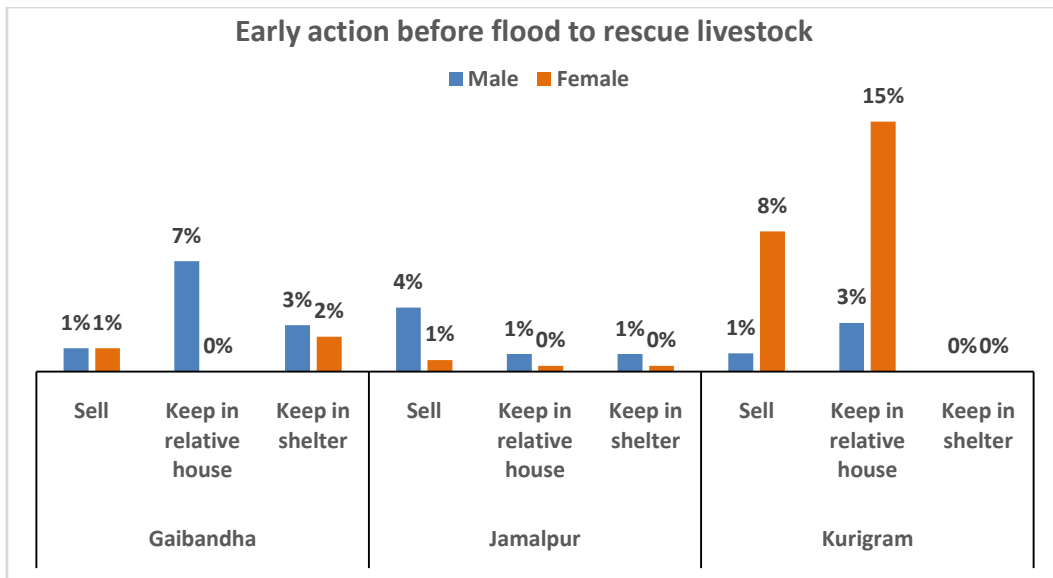
Figure 5.16e: Early action before flood to rescue livestock
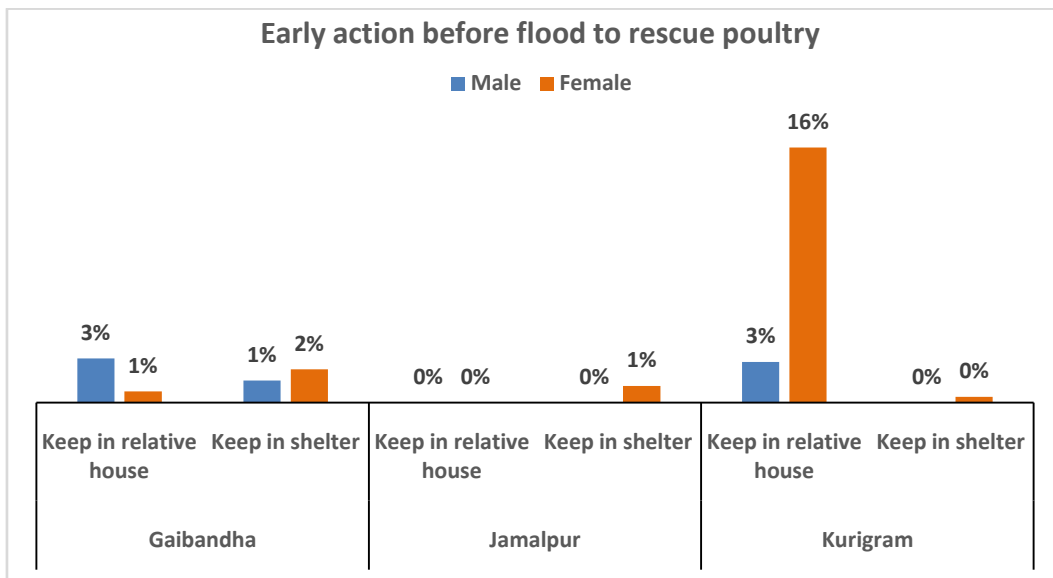
Figure 5.16f: Early action before flood to rescue poultry

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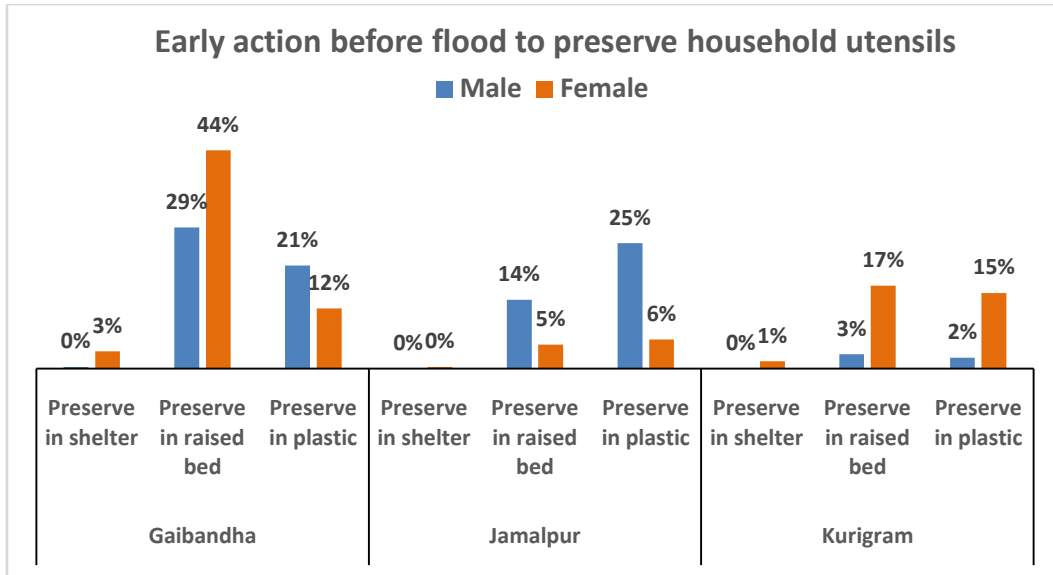
Figure 5.16g: Early action before flood to preserve household utensils
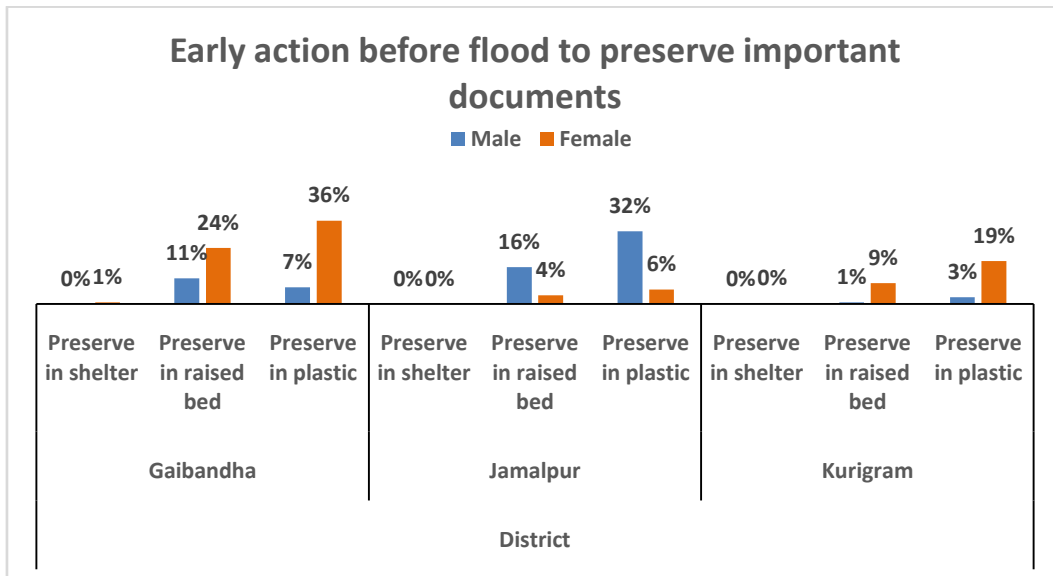
Figure 5.16h: Early action before flood to preserve important documents
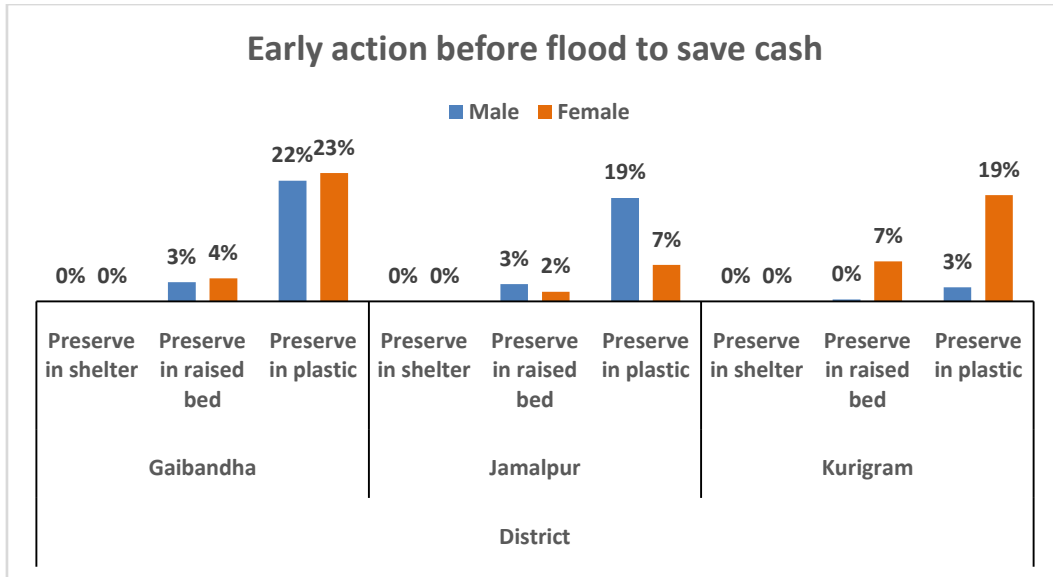
Figure 5.16i: Early action before flood to save cash
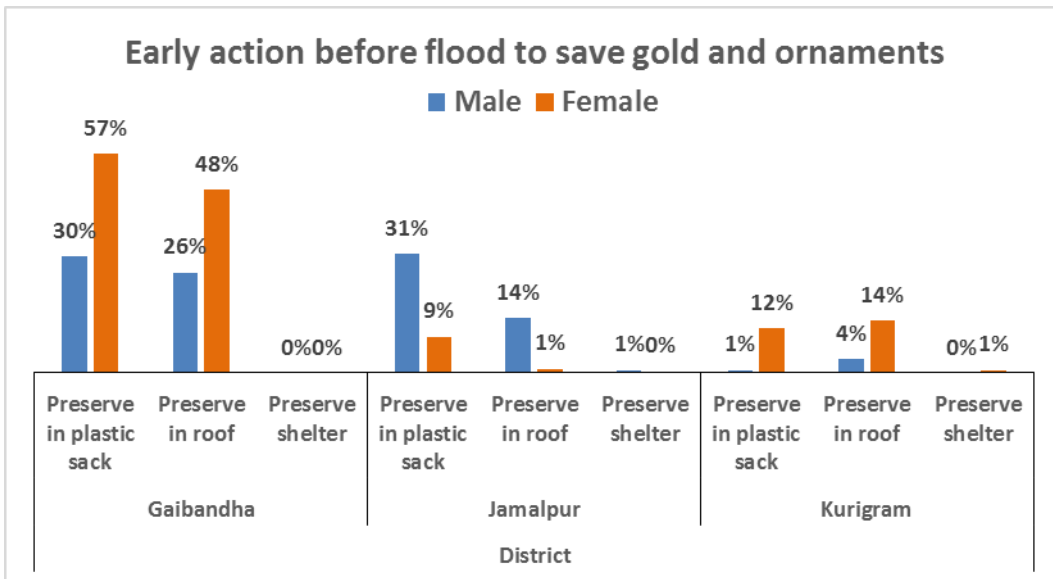
Figure 5.16j: Early action before flood to save gold and ornaments

5.13 Conclusion

Based on the study the following conclusion can be drawn-

Flood causes economic threats and financial hardship to the affected people. People lose their natural and social assets due to floods and people also face various diseases due to the effect of floods. To recover these losses they need more money so why the loan is essential for affected people. In Gaibandha, 53% of people overcome their loss through loans which are 63.5% at Kurigram and 62.60% at Jamalpur.

Almost every year the people who suffer from a flood, they cannot pay their loan and their loan burden is increasing. It is found that loan is the major flood loss recovery mechanism. Due to floods, people of the study area suffer from several diseases including vector-borne and water-borne diseases. After controlling the disaster situations, the affected populations

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participate in activities to restore community life and rebuild the environment and health as well as infrastructures.

There is great emphasis on the recovery of health by their own efforts and medicinal support. To recover human health, flood-affected communities invest money which is almost a burden for poor people. It is found that in Gaibandha, 77.20% of people pay below 1000.00 BDT which is 57.50% for Jamalpur and 67.30% for Kurigram to recover health. Some people of the studied districts invest above 200.00 BDT for health recovery which is 3.50% for Gaibandha, 14.30% of Jamalpur, and 7.60% for Kurigram.

CHAPTER SIX: GENDER DIMENSIONS

6.1 Introduction

Women have to create and earn their own wellbeing. The society at large and the system have only hardships and barriers for them. It is as if coping with disasters is a woman's natural, inherent responsibility where she must excel, whatever the calamity may be. They are the last in line to receive support and succor. This is mainly because the planners, on the whole, are not women-friendly.

Women's role is next to non-existent in the flood-prone areas, when it comes to doing the need assessment, budgeting for the works, site selection, planning and implementation for the shelters and other disaster management works. As the saying goes, *the Qazi's (judge) cows are in the register but notin the barn*. Sometimes, in some decision-making committees, some women are named only to comply with the relevant rules. But women are not given the authority to make the decisions since women are not considered empowered or competent; they are not allowed to exercise their decision-making power. However, if the number of female members in any committee is very low, then the woman member(s) must accept the consensus of the male majority. In this context, a man plays his role using his worldview to mould the project in its planning and implementation stages. The project becomes male-friendly and suffers in quality.

It requires no stretch of the imagination to understand that only a woman can from her lived experience give the appropriate decision on the height of the stairs in the shelter which a pregnant woman can use easily when she needs to take shelter at the time of a flood. Or consider what distance of latrines and lavatory would ensure women's safety and security? There is a need for hygiene management for menstruating women and girls. What should be the provision for lavatories for pregnant and aged women? Is there a need for completely separated rooms for women and men in the shelters? Even at the time of collecting relief, there should be separate lines and baskets for women and men. Along with relief, there should be supplies for women's menstrual hygiene and delivery kits.

Finally, as a researcher, I think, **there should be phased training on how the shelters are to be used at the time of disasters in the flood-prone areas.** When all people in a shelter are sensitive and appreciative of what they need to and should do, then women would have assurance on their comfort and safety. They too would be interested to come to the shelters along with the men. There will be less loss of life. Positive, encouraging results would come from the projects on disaster management.

Key Findings:

- To ensure easy access for women to the resource of receiving early warning messages
- To organize public awareness campaigns and activities
- Identify flood prone villages/unions and build flood shelters within range of villagers
- Shelters need to be Must women-friendly and ensure women's safety and security
- Justice must be valued in the distribution of relief or other courage.

6.2 Decision maker of house head migrated family

All through in this study large part of the respondents 59.20% was women and 40.50% was males. We all are agree in the contest of Bangladeshi society women are more suffer more

experienced and naturally they analysis the situation with their inner eye. That's why confidently we can find out the real scenario without any gender biasness.
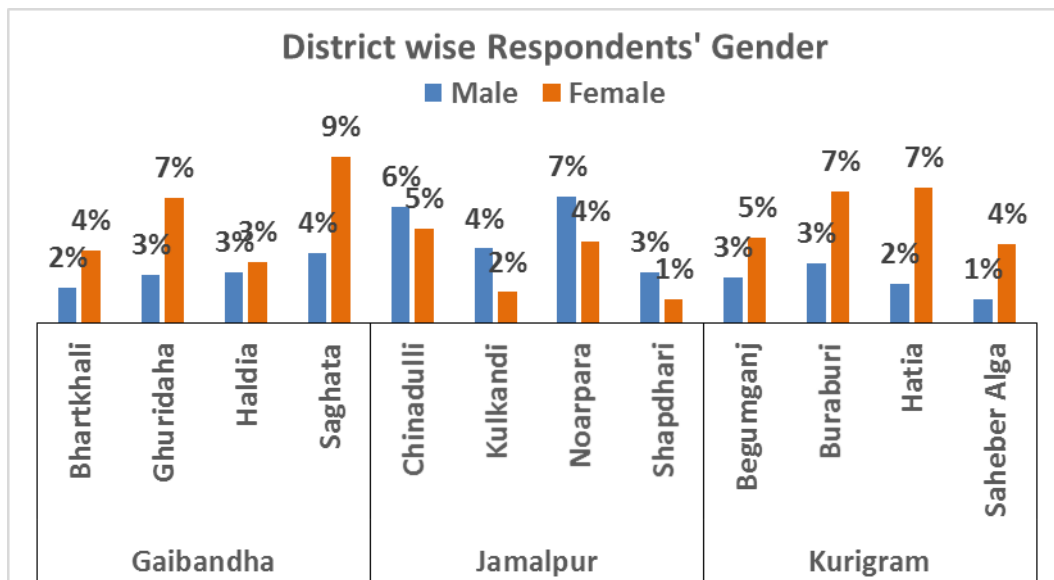
Figure-6.1: Distribution of respondents' gender (%) by union of the districts

In our patriarchal society, women do not know whether they have the right to make decisions or not. In any crisis of life, when a woman makes an immediate decision, usually she does not take it consciously. Most of the cases she suffered dilemma and confuse. Mostly, in the absence of men, women make decisions at the last minute. Although often that decision is correct. Basically, a person makes decisions based on his daily life experience. And women have more real-life experience than men. In any disaster, people's domestic life is at greater risk. The most precious thing in this world is our human life. So, people think to save their lives first. And then emphasizes the importance of preserving and lastly imposition of its future offerings.

Considering the division of labor, women mainly play a major role in household chores. These include making daily meals for the family, providing services to children and the elderly, raising livestock, growing vegetables in the backyard, and maintaining family sociality. And many of unrecognized works. It seems to be part of their responsibility. But she has to wait for the permission of the man of the family to decide on something special or not special. In most cases, women cannot make any decision. Marginal women do not have the habit of making any decision in a single way. Sometimes women are involved in decision making process. But that case Women are the only participants, in all family decisions that are implemented during normal times or in times of calamity. However, if there are no adult male members in the female-headed households, then women play a major role in the decision-making of those families.Reason of the flood some family need to displace their father or father in law family. Most of the cases Man send his family to his father in law house. To rebuilt houses and recover flood loss. It depends on secession who take the decision. Sometime women and man both are taking decision or only man take the decision.

Men are the ones who make the most decisions when it comes to forecasting storms, flooding or post-flood resettlement or migration ordisplaced. Although women may take part in the

implementation stage, that decision may not seem to her appropriate. According to our HHS we found the district-based data which is below:

Table-6.1: District-wise distribution of Family head (M/F) migrated elsewhere due to Flood

District	Female	Male
Jamalpur	16	10
Gaibandha	12	47
Kurigram	4	5

Last five years migration ratio is here; it seems that most of the people migrated from Gaibandha and lowest from Kurigram. Main causes perhaps Gaibandha is newer to Dhaka and communication is better than other Distract.

But this is positive indicate that due to flood not many of flood effected people migrated from their home place. They copped they fight and try to stable with their own land and fate.
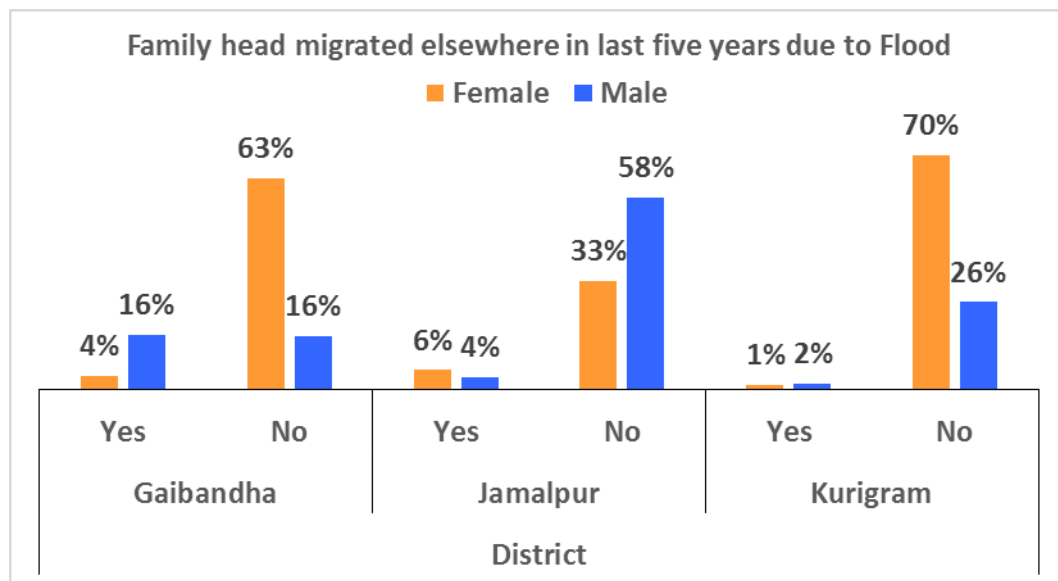
Figure-6.2 Family head migration last five years (2015-2019) due to flood

That's very true when people could not find any hope in their life to stay in own village then they take decision to migrate. Maxim decision took man women both together. Causes man is the main responsible for family maintains through earning. One the other way most of the women take decision for their own helplessness, bound to agree been a domestic worker flow their female decision and fail to recovery loan.

6.3 Impacts of flood on women (injury, movement and work)

Just as flood damage and endanger a large community in the long run, like that women's lives also letdowns from the inside and the outside. She wants to protect his partner and family members. The use of domestic life also seeks to preserve the daily small resources and livestock safely. In times of disaster, women give importance to everyone except themselves. Most marginalized women in flood-prone areas want to hold on to the past and secure the

present and want to secure her future. Women still have lack basic information about flood preparedness and what to do during a flood. Even though maximum time women usually predict flood but they do not want to believe that guess can really bring flood. Although she wants to be conditional, she wants to send other family members to the shelter and she stay at home. Women are feeling hesitant up to last moment when flood comes to going to the shelter. At that time the amount of work of women also increased. She wants to go to the shelter with as many household items as possible. If there are children or elderly members in the family, they also want to take dry food with them. He also works for the food and safety of chickens and hens. She has to do her best to organize the house cause after the flood she wants to the house will livable. Thus, from flood forecasting to post-flood rehabilitation and return to new normal life, women's physical activity multiplied which work is sometimes visible and sometimes invisible which has no statistics.

She has various obstacles first of all her dress, her long hair and her social reforms. Many women wrap their sarees around the water and the wind. She can't cross paths too fast if needed. A few incidents have been heard that the water has been swept away by the strong current, some have survived and some have not been able to return alive. Women's long hair also acts as a barrier during floods. If the hair is not tied tightly during the flood, it gets stuck with various things and it is difficult to go to a safe place. Although flood awareness leaflets have suggested cutting women's long hair for safety reasons, I have never heard of a woman who has had her hair cut but have case women did due to her long hair.

"During and after the floods, almost all of the women suffer by the legs sore, when we involve repair work of our home. It is very difficult to walk. No one even notices this. No drugs are available. But it's a big issue."

-Gaibandha, FGD of women group

The main dress of rural men in Bangladesh is lungi which can be garb shorter if needed. But women cannot take off the sari even during the biggest crisis of life. Also, the burqa, long kamiz, maxi (most recent) and the big orna are all obstacles to women's access to shelters during disasters such as floods. This issue obstacle to their easy movement and that is why they are more injured than men. The injure information we got through Focus group discussion but other important relevant information about flood diseases we find from HHS data.
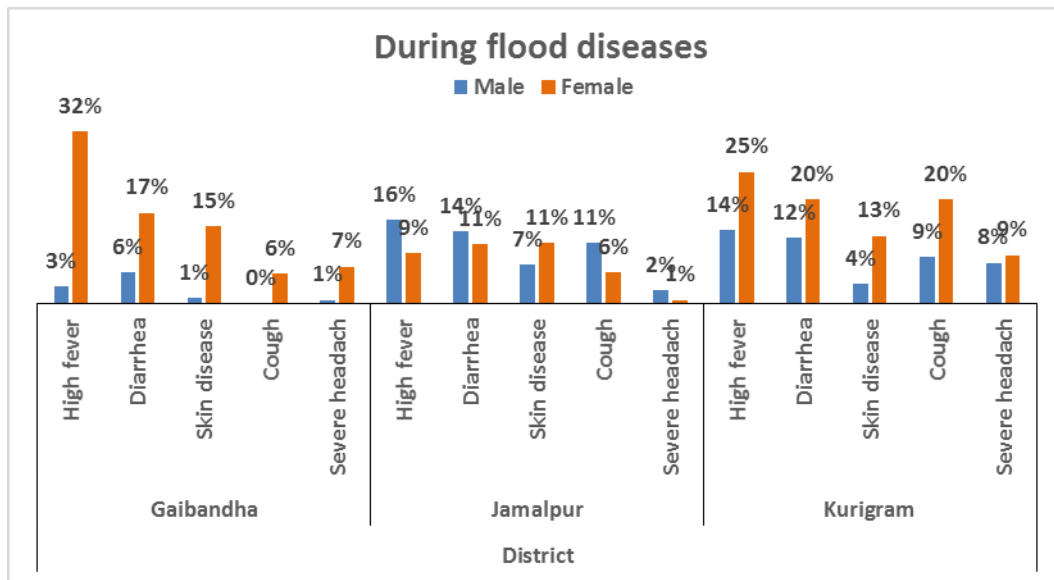
Figure-6.3a: Impact of Flood-borne Diseases of Women Health (during flood)
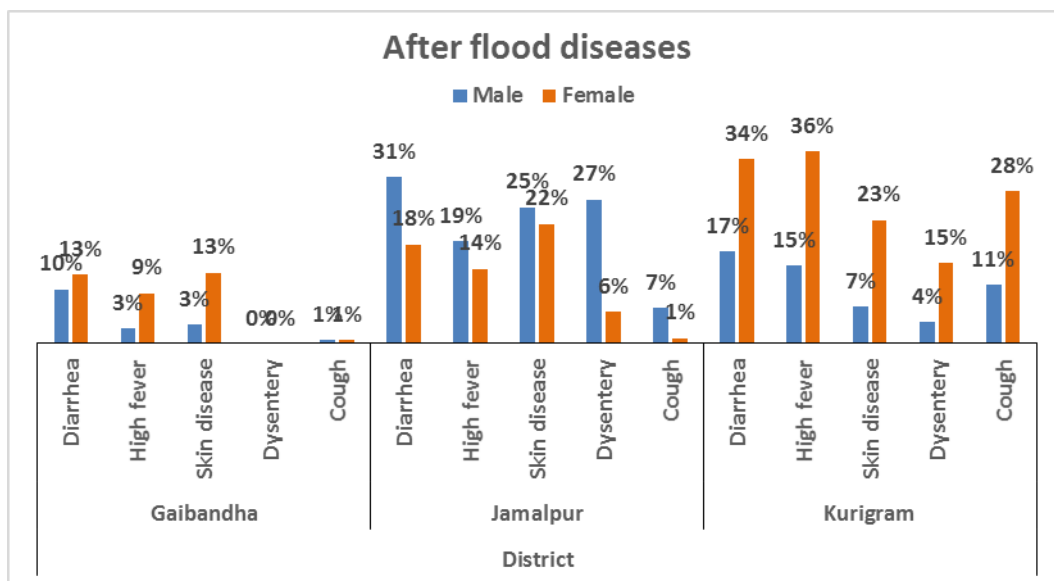
Figure-6.3b: Impact of Flood-borne Diseases of Women Health (after flood)

 Comparer than two graph shows that during the flood women are suffered more flood-prone diseases than men. And after the flood Gaibandha and Kurigram districts women also suffer more than men, only Jamalpur Districts Man and women suffer equally. It means during the flood women are worked more moves more and suffer more.

6.4 Impact of flood on women and adolescent reproductive health

In a state where women are considered as second-class Citizen's in-laws and regulations, the reality is that the conventional society will deprive them more. Women cannot think of women-friendly management for reproductive health in a disaster management infrastructure where women's opportunities are excluded. According to focus group discussion (FGD) when women face any difficulty in childbirth or pregnancy, they finally surrender to the invisible God. As still, our flood shelters are not women-friendly at all. Pregnant women are not considered there (even if she is the only one). Menstrual management of women and

adolescents is a far-reaching issue. In Bangladesh, women's menstruation is regarded as a taboo. Women also want to hide their ongoing menstruation during floods because they do not want to make themselves unclean untouchables or objects of hatred during disasters. Usually, pregnant mothers are physically and mentally weak, life becomes critical during the flood and the anxiety of losing everything after the inability to move normally, makes the woman physically and mentally disturbed. Sometimes it causes complications in a woman's child delivery and long-term physical harm.

One woman said that; due to hurry she did not take any cloth for use for blooding, when she went to the shelter, so the she kept her sari soaked from behind all night so that men would not see her menstrual blood and she would not be ashamed. And at dawn she got fever.

<div align="right">(Kurigram, FGD of woman group)</div>

Some painful findings come through focus group discussion that during the flood when women and adolescent's girl passing menstruation time in the shelter they feel like a hell. The shelter has no any single space for change the used cloth or napkin, no arrangement for clean water for washed and no space for dry. Soap and Dettol is a dream to them. Most of the women and girl use the same cloth repeatedly. Uses wet cloth as they cannot dry. As a result, maximum women suffer from various female diseases after the flood. And we know how rare it is to treatment female diseases in marginalized women.

However, during the KII We informed about a great initiative that Women and Children affair officer (DoWC) at Ulipur Upazila, in Kurigram district "**Ms. Sahana Akhtar**" provide sanitary napkin to women and Girl in flood shelter during the running flood (2020). She provides it from her another project of school Hygiene promotion" as an emergency basics. She strongly recommended that "*Sanitary Napkin mast be include with emergency relief package*" However, it is not prevalent everywhere now but should be.
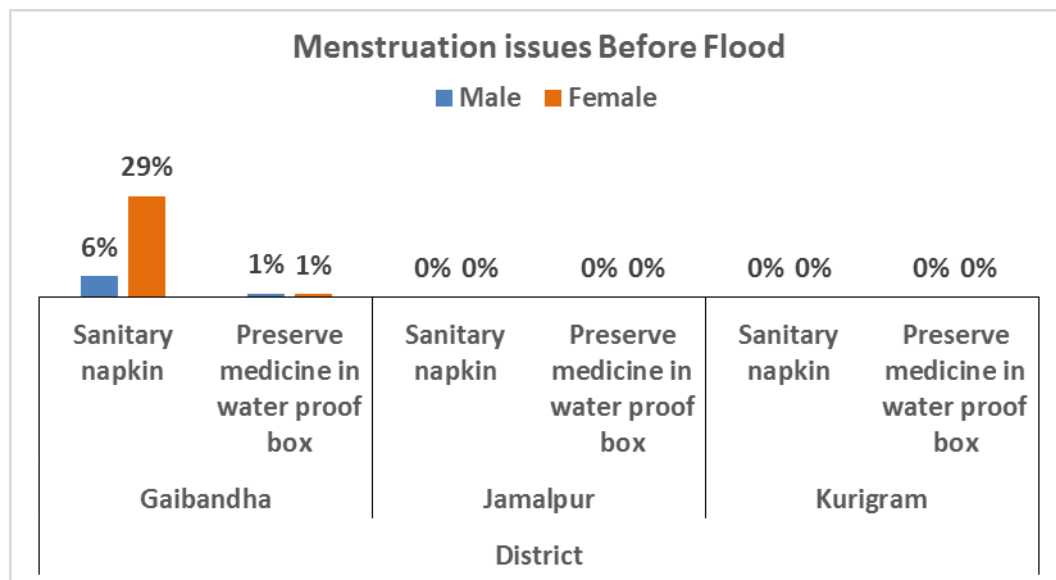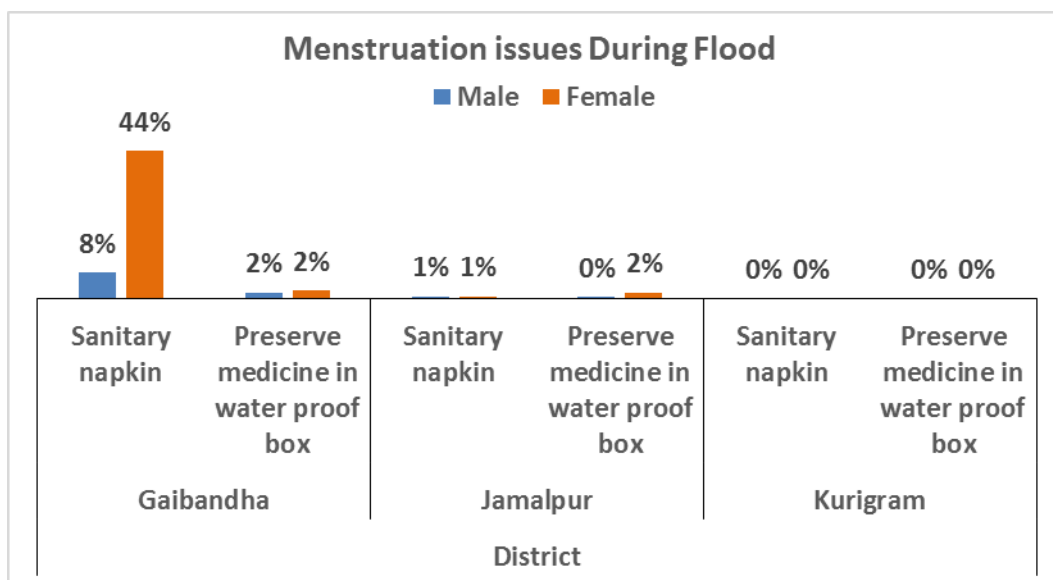
Figure-6.4: Data of inaccessibility of Sanitary Napkin for Women Adolescents

During the flood 44% eligible women preserve the sanitary napkin and after the flood 29% women preserve sanitary in Gaibandha District, unfortunately that napkin is not proper medicated sanitary napkin it made by used cloth. But other two District's women do not preserve sanitary napkin during or after the flood. So that reproductive health of flooding area's women is not health enough.

6.5 Gender Based Violence (GBV) Scenario during the flood and in the shelter

Analysis of the data collected through questionnaires among the target population area shows that the prevalence of the gender-based violence it is a little more than 1%. However, on these data, we cannot be optimistic that the prevalence of gender-based violence has come down to a negligible rate. Because gender inequality is a psychological condition that remains deeply embedded in people's minds. This manifests itself in the day-to-day conduct of the people.

It is assimilated every behavioral aspect, the result of which is always detrimental. Which fails to register in people's minds when there is a manifestation of gender-based violence in their immediate environs. Persons, who perpetrate gender-based violence, do so, without any second thoughts as to its abnormality and amorality. Because he has been harboring the belief of women's subjugation by man is the natural order of things. The target respondent population is mostly illiterate and/poorly educated. They could muster to visualize a severe beating or an act of rape, to fall within the sphere of gender-based violence. That is why they have answered the question on the prevalence of gender-based violence while they could recall such graphic memory.

The people of the village may understand violence, but they could not differentiate between mental, physical and sexual harassment beyond their comprehension that there can be intentional violence based on gender. Violence against women is considered normal by women. They accept the fate of all these women.

(Dialogue by: Mr.Ruhul Amin DSS, Jamalpur during KII)

There was no scope to explain in detail to the respondents that obvious and hidden violence

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can happen on multiple dimensions and settings attributable only to the sex identity of the victim, because the main objective of this Study was not gender inequality. Even then, it is not that gender-based violence is limited to men and women only. The scoping of the gender-based violence has to take into account, people with physical challenges, and the people of the third sex. If we consider women and men as primary and main objectives of the study, and disaggregate their lived experience into multiple layers and dimensions, then we will be able identify significant and perhaps disturbing data. That would also provide us with an opportunity to embark on a solution to overcome the social evil of gender-based violence.

In the introduction, the fact has been presented; the shelters are not at all women friendly. There is no room for women to stay in women-only enclosures. There is usually no provision for separate restrooms or toilets. Though there are a few rooms there and a few restrooms as well, but there are no dedicated gender centric arrangements for rooms or restrooms. As a result, the women do not get the ease from using the restroom. Neither is there the locality centric government-built shelters in all places. Depending on the severity of the situation, in most places, people use strongly built schools, colleges, Madrasas, Union Council buildings, and the houses of the local well-off people as temporary shelters while at the same time the Government-built shelters are used at the time of calamities. So, it is not that all the shelters are offering the needed quality of shelter.

In spite of that, from the field level experience it is sin there is the dearth of space in relation to the numbers of people who need shelter and the women have to huddle closely with and among the menfolk. Women are unable to keep their bodies discreet and maintain the distance. The middle-aged women and the adolescents get to stay in the most exposed areas. Due to the insensitivity of the men, women face problems in getting drinking water and using restrooms. If we superimpose gender based sexual harassment, over gender-based violence, then we realize that the data generated in the study points that more than 50% of both men and women are saying that the shelters are not safe for women and adolescent girls. Even in closed group discussions, the women are reluctant to acknowledge the indignities they suffer and remain apprehensive about the matter. There may not be many instances of gender-based violence; the examples of sexual harassment are galore, which mostly remain unacknowledged. The instances of the sexual harassment come up only through one to one discussion. We got the number of findings during the focus group discussion with adolescent girl, they said that almost everyone was sexually harassed in one way or another during the floods. Middle-aged and younger age men have unnecessarily rubbed their bodies, touched teenagers' bodies in an offensive manner, and offered love or sex.

Once a woman or an adolescent girl suffers sexual harassment, she does not want to go to the shelters at subsequent times of calamity. She would even stay in her dwelling at the risk of her life.

In particular, women in the women headed households where there are no grown up men, suffer relatively more gender-based violence in the shelters. At the time of taking shelter, they do not get a place, and they have to stand at the last in the queue to collect the foods and reliefs. Sometimes they are talked over, heckled, and physically battered, only because they are women and because there are no men at their families to protect them. So, in spite of the active well-intentioned efforts by the NGOs and the government, it is not possible to save women's lives and reduce their risk exposure to cyclones unless gender-based violence is totally eliminated.

Even the relatively wealthy villagers who do not need to come to the shelter but they come to the shelter only for sexual pleaser and harassed to the girl and stay there temporarily

So, it is certain that sexual violence against women cannot be monitored or reviewed by relying solely on questionnaires or number-based data. In our society where 80% of women are not allow to go out of the house with our men permission. It is not to be expected that women will suddenly open their mouths in front of a little-known or unfamiliar person to answer questions about sexual violence. If you want to get an accurate picture of sexual violence, you have to consider the status and position of women of the focused community in 360 angles.Figure-6.5 is mentioning that Overall, 1.2% women are victimized by sexual violence and 4.0% women are attracted by other violence.

Figure-6.5: Gender Based Violence Scenario (GBV) at during flood and the shelter

Table-6.2: Gender based violence

Gender based violence	Districts			Overall
	Gaibandha	Jamalpur	Kurigram	
According to District data	0.7%	2.6%	0.4%	1.2%
others	2.8%	7.3%	1.8%	4.0%

6.6 Women security in flood shelter targeted

When the state fails to create a safe haven for women, it is a day dream to think of other measures as safe or 100 percent secure. Now a days the home is not safe for women in Bangladesh, so it is not possible that crowded shelters will be safe. But we strive to establish a society based on equality. The data which collected through questionnaires from the three targeted districts, we found that a total of 26% of the flood-affected people who have taken shelter in ones or more, they replied that the shelters are not safe for women. On the other hand, 85% of women and adolescents told on Focus Group Discussion that shelters are not

safe for women at all. Almost every woman suffered from security risks in one way or another while staying in the shelter. Forcibly take away girl, offering to have illicit sexual relations, showing the temptation of a job. Asking for sex in the name of getting relief often happens in the shelters. In the context of which the ultimate reluctance of women to take shelter in the shelters during floods or cyclones. "***They think dignity is greater than life***"
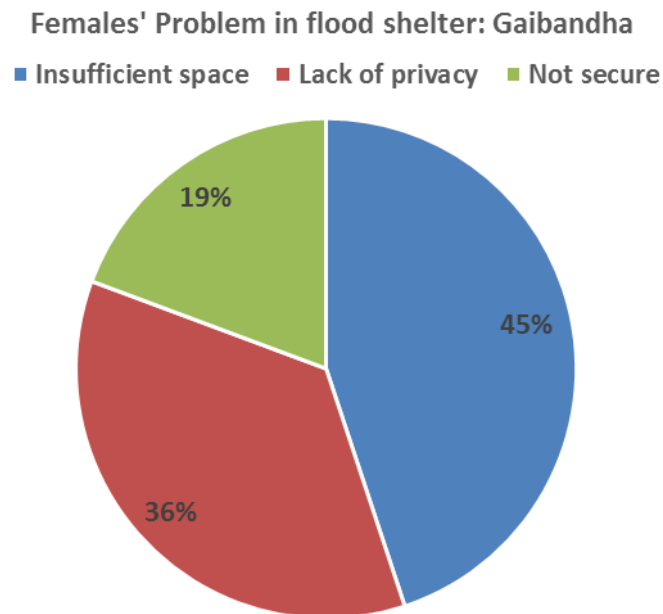
Figure-6.6: Women facing problem in flood shelter: Gaibandha district

To say unsafe in our social context means that the environment in those shelters were degrading to women and susceptible to sexual harassment and sexual violence (rape). To be unsafe in view of the research, some additional issues needed to be analyzed, including those relating to the safe movement of women and a reasonably livable atmosphere for them in the shelters; the provision of reproductive health, women-friendly sanitation and which ensure women's dignity.

"**It is better to climb and stay on the tree than to go to a shelter**"

Name: Ms. Sweety

(An adolescent Girl from Islampur, Jamalpur District during the FGD)

The presence of any of these deficiencies denotes that the security for women is far from being full and comprehensive.

During the discussion (FGD), women and adolescents did not just talk about insecurity, they also mentioned ways to overcome it. Which is mansion in the Recommendation section.

"For avoid or reduce sexual violence of women in flood shelter; Leady police need to assign for each shelter as their duty"

"Ms. Sahana Akhtar" (DoWC) at Ulipur Upazila, in Kurigram district

Table-6.3: Type of problem respondents faced in the flood shelter by district

Problems faced in the flood shelter	Districts			Overall
	Gaibandha	Jamalpur	Kurigram	
Unavailable toilet facility	62.4%	42.9%	55.1%	53.6%
Unavailable drinking water facility	56.4%	41.0%	31.8%	43.3%
Insufficient space	59.9%	44.3%	58.8%	54.4%
Lack of privacy	47.7%	41.0%	41.6%	43.5%
Not secured for women and adolescent girl	25.4%	37.0%	15.0%	25.8%
Gender based violence	0.7%	2.6%	0.4%	1.2%
others	2.8%	7.3%	1.8%	4.0%

Table-6.3 mention that overall, 54.4% responded talked about insufficient space, 43.5% ensure lake of privacy at shelter and 25.8% response about insecurity for women and girl at shelter. Analysis all over the data it seems shelter is not a safe place for women at present

6.7 Role in Gender Preparedness and Warning Phase

Although technology is considered to have reached the nooks and corners of Bangladesh, the reality is that rural women are still the last to hear about flood. Women basically make decisions and make preparations in the light of the experience by analyzing the weather conditions before hearing the news of the official warnings/ forecast. By nature, women are always assessing the present and planning for the future. Therefore, as soon as the flood is forecast, they prepare to keep the household property safe, including the dowry ornaments, money, documents, etc. If the crop seeds are stored in the house, arrangements are made to keep it in a safe place. They arrange to take dry food along. Home furniture and utensils of daily use are kept in as safe a place as possible. If there is an elderly member of the family, they and the cattle are taken to a safe place first.

A data-based information system is essential for flood prone area to effectively work for Preparedness and Warning Phase; then we can organize shelter, rapidly can assess need, distribute relief according to individual data How many Women, how many adolescent and child.

Baby food is necessary to include with relief package

By: Mr. Abu Sufiun through KII
Upazila Social service Officer (USSO)
Sagatha, Gaibandha

Usually women in the area psychologically prepare themselves during the flood season. They make provision for as much dry food as possible, matches, kerosene oil, hurricane or local Maddy lamp, earthen stove, fuel wood, some extra bedding and some additional accessories if there are infants in the family. Men just provide help for outhouse work and provide moral support for bringing weighty Goods and bags. The instinct of the men is that all this work rightly belongs to the women.

6.8 Role of women during flood and post-flood activities

Women's work first begins on the flood forecast. Protecting the house from the flood, its very important matter for her. During flood, women try to protect everyone in the family. If a family can't go to the shelter, the women provide food (especially by doing the cooking) for the whole family while they are at home. Drinking water is mostly collected by the women. It is they who keep an eye so that waterborne diseases do not infect the older members and children.

This is very true that during the flood women play the equal role of man maximum time worked more than man. But society do not recognize, do notprovide the value of women works.

<div align="right">FGD Finding of women group at Kurigram District</div>

They take special care if any other female member of the family is pregnant, even they themselves are pregnant. Occasionally, despite not having the requisite training, she has to fulfill the responsibilities of a midwife depending on the situation. In the shelter, one has to be vigilant about one's own safety as well as that of the teenage girls. She has to also collect relief food and water and ensure the safety of the children. Some of them also provide leadership to the disaster-stricken people.

After the flood, in rebuilding the destroyed or severely damaged homes, women have to work hand in hand with the men. Women have to work extra hard to make their homes as habitable as before. Women's labor is invested in everything from the regeneration of home garden agriculture to the raising of the cattle. Till the men of the family resume their vocational work the women have to provide to meet the family's need for food and other necessities.

After all this, if the family needs a loan, the woman has to contact the lender. Often when the man's income is not adequate to cover the loan installment the woman has to join in as a daily laborer or as a domestic worker. Sometime after flood turns a housewife started herself in a female daily labor in a village or floating woman in the city.

6.9 Impact on the mental health of women

To describe of the mental health of the marginalized women in disaster prone areas in contemporary Bangladesh and bring it up in a research paper seems like a farce. Although it is absolutely true that ensuring mental health is an integral part of the human life and also is a human right by itself. But it is the call of our times to attach equal importance to women's mental health as well as to their general health. Any disaster in life can wreak havoc with money and health as well as mental wellbeing. In fear for lives since the flood is forecast, the additional fear of losing everything makes women anxious and disoriented. In being submerged in threats, she feels lost and alone.

We are very emotionally broken because we know that when we will come back after the flood, we will never get anything like before. Every flood time, we gradually lose our morale strength, resources and loved ones

<div align="right">Findings of FGD women group at Gibandha</div>

The fear of sudden loss of a lifestyle painstakingly accumulated over her sweat and tears make her restless and anxious. She goes beyond her means to try to protect everything. Mostly she is not able to do that. She begins to think of herself as guilty, wondering why her power is so limited. Flood naturally takes a lot away from the women.

According to FGD finding during the flood in the shelter Women are humanely frustrated. They are always busy hiding themselves if there is any harassment happen! Most of the time when a woman is a victim of sexual harassment, she hides it. Because if she tells her husband, the victim woman is the first to be convicted. If a husband or a father seeks redress, there will be animosity between men. This can lead to increased violence. Woman experience that justice will never be found. So, women just endure.

Someone loses family members. The home is severely damaged or destroyed. Agricultural resources, poultry and cattle are lost. People of settled village households become part of a

floating population with uncertain futures. Scarcity of food, shelter feeds into an extreme frustration. She loses the will to start her life again from the scratch. In the hope of earning a living, the husbands move to the city leaving the burden of debt on the women; and some of them go missing. Sometimes the husbands return but mostly they remarry and become city dwellers, leaving behind the past lives. Many women are abandoned by their husbands after a flood. Some are trafficked while some are forced to migrate.

6.10 Coping mechanism of women

"Women endurance" is a Bengali proverb and this proverb has been created from the long history of compromising the adversity of Bengali women for thousands of years. Women are part of nature and she wants to be close to nature even in hundreds of disasters. She wants to keep her life tied up which she belongs to sweat and labor; after the flood. In the disaster-prone area, the woman dreams of a new life even if she loses all her immovable property. When she returned to her home, she started rebuilding in the middle of the rubble. She invests her labor in the construction of new houses on an equal footing with the male members. If she has any jewelry or any other salable property, she sells it. If needed she joining the loan project to deal with the loss. Before she was only a housewife but for the deal with loss, she reforms herself as a domestic worker, as a construction worker, as an outhouse worker, an agricultural worker, as a shrimp worker, or as a forest worker (region based). Women trying to reduce the daily expenses of the family. Shorten the list of food items. She stops her children to sending to school if she needs to cut costs.

Most of the time due to provide everyday food for her family member she collects what she can get for free from the natural resources around her. And she arranges food such as uncultivated vegetables, wild fruit, small fish, crabs, etc. To serve food to more members of the family with less food tries to level best to meet the need for food by using her own experience, such as rice starch, zhaovat/ flour zhao (soft boiled rice with starch), shapla boiled, etc. Relief collections are also mostly collected by women.

The painful story is that ; after the flood, the house was destroyed along with the toilet, so when the women come back after the flood, every so often they willing do not eat for a few days so that they do not have to use the toilet because there is no place to use the toilet in the household. Men can go to the toilet without any protection but women cannot!

<div align="right">Findings of FGD women group at Gibandha</div>

However, all of these strategies work at different levels depending on the economic situation, different classes of people have different ways of dealing with disasters. We have tried to mention here only the post-disaster management of low-income people. Naturally, women-headed families are more vulnerable and at risk. In a patriarchal society, the direct presence of men to get various help or cooperation has a latent effect on the benefactors. Besides, the social mobility of marginalized women is not very active. She faced sstricky situations to take advantage of and get benefits. We could not bring concrete scenarios from the primary data but if we analyze the secondary data or FGD findings we find out that some women are forced to sell their sex for the sake of opportuneness. Again, she is forced to cover up incidents like sexual harassment by taking loans from relief providers or moneylenders. This fact is quite hidden. A flood destroys a community, destroys an inhabitant, so does a woman's life too. Even then, those who can't cope up with this existent situation she lives become a spinning kite.

According to HHS data 12% people sale their personal asset which mansion pie chart as other. 21% people reduce their daily expenditure this is very tough for them. Most of the

sexual harassment and undignified case is happened 41% people when depended on personal loan. Whatever who received loan man or woman. Utmost the moneylenders have a hidden agenda behind the veil.

6.11 Gender related barriers and challenges

To getting flood forecasting and take preparedness for safety are many barriers and challenges is there. Few are mentioning here. Most of the women and people with disabilities hear the flood warning from neighbors and friends. Women do not have access to information technology resources such as radio, television, and phones. So, they hear the warning lately.Most of the time they feel hesitant about the message of the flood. Can't believe it. Lack of single decision-making power women could not take fast decisions about their safety. She always depends on the decision of the man in the family. So, in most cases, it is too late to take action.

In most of the areas where the study has been conducted, there are no Government flood shelters, so flood-affected women in Kurigram, Jamalpur, and Gaibandha may know the warning message, but they are not interested in going to temporary shelters. Because women do not feel safe in the shelter. Security is a big issue for marginalized women in Bangladesh. However, very recently, Government has planned to build some flood shelters in the floodprone areas called "Mujib Kella" and already implementation starts in Jamalpur District. Hoped that those shelters will be women-friendly.

(According to the HHS data we found Women do not have access to information technology resources such as radio, television, and   phones. So, they hear the warning lately)

During floods periods temporary shelters set up in government establishments, schools, colleges, or highways. But those shelters almost have no basic toilet facilities for women. Findings came through FGD that women often eat less food and drink less water when staying the shelter, because there is no toilet so they do not have to use the toilet at least the daytime.

There is a high incidence of sexual harassment of women and adolescents in makeshift shelters, among them 90% incidence keeping hidden. Because of dishonor and there is no possibility of justice.

Women faced a big problem if the flood is prolonged to cook food for their families. In the shelter, they can't manage a stove or chalk for cooking. Since the society through cooking responsibility to the women's shoulder.

Many respondents especially females don't understand Flood Early Warning which is a barrier to take early action at the flood time (**Figure 6.7 a,b**).

(a)

Flood Forecast Knowledge
■ Male ■ Female

59%

29%

68%

39%

Yes

No

(b)

Do respondents trust the Flood Early Warning?
■ Male ■ Female

72%

48% 52%

28%

56%

44%

Yes

Partially

No
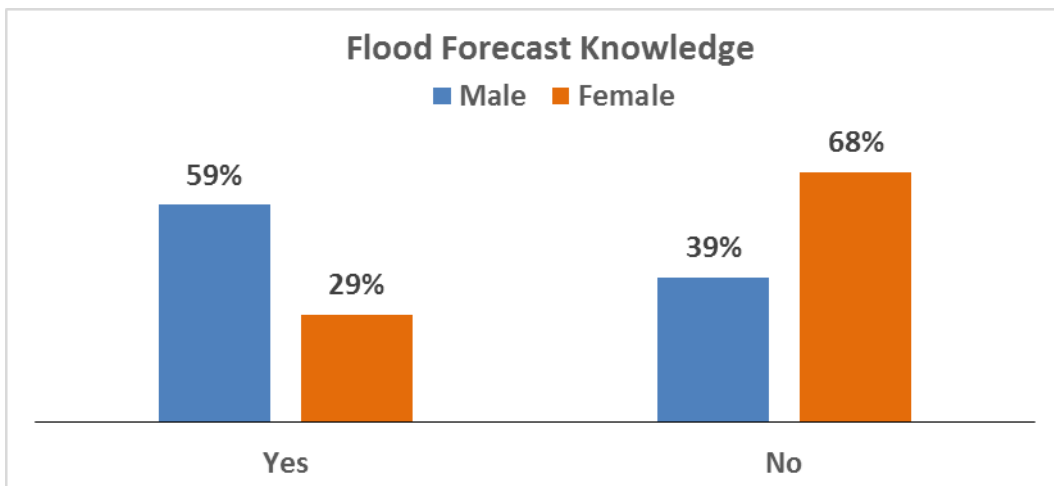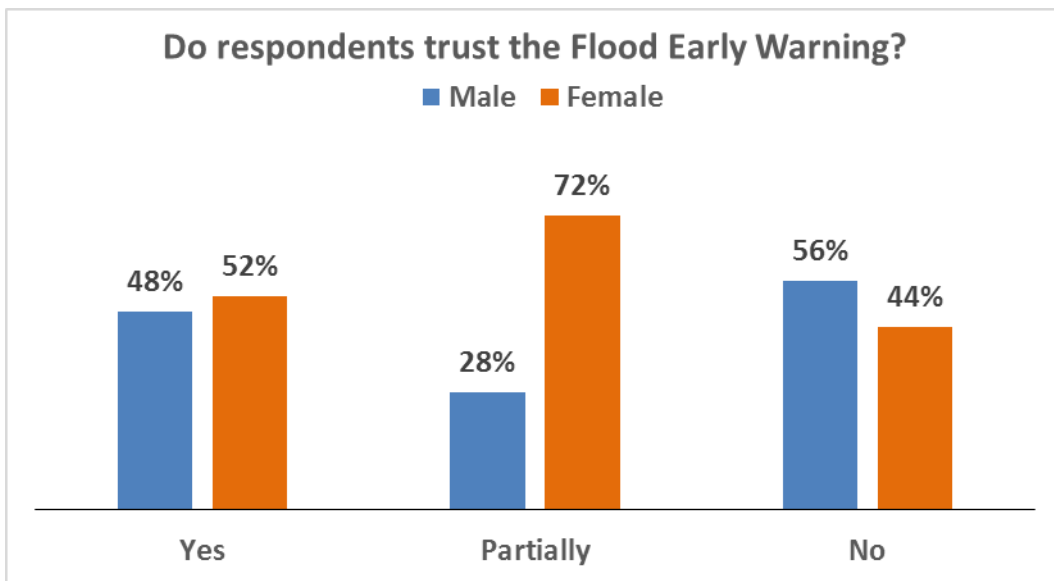
Figure-6.7: Gender perception on (a) Flood forecast and (b) reliability of Flood Early Warning

6.12 Conclusions

The effects of the floods act as horrific change makers for women life. Those have come up in the midst of answering just through a few questions in this study. Although it seems all targeted communities people have no government flood or cyclone shelter in their near premises. Most of them take shelter on high roads, schools and near neighbors' buildings. Therefore, it was difficult to find equal findings by using the same question. Strong recommendation is that to safe life and provide a quality support to flooding community initially should cover all the community by providing flood shelter.

Appraising the data of women condition in flood we have already seen through the data; how unsafe the shelters of Bangladesh flood prone area are during and after the floods. The steps of infrastructure planning, budgeting and implementing of the shelter are not entirely neutral or women friendly at all. In the real sense, women have no friend in the state structure. When

any development plan is made for the general population, it is also necessary to think about the appropriate management for half of the women (adolescents) population. Unfortunately, this is always ignoring in developing countries like ours.

The fate of women remains hidden. If disaster management authority were gender sensitive, each shelter would have a separate room for women, a toilet, a separate place for pregnant mothers, whether it was a permanent or temporary shelter what else. It was important to have the necessary menstruation management arrangements. But the results of our study, did not find any women-friendly findings. If the shelters had been women-friendly and safe, women would not have waited anxiously at home until the last moment after receiving flood warnings. Undoubtedly, they took refuge in shelters before they were in danger. As a result, the loss of some women honour, life and property would be less. Women would be less fear.

A strong recommendation come through Keep in-depth interview (KII from Kurigram) that since floods occur in a specific season, therefore the flood management authority should have an annual plan before one or two months of the flood season to keep each shelter clean and repaired under national preparedness program have to inbuilt solar power system in each shelter. In addition to deploy women police especially for women when the people are in the shelter.

The issue of gender analysis is covered in a small space throughout the study. It is only a small part of the larger purpose. However, the main purpose of this study is to plan and implement sustainable solutions in the future to deal with the damage caused by disasters like floods. The specific areas people are the first beneficiaries but half of the population is women this concept is ignored all through from the implementing process.

Therefore, there was a need to pay more attention to women's needs, benefits, needs and opinions on safety and outcomes. It was necessary to give special importance to the assessments of women by raising them through separate questions. Outcomes can be used for the next reintegration plan.

CHAPTER SEVEN: FLOOD EARLY ACTION

7.1 Introduction

In general, flooding is a hydro-meteorological phenomenon which might cause loss of infrastructures, lives, and livelihoods and damage the environment. The Fourth Assessment Report (2007) of the Intergovernmental Panel on global climate change (IPCC) predicts-

"Heavy precipitation events, which are very likely to extend in frequency, will augment flood risk".

Time and location-specific Flood forecasting and Flood early warning are the foremost reliable and effective flood risk management strategies for minimizing the negative impacts of floods.

Flooding is common and adverse in the study region of Gaibandha, Jamalpur, and Kurigram districts during the monsoon season. Flood damages not only physical assets but also social assets. In this chapter, assessments of flood early action knowledge and gaps are described.

Key Findings

➢ The knowledge of Flood Early Warning (FEW), Flood Danger Level (FDL)/ Danger Level of River Water (DLRW), and Flood Forecast (FF) is essential for Flood Early Action (FEW), safety and management. The study found that the Flood Early Warning (FEW), contents of Flood Early Warning messages are not community-friendly.

➢ The community receiving FEW only from TV, known friends, and family members. The electricity unavailability and poor or no mobile network make the communication complex.

➢ The respondents of Gaibandha and Kurigram has mentioned that they never get any support from community volunteers (CVs) to understand the FEW contents. There should be funding and training support for the CVs related to FEW and Flood Early Action management.

➢ The trustworthiness and acceptance of the FEW are important but almost 44% of respondents mentioned they partially take early action even they receive FEW.

➢ The major causes for not willing to take FEA are:a) FEW messages, b) Communication and c) household abilities. Effective awareness programs to understand FEW contents and necessary initiatives for improving communication channels are recommended.

➢ To receive and understand the FEW messages is a great challenge for the remotely located community. An effective, trustworthy, and community-friendly impact based FEW messages will be helpful to take Flood Early Action among the community. In this aspect, there should be a priority arrangement for capacity building and support of many inactive but necessary channels like community volunteers, teacher community, miking, community radio, electricity availability, mobile network improvement.

➢ During and after the flood many people died only for three major causes. These are a) washed away due to strong river current, b) snake bite, and c) lightning hit. An effective FbA needs to address for reducing death causes.

7.2 Flood Early Warning, Danger Level, and Forecast knowledge

The Enumerators are well trained by the SUFAL project consortium about the technical terms "Flood Early Warning", "Flood Forecast" in terms of lead time. Before the household survey, the enumerators explained the respondents and confirmed the level of understanding by taking feedback.

7.2.1 Flood Early Warning (FEW) knowledge

Figure 7.1 (a) shows the district wise respondents' opinion on FEW. It is observed that in Kurigram district a good number i.e. 70% of respondents have knowledge on FEW.

(a)

(b)
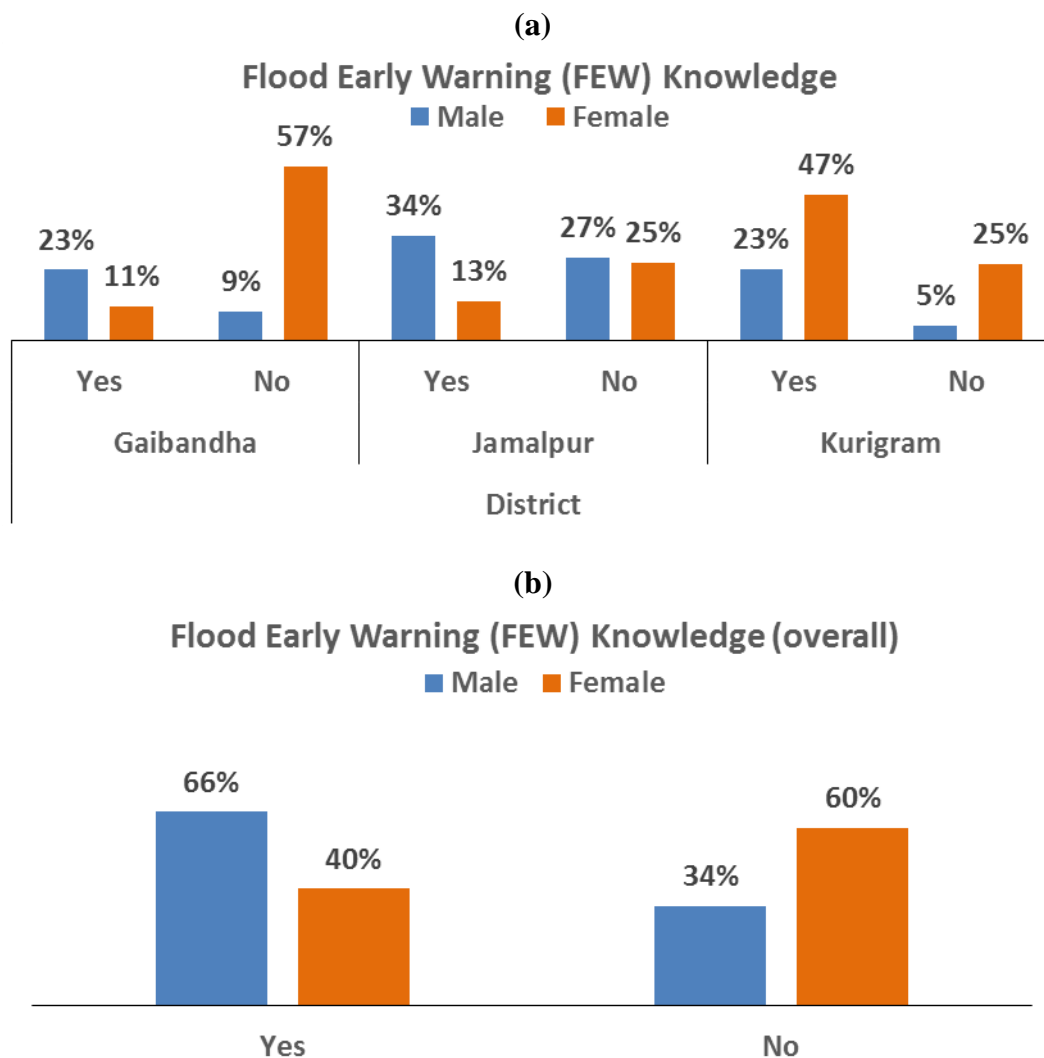
Figure 7.1 Respondent's (Male and Female) knowledge on Flood Early Warning (FEW) (a) district wise and (b) overall

In Gaibandha district 66% of respondents don't have ideas on FEW. In the Gaibandha district, around 57% of females don't have any knowledge of FEW. There is an understanding gap of FEW though the communities are living with floods for a long.It is found that within the female respondents, overall 60% had no knowledge of FEW (Figure 7.1 b). And, among the male respondents, 66% had an idea on FEW. That is because male respondents usually have multichannel communications but females are mostly occupied in the house.

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The People during the Focus Group Discussions (FGDs) and Key Informant Interview (KII) narrated that flood early warning (FEW), the Flood Danger Level (FDL), and Flood Forecast (FF) knowledge situation in the locality.

"*The flood almost occurs every year and there are some places where usually water overflow. In 2017 and 2019 the flood scenario was different. Both the years' flood occurred in many areas where floods never occurred before.*"

- FGD with Farmers, Students, Small traders of Jamalpur and Kurigram districts

7.2.2 Flood Danger level and Flood Forecast knowledge

Figure 7.2 indicates 61% of Female respondents of the Gaibandha district don't have proper knowledge of FDL. In Kurigram district 35% of female respondents know about the FDL. Figures 7.1, 7.2, and 7.3 indicate the community-wise status of respondent's ideas and knowledge about FEW, FDL, and FF.
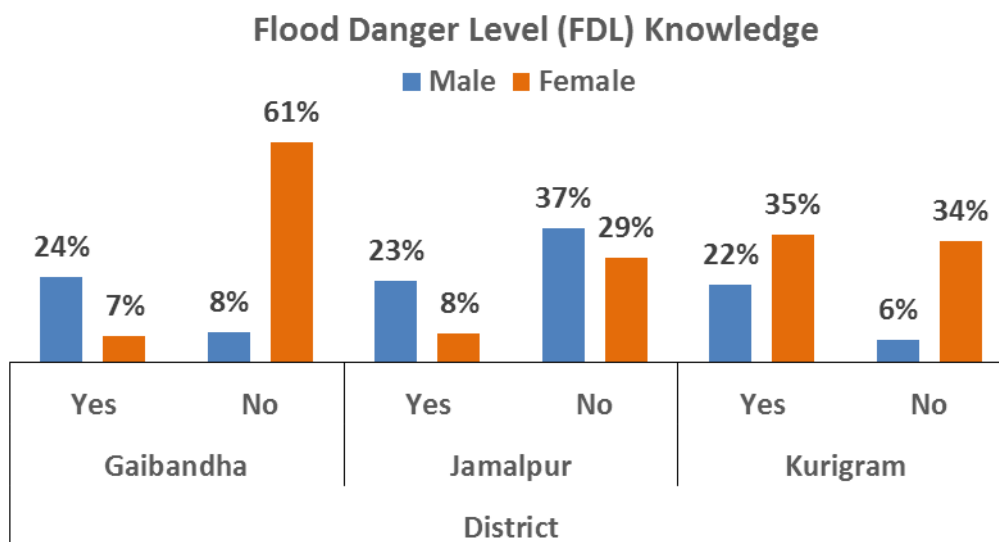
Figure 7.2 Respondent's (Male and Female) Knowledge on Flood Danger Level (FDL)

It was observed that the respondents of the Jamalpur and Gaibandha community have less knowledge of FF. Only 26% and 38% of the respondents of those communities have knowledge in these aspects. The communities of Kurigram district have a higher level of understanding (70%) for FEW. In the case of Gaibandha, it is only 34%. The understanding of the FDL is overall 41% and understanding of FF is 43%. In the Kurigram district the level of understanding comparatively better whereas Gaibandha and Jamalpur districts indicate poor knowledge of FEW.It was found that people of the community had less knowledge about the FDL, and FF to deal with the flood hazards.

70
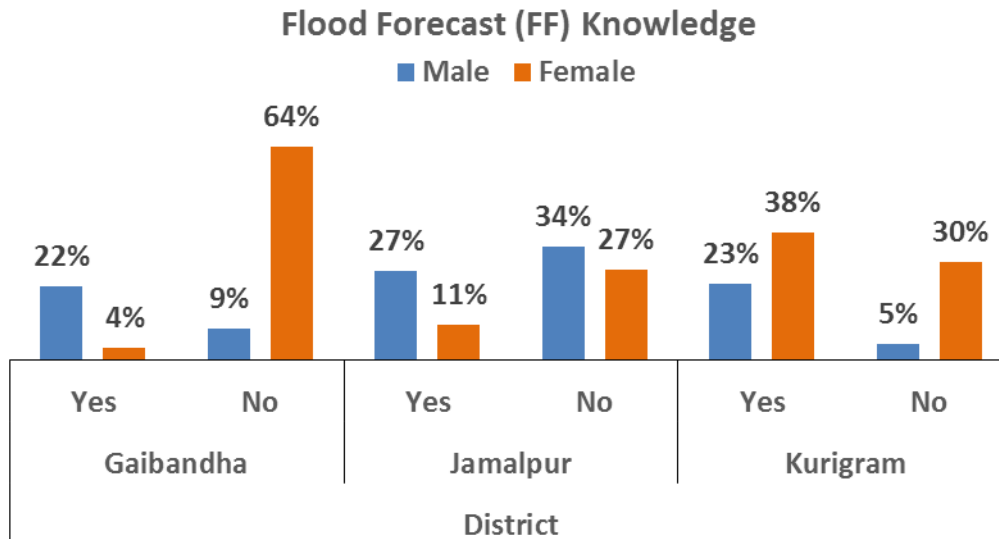
Figure 7.3 Respondent's (Male and Female) Knowledge on Flood Forecast (FF)

7.3 Access to early warning and reliability

It is observed that there is no official channel for receiving the flood early warnings to the union, Charland, and village level communities. The potential channels from where they are receiving and collecting flood warnings information are TV, friends/relatives, and mobile communication, and occasionally from the radio/community radio.

7.3.1 Friends and TV news based FEW

The enumerators have asked the respondents regarding the early warnings for the flood at least one to 7 days lead time and from where they get the flood early warnings. The majority of respondents have mentioned that TV news, family relatives, and friends are the main traditional sources of receiving the Flood early warning.
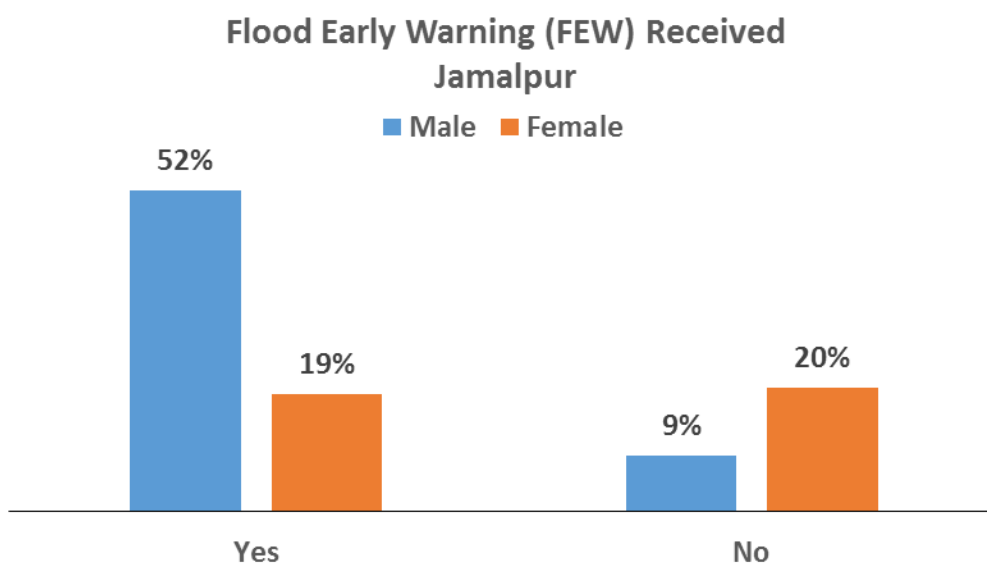
Figure 7.4 Flood Early Warning (FEW) received by the respondent's (Male and Female)

The respondents have understood by the flood early warning that the River level may increase. They don't perceive from those traditional sources of warning that is there any immediate impact in their locality.From the household survey, it is found in the Jamalpur district 20% female respondents never receive FEW and these are presented in Figure 7.4.

"The flood early warning messages available at the FFWC website. FFWC headquarter issues the Flood warning and forecast messages. If required we send this information to the Upazila offices. They take action as per requirement by consulting with the relevant departments."

- KII with the Chief Executive Engineers of Bangladesh Water Development Board office, Gaibandha, Jamalpur and Kurigram districts

There is no such dissemination system at the union level. If the situation is alarming they inform UpazillaNirbahi Office for necessary measures. Only Bangladesh Water Board Headquarters has the authority to issue the Flood Early Warning message which contains the nearest water gauge station present water level in respect of Danger Level (DL), possible increase/decrease of water level within 24 hours. At the district level, they usually don't receive any flood forecast message before two weeks of the flood. As per the Local stations of the Water Development Board, they are responsible for looking after water-related structures (polder, dam, etc.).

7.3.2 FEW receiving common channels

As per respondents' opinion, the most common channels for receiving the FEW are Friends/Relatives, TV, Mobile, and Radio. Among the mentioned common channels the most active channels are Friend/ Relatives and TV. In Figure 7.5 the cell frequencies are calculated out of total within cell frequency (100%) and divided by the total household survey (HHS) within the district. Figure 7.5 shows Gaibandha and Kurigram district has a significant number of females respondents (i.e. 27% and 39% respectively) have received FEW from friends and relatives.

The above-mentioned household survey findings are almost similar to the discussion of Farmers and small trade group FGD at different union levels. Even in the KII with PRO and WB officers, they mentioned that if any nearby region river area water increases and there is continuous heavy rainfall, people try to collect flood information. In the official channel, they receive flood warnings where the region has been already floods affected. From KII with Union Parishad Chairman, Agricultural, and Livestock officers it is acknowledged that they formed volunteer groups if needed. There was no such active group in the Jamalpur and Kurigram District study area.

In the warning information they only able to know the water gauge station danger level and probability and duration of flooding. In 2017 and 2019, the people of the flood-affected locations were not able to save any of their assets.

"*To make the FbA effective and more accessible itis important to have flood specific location marks which will be reliable with Flood warning and lead time.*"

- KII with the Country Director of Start Fund Bangladesh

(a)

Common channels for Flood Early Warning Gaibandha

(b)

Common channels for Flood Early Warning Jamalpur

(c)

Common channels for Flood Early Warning Kurigram
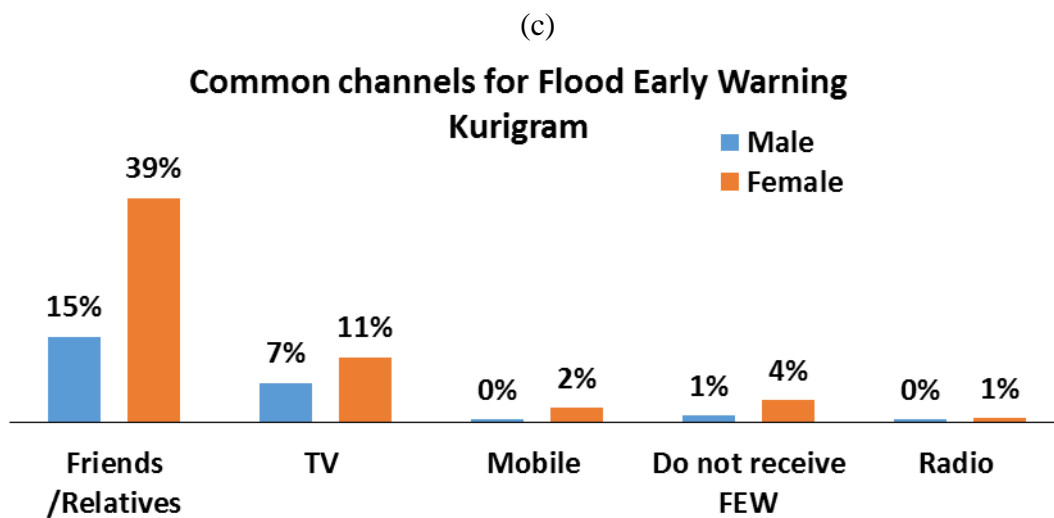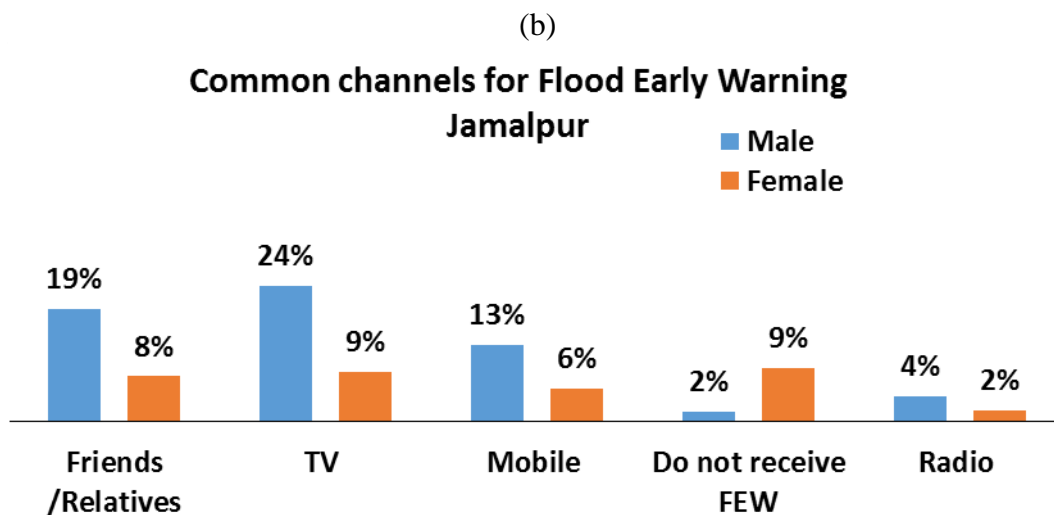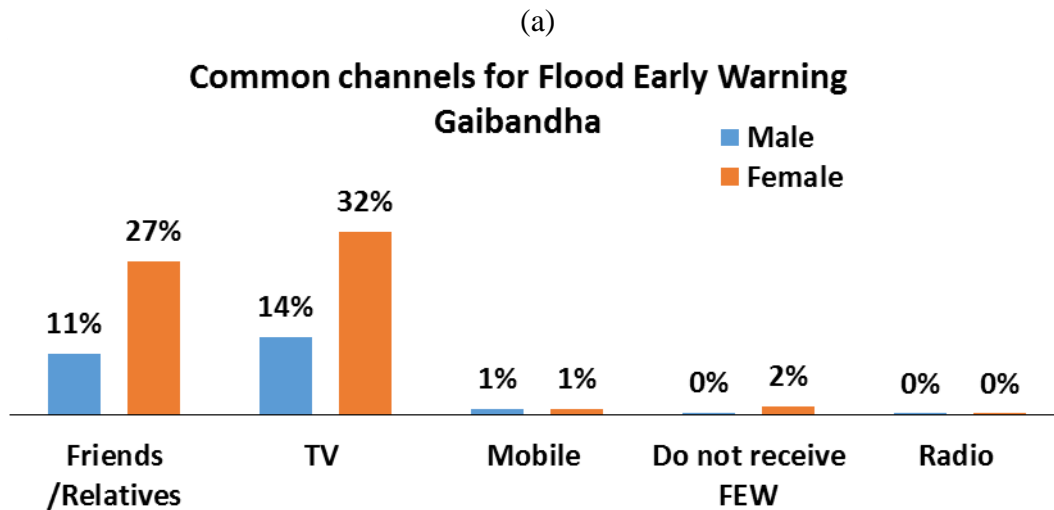
Figure 7.5 The most common channels for FEW by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

7.3.3 Community volunteer in the study area

In the flood-prone region, there is almost no community volunteer as per respondents' opinions which is shown in Figure 7.6. From the FGDs, it was observed that there were no organized volunteer activities but at the time of the flood, some people used to do volunteer services.
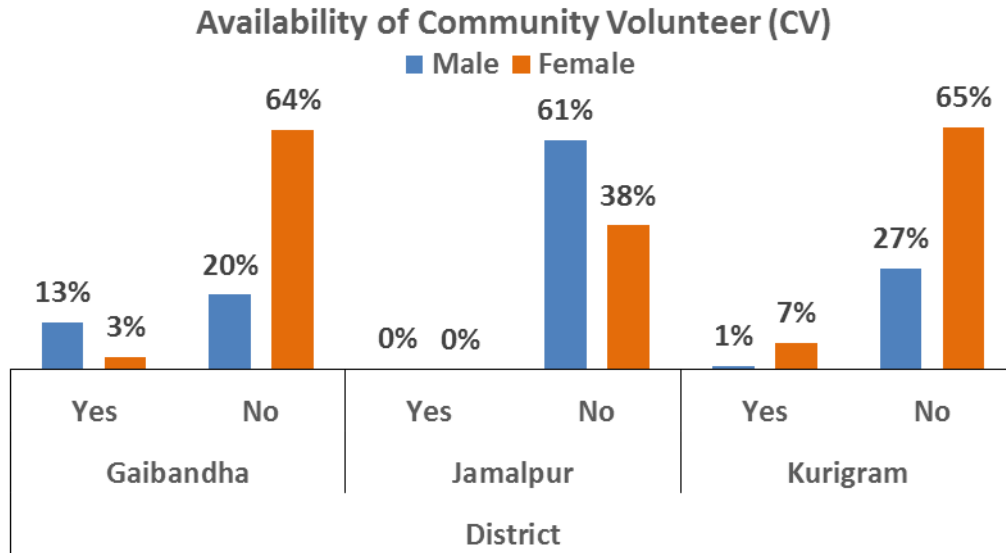
Figure 7.6 Availability of community volunteer by the district.

7.4 FEW contents understanding, support, and sources

7.4.1 FEW contents understanding

As per HHS, there are 21% of female respondents of Kurigram not understand FEW messages though they have received it. This message contents fully understand by 36% of female respondents of the Kurigram study area. In the Gaibandha district study area, almost 43% of female respondents to some extent understand the flood warning messages which are shown in Figure 7.7.

Flood Early Warning messages contents understand
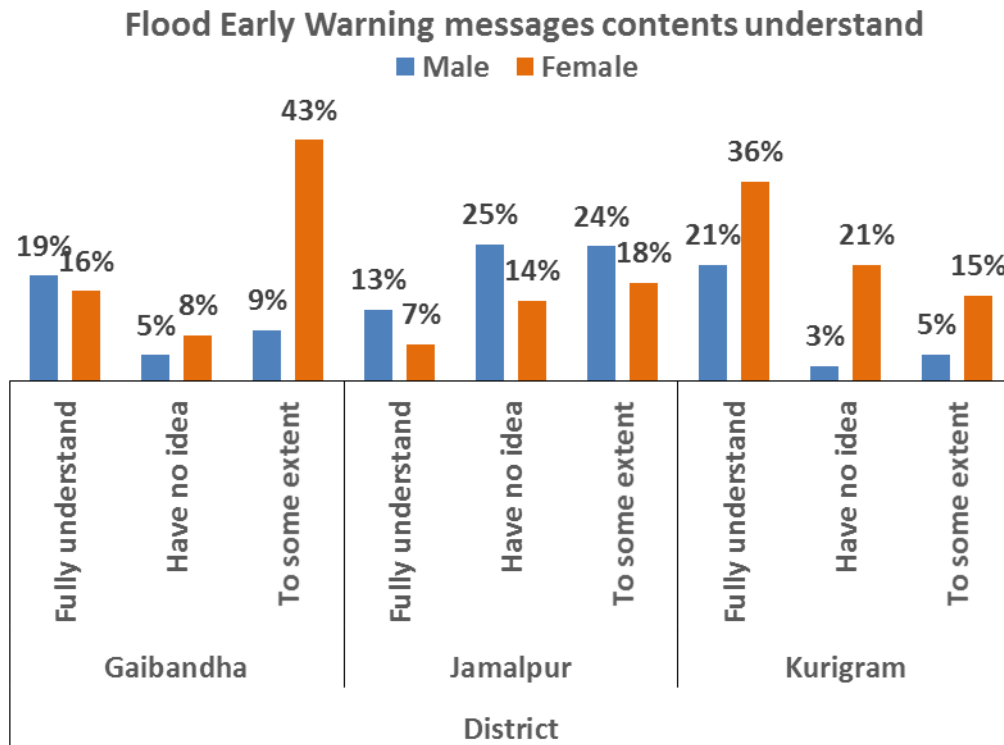
Figure 7.7 The Flood Early Warning (FEW) message contents understanding by district.

7.4.2 FEW contents understanding support

Flood early messages disseminate from the Headquarter of Flood Forecasting and Warning Centre (FFWC) which is available on their official web-page.

"*Interested people browse FFWC website and check the status of flood*" opinion given by Upazila and District level Government officers.

Support to understand Flood Early Warning messages
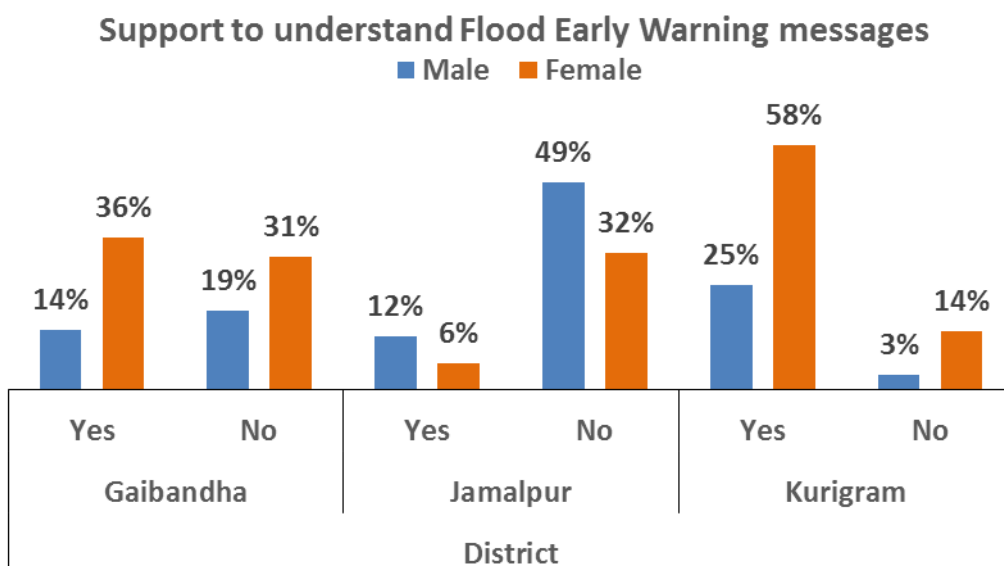
Figure 7.8 The Flood Early Warning (FEW) message understanding support by the district.

DRO receives this warning message from DDM. If required they send this message to the Upazilla level. There are no such steps to translate this kind of message to the community which is a gap in implementation procedures.In Jamalpur district, 49% Male respondents have mentioned that they usually don't get any support to understand the FEW message content which is shown in Figure 7.8.

7.4.3 FEW contents understanding sources

The effective sources to support for understanding the FEW messages are Friend/Relatives which is mentioned by 60% and 66% male respondents of Gaibandha and Kurigram respectively. In Jamalpur, 58% of female respondents have also given similar opinions (Figure 7.9).

(a)

(b)

76

Sources of support to understand FEW message
Kurigram
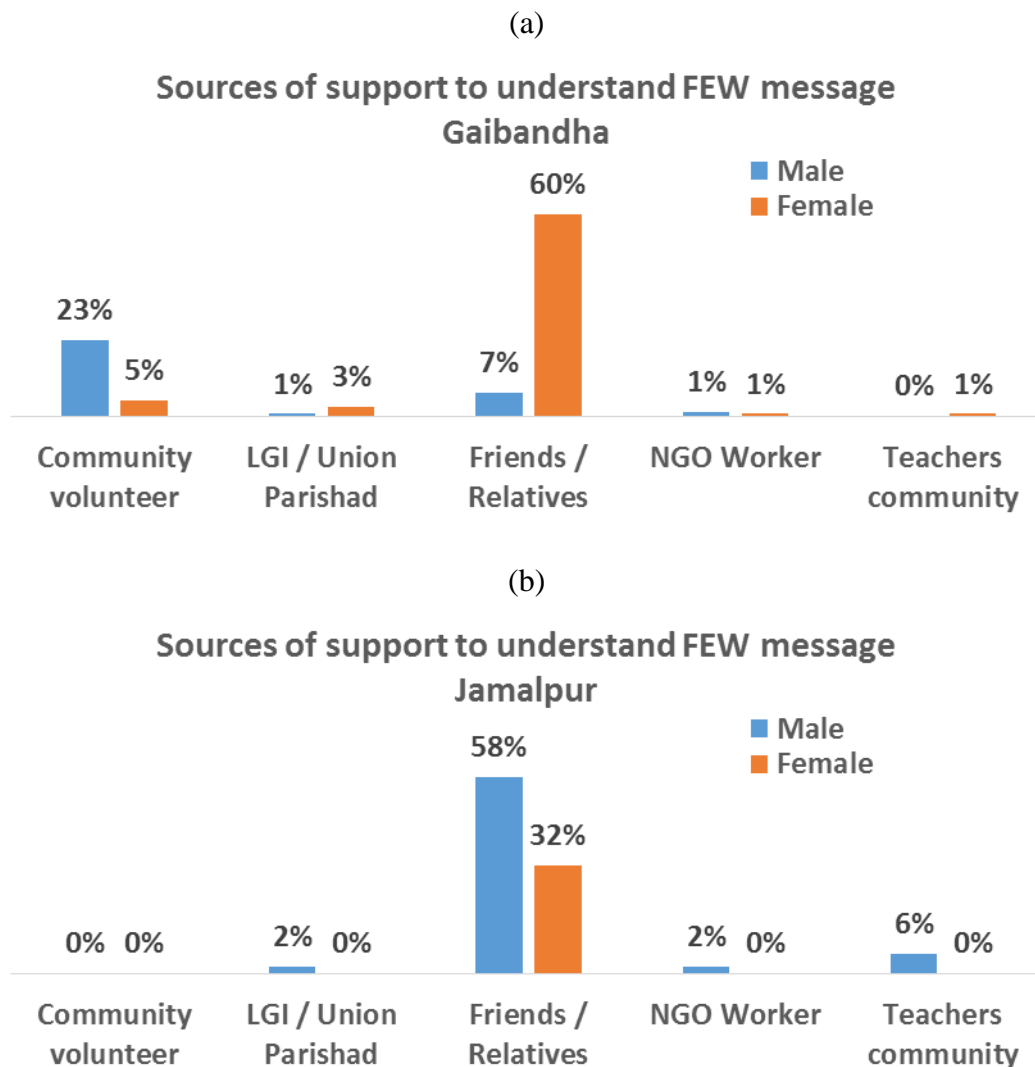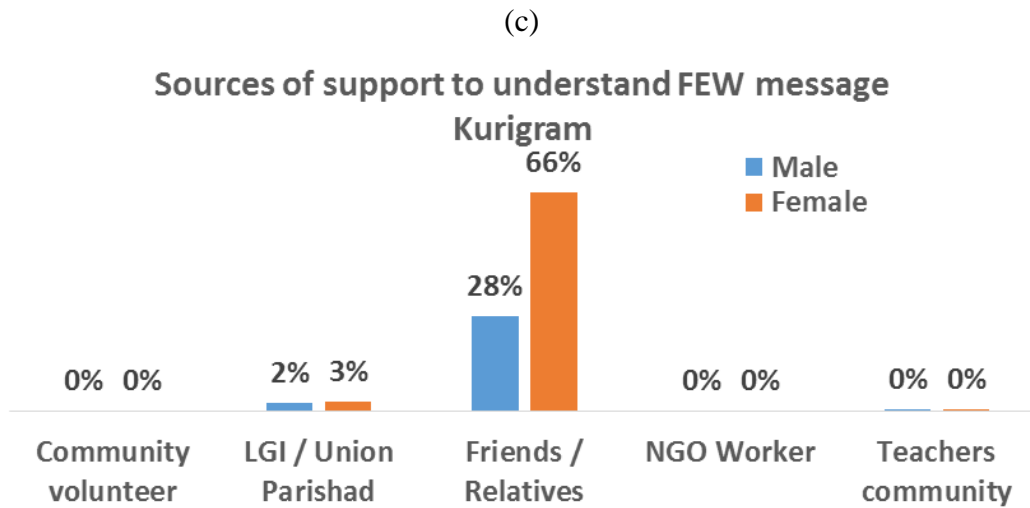
Figure 7.9 The FEW message understanding support sources by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

7.4.4 FEW information types

The effective sources of information of the FEW are Print and electronic media especially TV, personal communication with friends, and relatives by using mobile networks. The major information types of FEW are News, SMS, voice call, voice messages, etc. Among all sources, the most effective one is Friend/relative communication as per 62% of respondents of Gaibandha and 90% of respondents of Kurigram and shown in Figure 7.10. TV is an audio-visual medium. In the Gaibandha district, around 82% of respondents expressed that there is a dependency on TV news. The respondents think that TV news is effective and reliable.

(a)

Flood Early Warning information types
Gaibandha

(b)

Flood Early Warning information types
Jamalpur
■ Male ■ Female

	TV	Mobile		Friends/Relatives	
	News	SMS	Voice Call	Voice Call	Voice message
Male	15%	5%	13%	2%	6%
Female	7%	1%	5%	1%	15%

(c)

Flood Early Warning information types
Kurigram
■ Male ■ Female

	TV	Mobile		Friends/Relatives	
	News	SMS	Voice Call	Voice Call	Voice message
Male	2%	0%	0%	0%	25%
Female	1%	0%	1%	0%	65%

Figure 7.10 The FEW information types from different sources by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

7.4.5 FEW messages contents

In the FEW messages, the major contents are Flood Danger level, Flood duration, and Water level rise. In Jamalpur, around 98% of respondents have mentioned that Water level rise information is provided in the FEW messages and the analyses are presented in Figure 7.11.
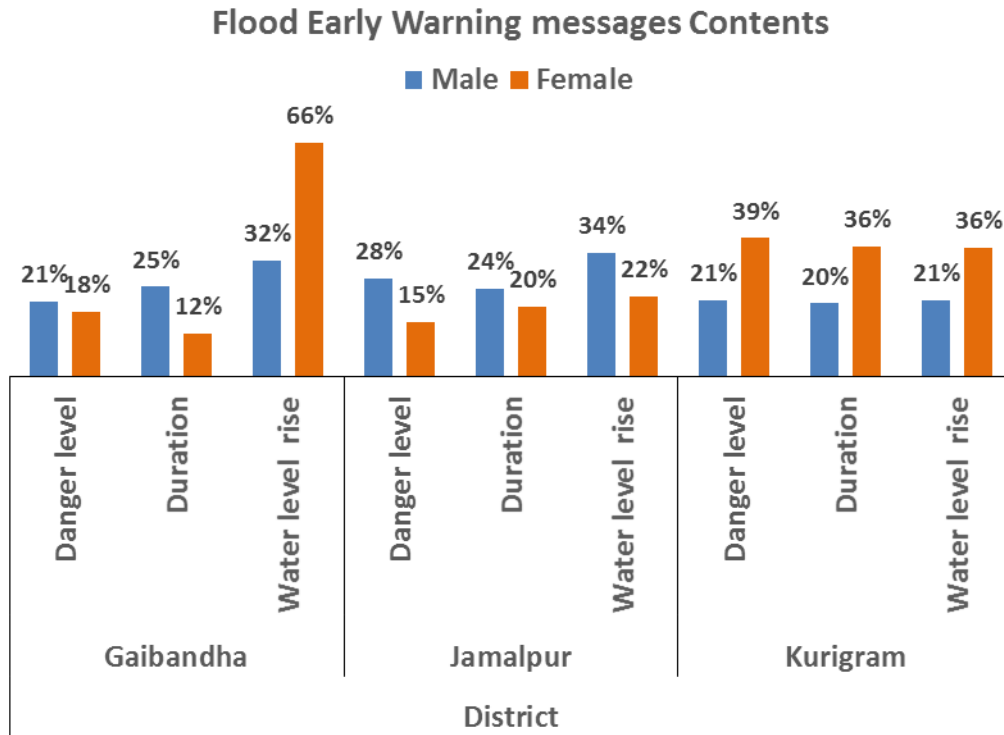
Figure 7.11 The Flood Early Waring (FEW) message contents as per respondents by district.

7.5 FEW trustworthiness and necessary actions are taken

The district-wise distribution indicates 50% and 53% female respondents of Gaibandha district partially understand FEW (Figure 7.12 a) and almost a similar percentage of respondents have partially taken the necessary initiative to manage flood (Figure 7.12 b). Around 43% proportion trusts the FEW messages, among those trust, a similar percentage takes early action which is shown in Figure 7.12 (c and d). Around 44% of respondents only took a partial attempt and 13% not yet ready to make any attempt. From the data analyses, it is observed that there are 43% of respondents have mentioned that they took necessary precautions and attempt to save their lives and livelihood (Figure 7.12 c, d).

Flood Early Warning message trustworthiness

■ Male ■ Female

	Gaibandha			Jamalpur			Kurigram		
	Yes	Partially	No	Yes	Partially	No	Yes	Partially	No
Male	23%	8%	2%	17%	24%	20%	22%	5%	1%
Female	15%	50%	2%	8%	24%	7%	43%	18%	10%

District

Action taken after receiving Flood Early Warning

■ Male ■ Female

	Gaibandha			Jamalpur			Kurigram		
	Yes	Partially	No	Yes	Partially	No	Yes	Partially	No
Male	22%	7%	3%	19%	18%	24%	21%	7%	0%
Female	11%	53%	4%	11%	19%	9%	43%	27%	1%

District

FEW message trustworthiness

No, 14%
Yes, 43%
Partially, 43%

Action taken after receiving FEW

No, 13%
Yes, 43%
Partially, 44%

Figure 7.12 The FEW message district wise (a) trustworthiness, (b) necessary actions are taken or not, overall respondents (c) trustworthiness, and (d) necessary actions are taken or not.

7.6 Effective and reliable sources of the FEW information

The effective and reliable sources of FEW are TV, Friends/Relatives, Union Parishad, Miking from Mosques, and community volunteer. Among all options, 60% of female respondents of the Gaibandha district and 55% of male respondents of Jamalpur district have mentioned TV is the most effective and reliable (Figure 7.13).

(a)

(b)

(c)

Figure 7.13 represents the chart titled "Efective and reliable sources of FEW information Kurigram" with Male and Female data:
- TV: Male 13%, Female 30%
- Friends/Relatives: Male 19%, Female 52%
- Union Parishad: Male 23%, Female 41%
- Miking from Mosque(s): Male 15%, Female 21%
- Community Volunteer: Male 14%, Female 19%
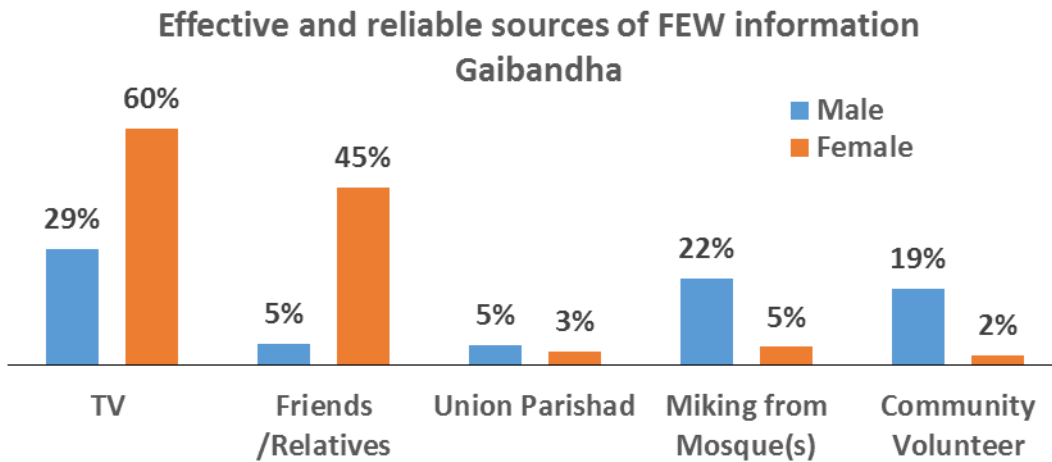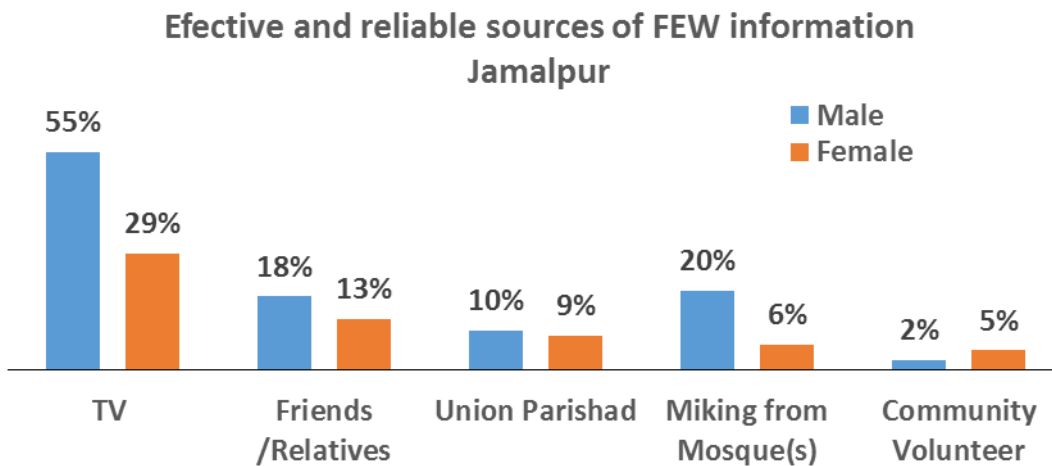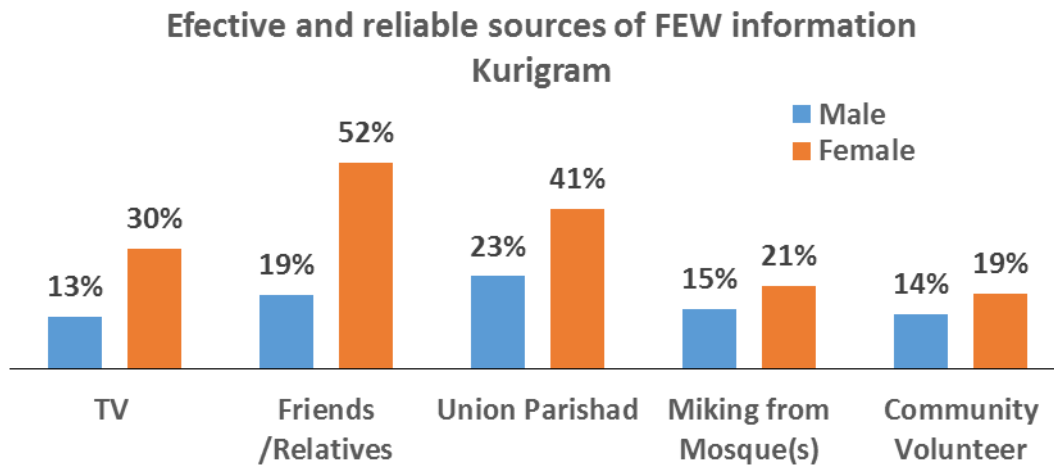
Figure 7.13 Effective and reliable sources of the FEW information by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

The effective and reliable message types of FEW is Miking, News, Volunteer information, voice call, and audio voice. Among all, the most effective type is miking, news, and volunteer information. As per the survey, around 84% of respondents of the Gaibandha district have mentioned that news is effective and reliable (Figure 7.14). It is supported by FGD and KIIs and HHS of Jamalpur district.

(a)

Chart titled "Effective and reliable message type for FEW Gaibandha" with Male and Female data:
- Miking: Male 25%, Female 38%
- News: Male 25%, Female 59%
- Volunteer: Male 20%, Female 2%
- Voice Call: Male 18%, Female 24%
- Audio voice: Male 0%, Female 1%

82

(b)

Effective and reliable message type for FEW Jamalpur

(c)

Effective and reliable message type for FEW Kurigram
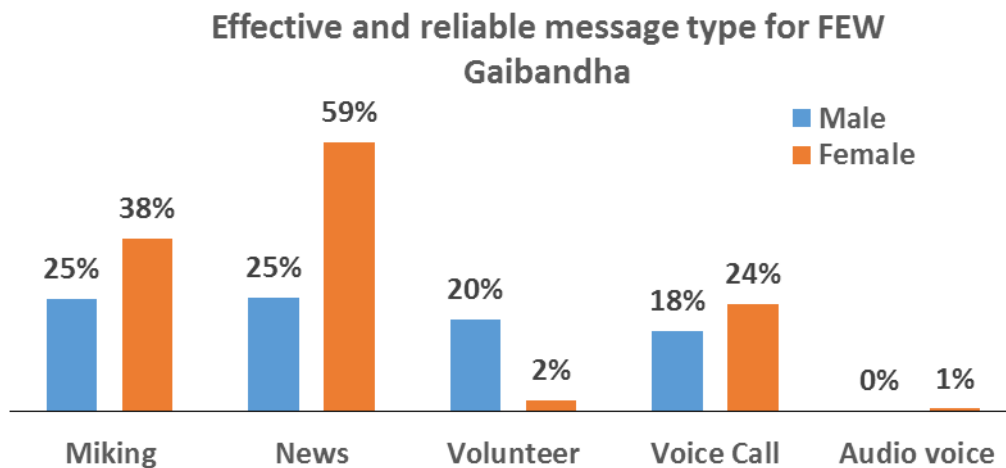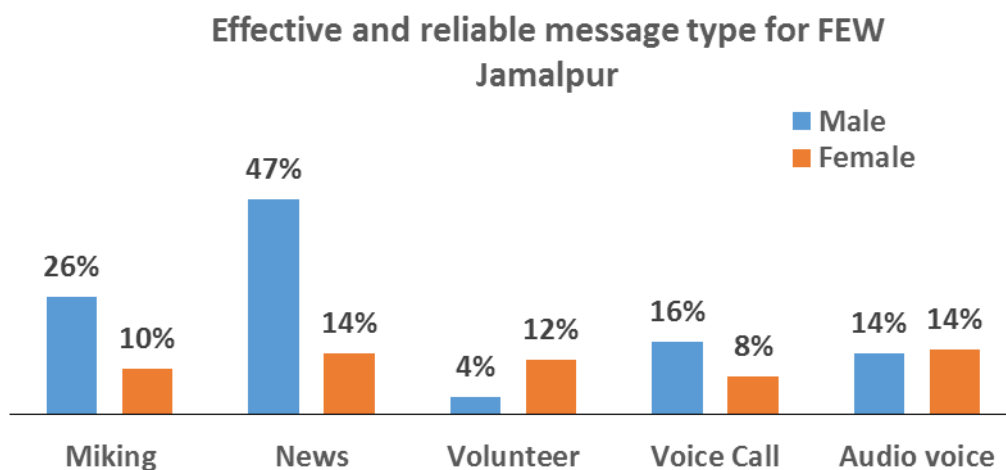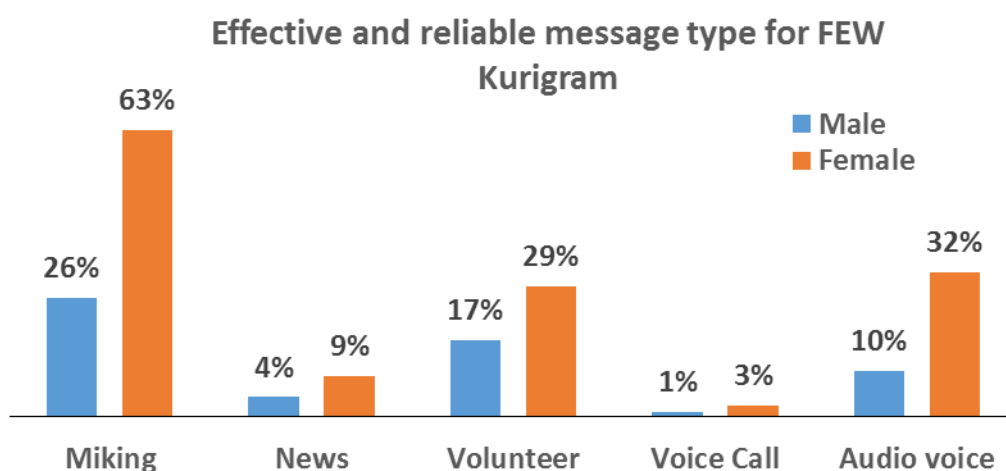
Figure 7.14 Effective and reliable message type ofthe FEW by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

7.7 Flood early warning and Forecast sources with a lead time

7.7.1 Flood Early Warning sources with a Lead time

Flood Early Warning lead time up to 7 days (Figure 7.15) is effective and flood messages need to be simple to understand clearly. In addition, a personal communication channel is also mentioned where they get flood warning information.

(a)

**FEW information sources with Lead time: Friends/Relatives
Jamalpur**
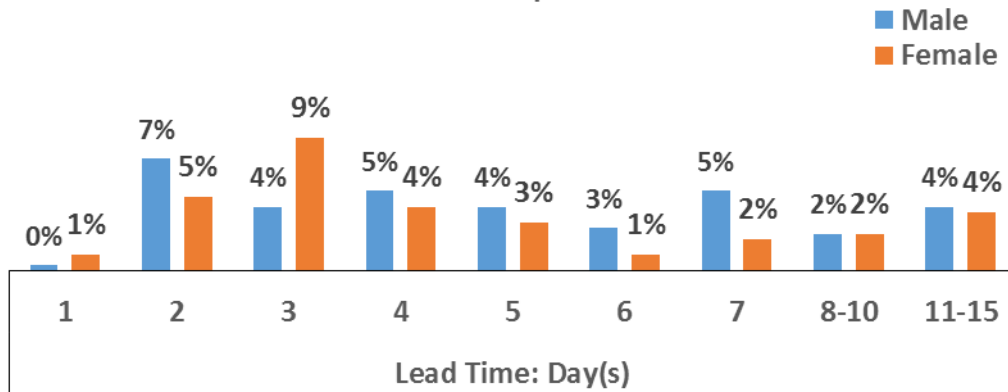
(b)

**FEW information sources with Lead time: TV
Jamalpur**
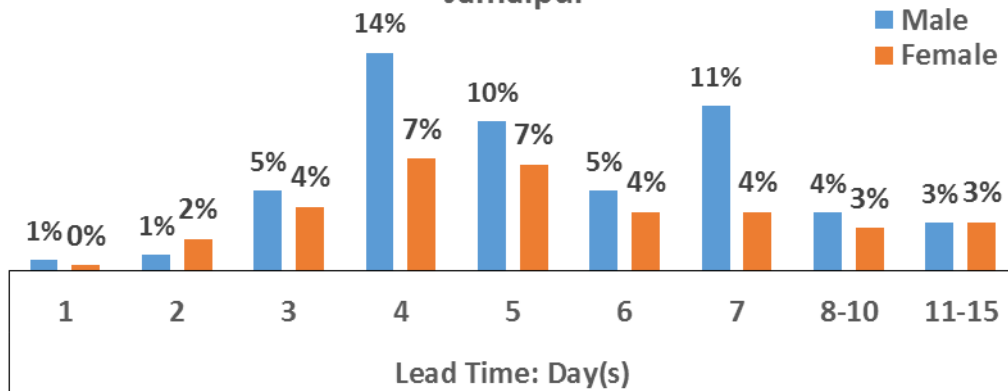
(c)

**FEW information sources with Lead time: Mobile
Jamalpur**

(d)

FEW information sources with Lead time: Radio
Jamalpur
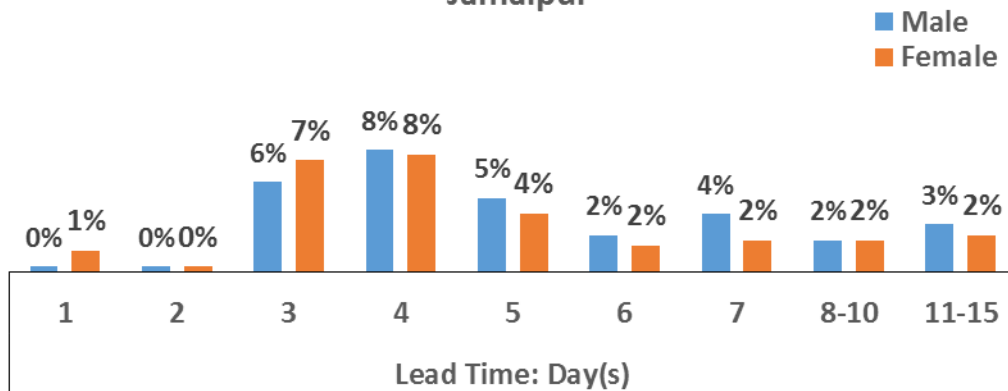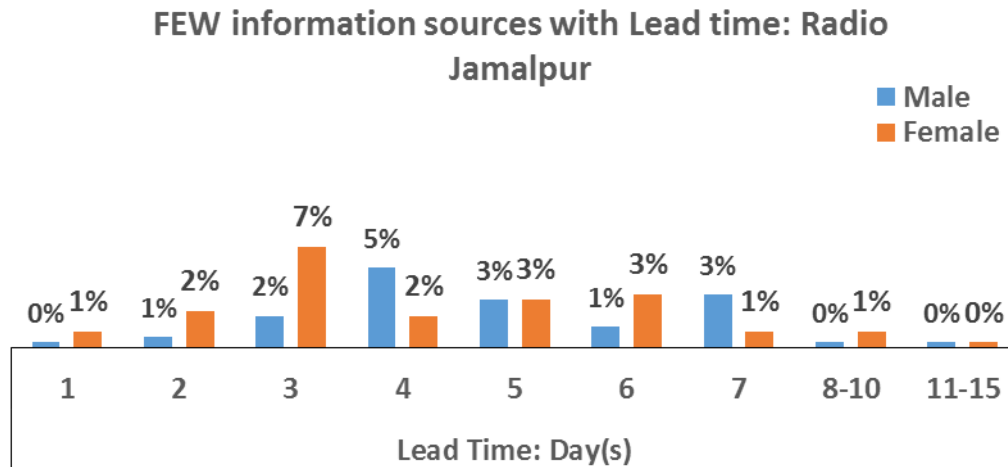
Figure 7.15 Flood Early Warning information sources with Lead time for Jamalpur district a) Friends and Relatives, b) TV, c) Mobile, and c) Radio.

PRO of all three districts had mentioned the importance of community radio and mobile SMS/voice call for the dissemination of Flood Early is important but these are not practiced yet. Only Jamalpur district has the community radio service which supported significant during flood situations for the remote locations. Very few places have miking procedures, occasionally the community received a flood warning through leaflet and print/electronic media.

A few of the respondents have mentioned that they have received a warning notice from Radio, Miking from mosques, community volunteer, and union Parishad. There were multiple options in the HHS among them many channels are very much inactive such as FFWC, Weather station, Flood Preparedness Program (FPP), Social media, NGO workers, Religious and educational institutes. There was no digital display system in the study region of the three flood-prone districts.

7.7.2 Flood Forecast sources with a lead time

The respondents have mainly mentioned 15 days lead time forecast available from TV and Friends/Relatives but Upazila level government officials mentioned they don't know anything about flood forecast of 15 or 30 days lead time (Figure 7.16).

(a)

Flood Forecast information sources with Lead time Jamalpur

(b)

Flood Forecast information sources with Lead time Jamalpur
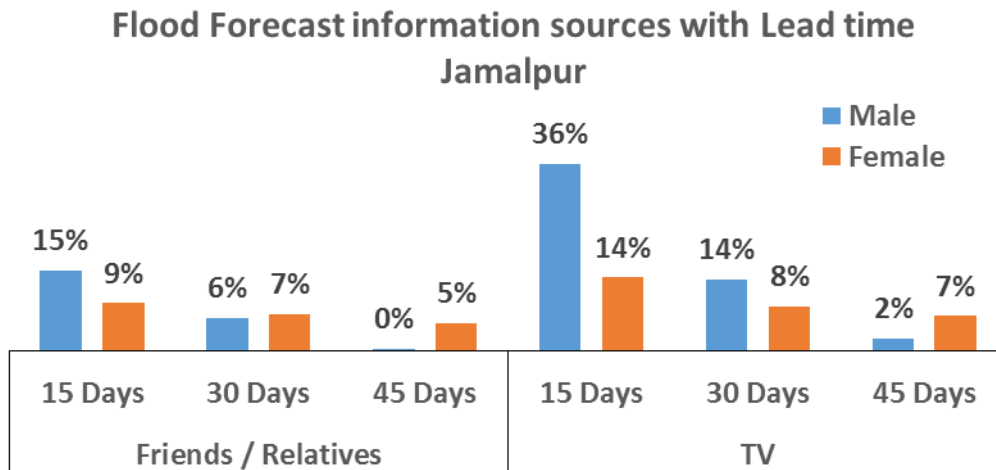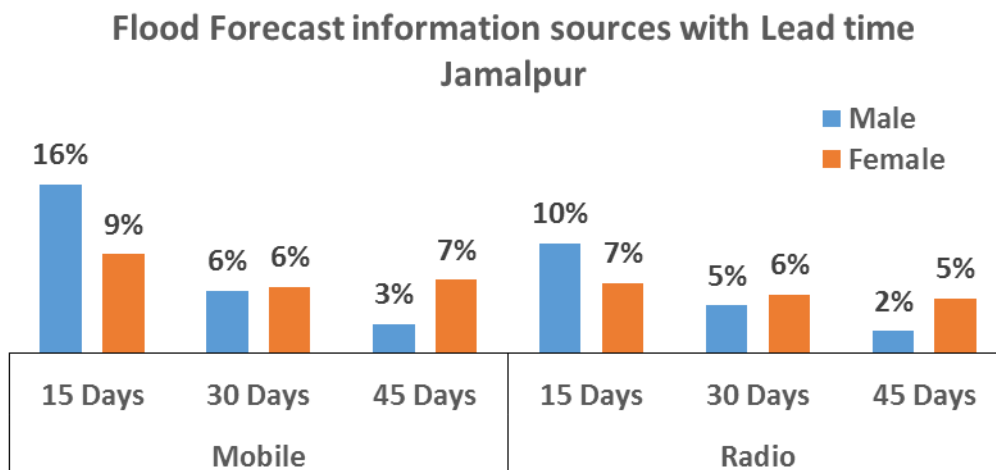
Figure 7.16 Flood Forecast information sources with Lead time for Jamalpur a) Friends/Relatives, and TV and b) Mobile and Radio.

7.7.3 Preferred and effective lead time for FEW in flood management

The preferred and effective lead time for early warning in flood management is mostly 7 days or more. For savings lives, properties, crops, and livestock a substantial preparation is needed. At the community level, only Union Parishad plays the role to disseminate FEW. As per KII with government officers, they have mentioned that after receiving the FEW Messages they conduct emergency meetings. In the emergency flood management committee UNO, Public Representative, Agricultural Officers, Livestock Officers, Health Officers, NGOs, Volunteers are included.

In reality, an effective way of FEW would be disseminated at least 7 days ahead. In the Gaibandha and the Kurigram district, more than 40% of female respondents have given the opinion for 7 days advance flood warning (Figure 7.17 to 7.21). Also, in the FGD and KII, it is mentioned that there is a gap between the time of action and actual occurrence time of flood which needs to minimize in an appropriate coordinated approach.

(a)

FEW Preferred and effective lead time for saving lives Gaibandha

■ Male   ■ Female

(b)

FEW Preferred and effective lead time for saving lives Jamalpur

■ Male   ■ Female

(c)

FEW Preferred and effective lead time for saving lives Kurigram

■ Male   ■ Female

Figure 7.17 FEW preferred and effective lead time for saving lives by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

(a)

FEW Preferred and effective lead time for saving asset (individual)
Gaibandha

■ Male ■ Female

(b)

FEW Preferred and effective lead time for saving asset (individual)
Jamalpur

■ Male ■ Female

(c)

FEW Preferred and effective lead time for saving asset (individual)
Kurigram

■ Male ■ Female
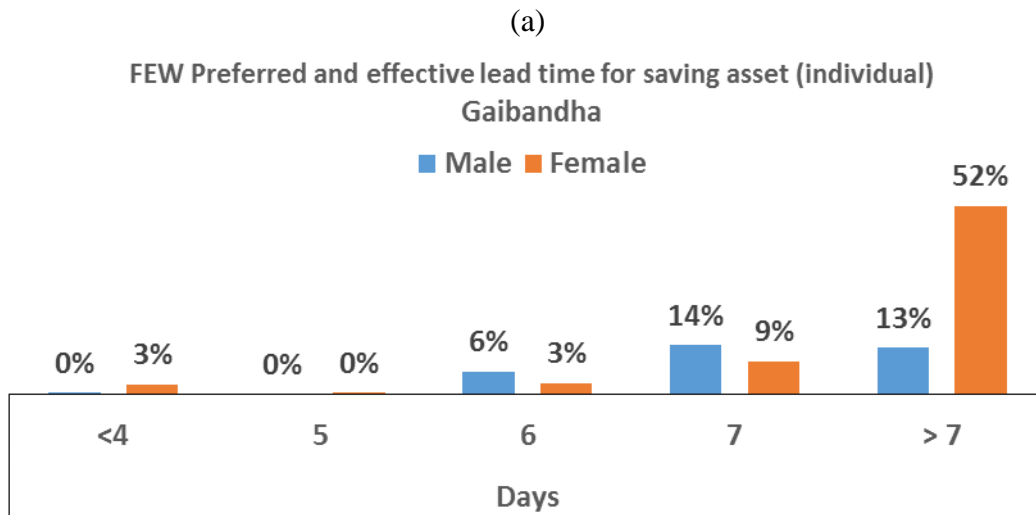
Figure 7.18 FEW preferred and effective lead time for saving asset (individual) by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

(a)

FEW Preferred and effective lead time for saving asset (community)
Gaibandha

■ Male ■ Female

0% 0% 0% 0% 5% 2% 14% 6% 16% 57%

<4   5   6   7   > 7

Days

(b)

FEW Preferred and effective lead time for saving asset (community)
Jamalpur

■ Male ■ Female

18% 22% 7% 6% 2% 3% 8% 4% 20% 11%

<4   5   6   7   > 7

Days

(c)

FEW Preferred and effective lead time for saving asset (community)
Kurigram

■ Male ■ Female

9% 18% 2% 6% 1% 5% 2% 5% 9% 44%

<4   5   6   7   > 7

Days
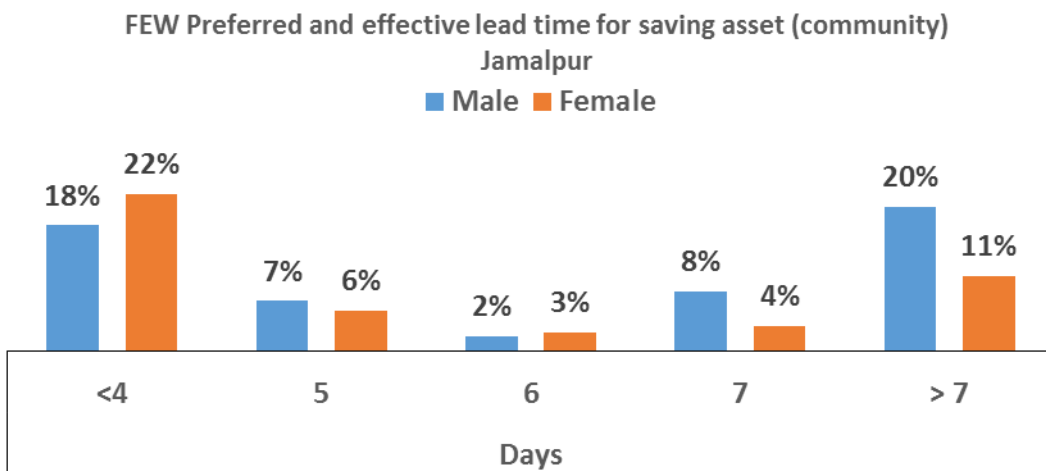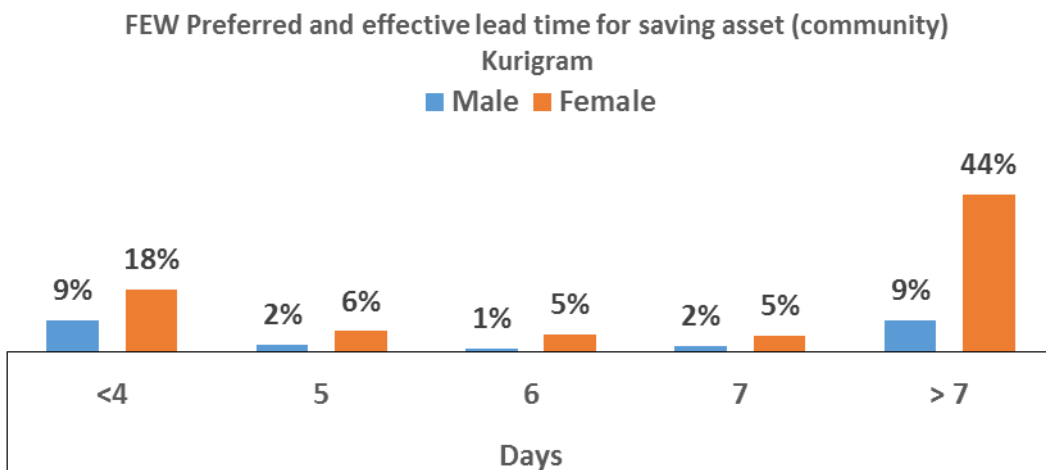
Figure 7.19 FEW preferred and effective lead time for saving asset (community) by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

(a)

FEW Preferred and effective lead time for saving crop
Gaibandha

■ Male ■ Female

Days	<4	5	6	7	> 7
Male	0%	0%	5%	14%	15%
Female	0%	0%	2%	4%	59%

(b)

FEW Preferred and effective lead time for saving crop
Jamalpur

■ Male ■ Female

Days	<4	5	6	7	> 7
Male	3%	1%	4%	11%	39%
Female	12%	2%	6%	6%	16%

(c)

FEW Preferred and effective lead time for saving crop
Kurigram

■ Male ■ Female

Days	<4	5	6	7	> 7
Male	0%	1%	1%	2%	23%
Female	4%	4%	4%	6%	56%
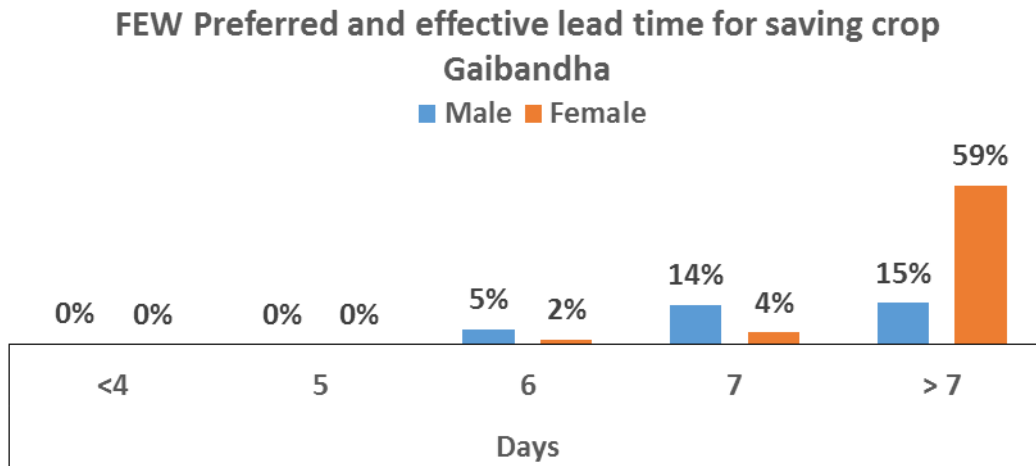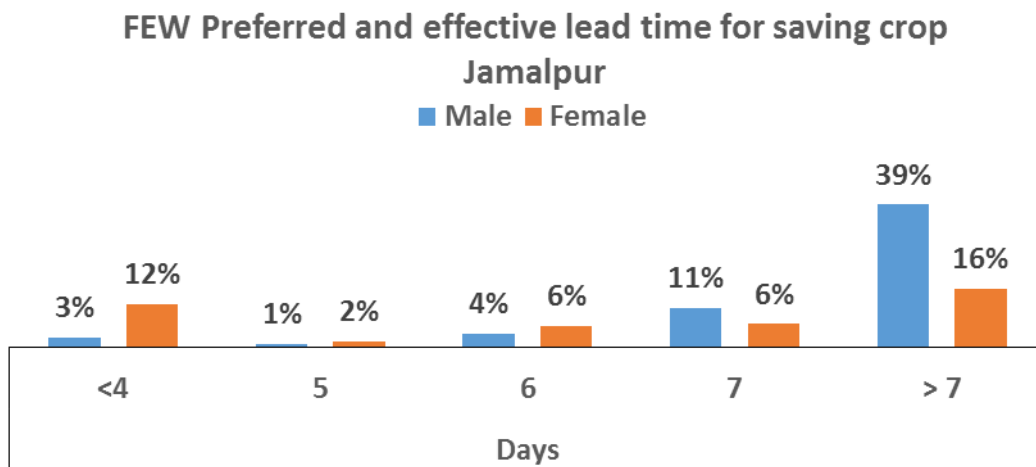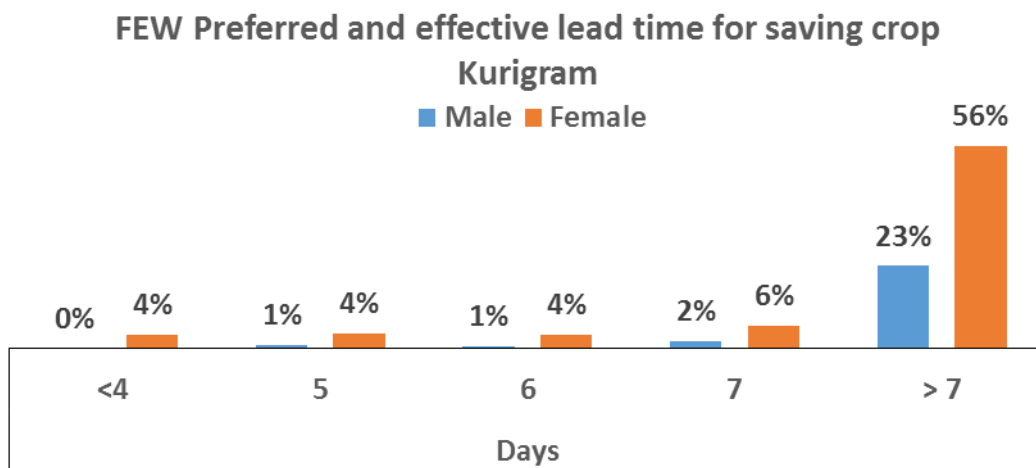
Figure 7.20 FEW preferred and effective lead time for saving crop by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.

(a)

FEW Preferred and effective lead time for saving livestock
Gaibandha

■ Male ■ Female

(b)

FEW Preferred and effective lead time for saving livestock
Jamalpur

■ Male ■ Female

(c)

FEW Preferred and effective lead time for saving livestock
Kurigram

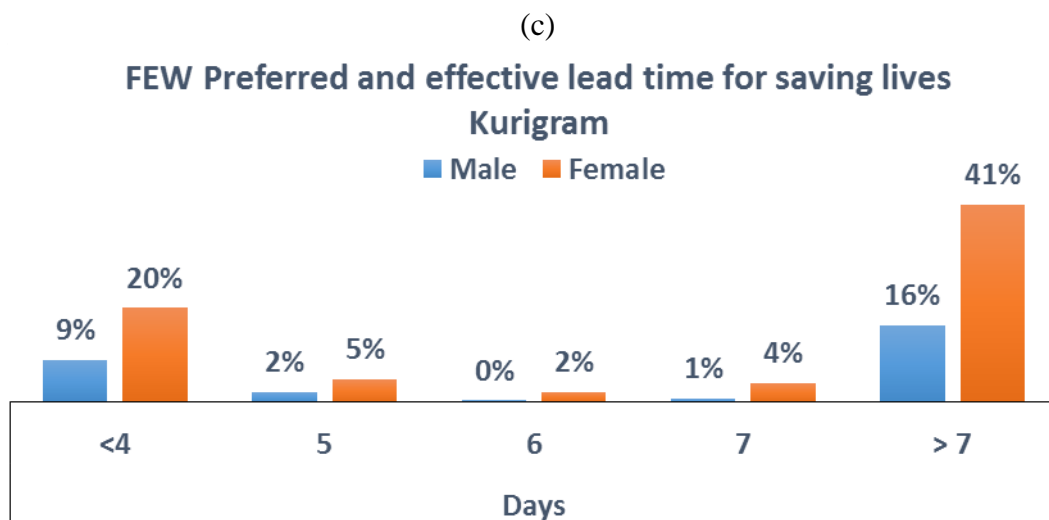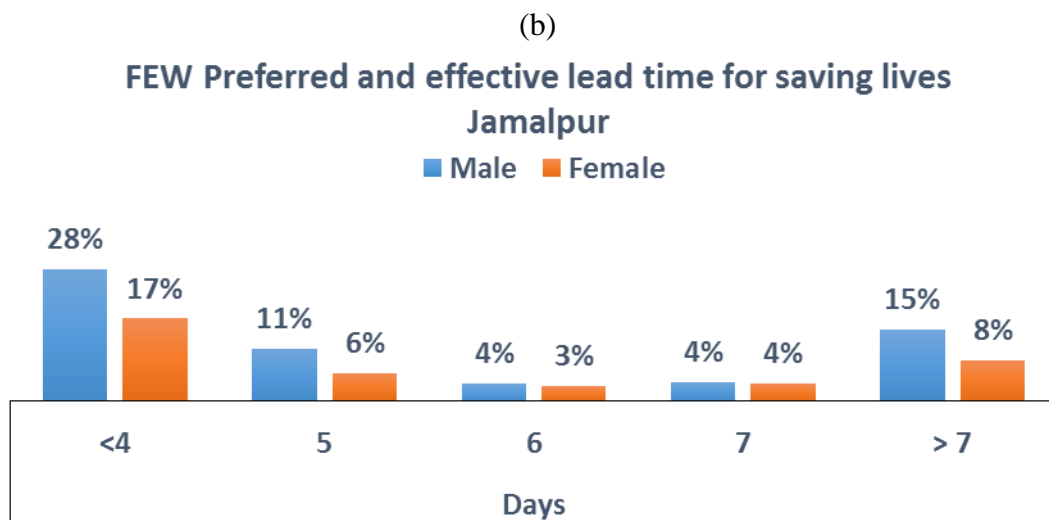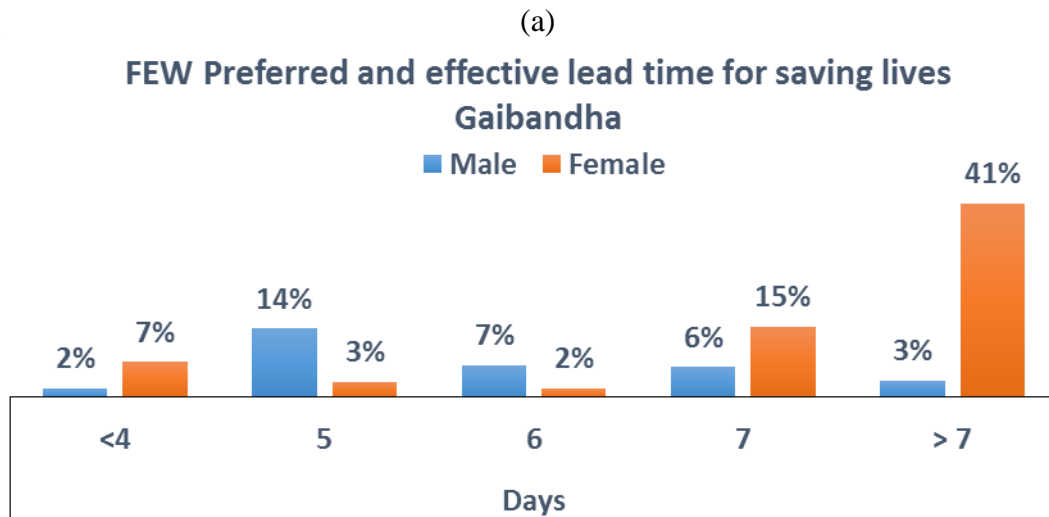■ Male ■ Female
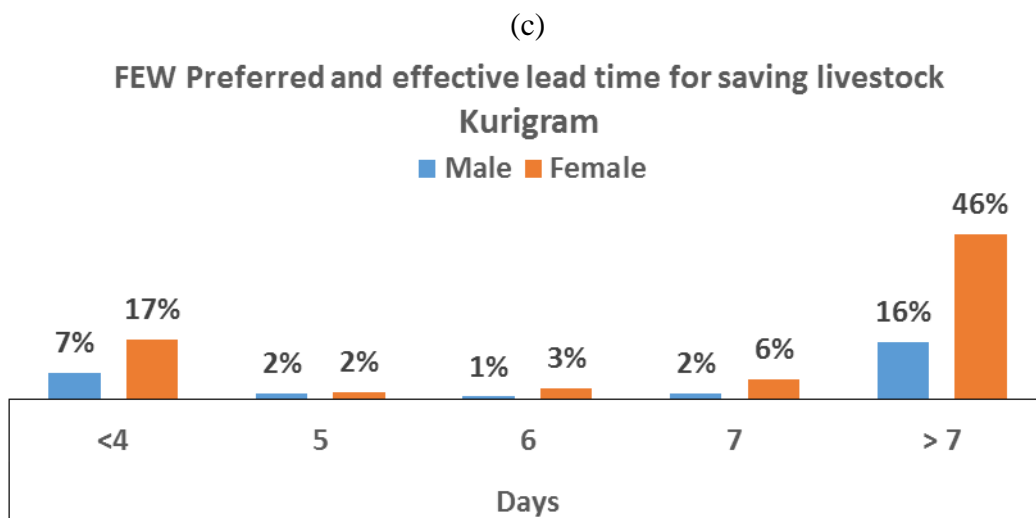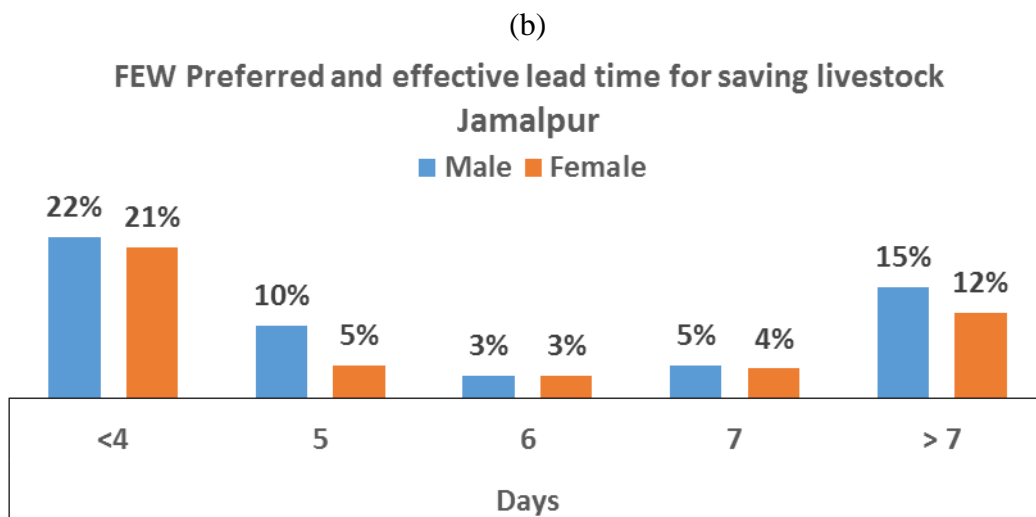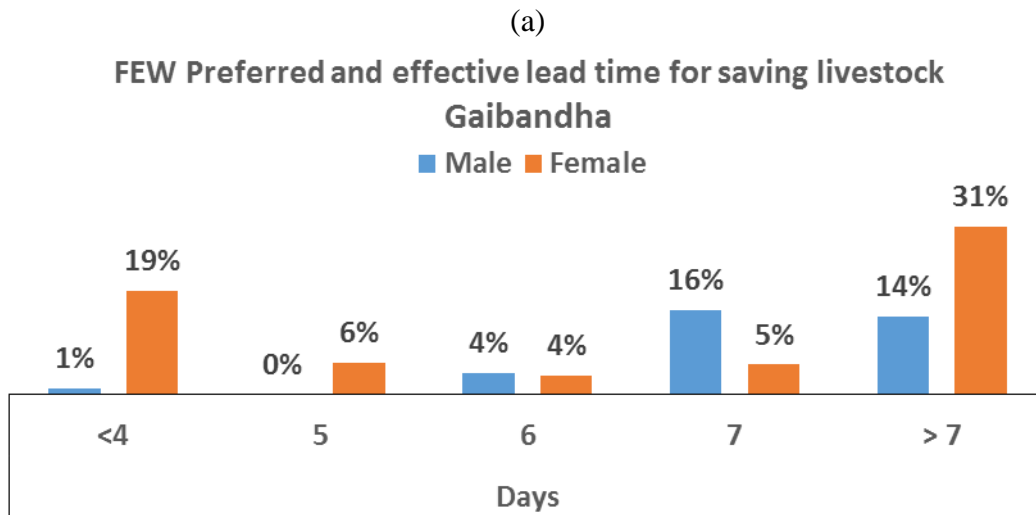
Savings livestock

Figure 7.21 FEW preferred and effective lead time for saving livestock by the district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.
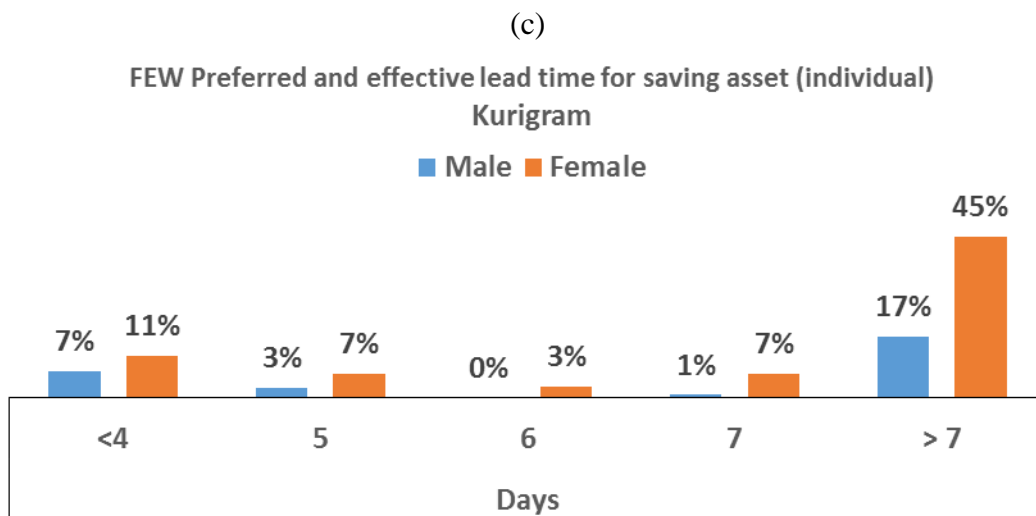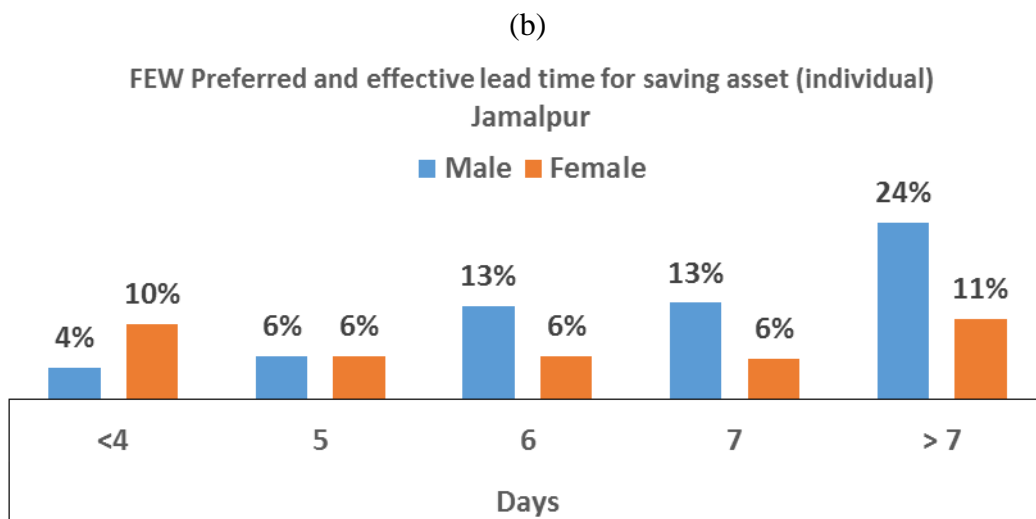
7.8 Quality of communication channels during flood

7.8.1 Conditions of electricity

Figure 7.22 (a) showing electricity supply and availability during the flood, by districts. The overall situation of electricity is a bit better in the Gaibandha region though it is available only on the scheduled hour. The other two districts, more than 80% of respondents have mentioned there are no electricity facilities at all. The people who bound to live in the remote Char land area don't have the facilities of pure drinking water, sanitation, educations, treatment, and transportation. The livelihood is very miserable there.

(a)

(b)
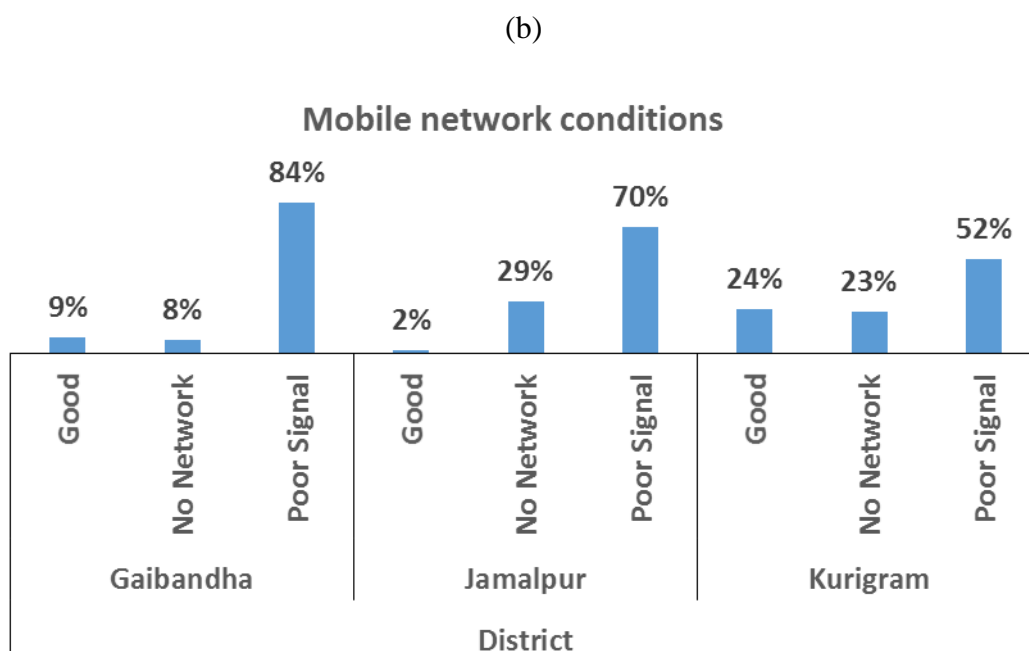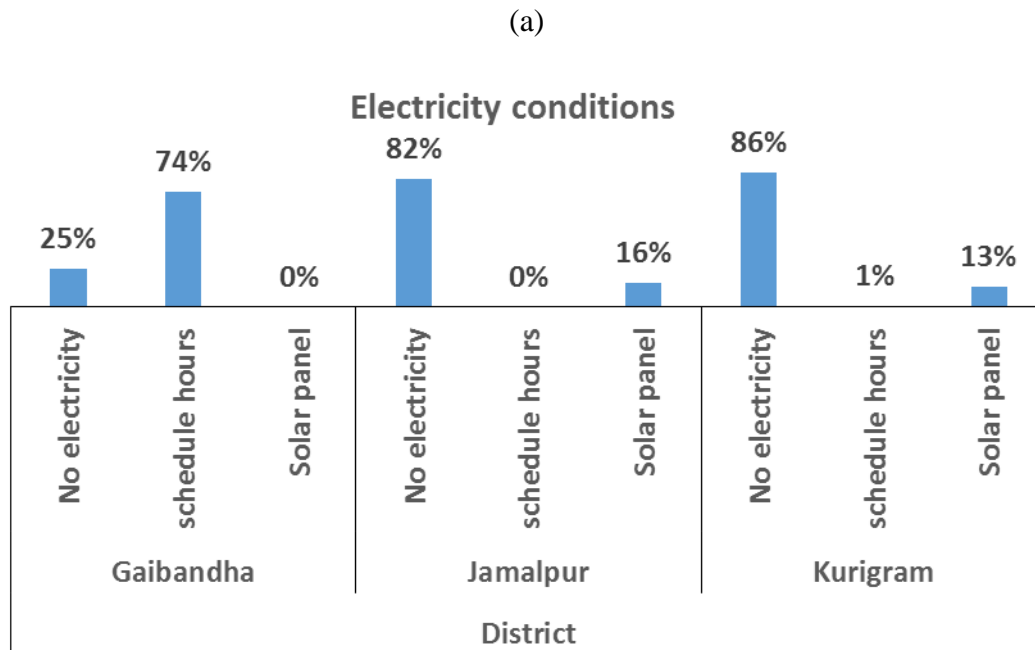
Figure 7.22 (a) Electricity and (b) mobile network conditions during flood by district.

7.8.2 Conditions of Mobile network

Figure 7.22 (b) showing mobile network availability during the flood, by unions for three districts. According to the HHS, FGD, and KII, all respondents informed that in this flood-prone region mobile signal is weak most of the time. Especially, in the Char lands the situation comparatively worse. The poor signal and no signal make the flood situation more vulnerable. In Kurigram, Gaibandha, and Jamalpur districts study region shows poor mobile signal 52%, 84%, and 70% respectively.

7.9 FEWS improvement to minimize Loss and damage

To minimize flood-related damage it is necessary to have some effective measures for Flood Early Warning System (FEWS). As per respondents, FEW lead time, FEW message type, message language, volunteering support are essentials. The female respondents of the Gaibandha and Kurigram districts have given priority for the lead time of FEW. Around 66% of female respondents of Kurigram think that more reliable information should be incorporated with a specific location mark (Figure 7.23).

(a)

(b)

FEWS improvement to minimize Loss and damage Kurigram

■ Male ■ Female

Lead time: Male 21%, Female 33%
Message type: Male 1%, Female 3%
Message language: Male 4%, Female 4%
Volunteering support: Male 19%, Female 30%
More information: Male 26%, Female 66%
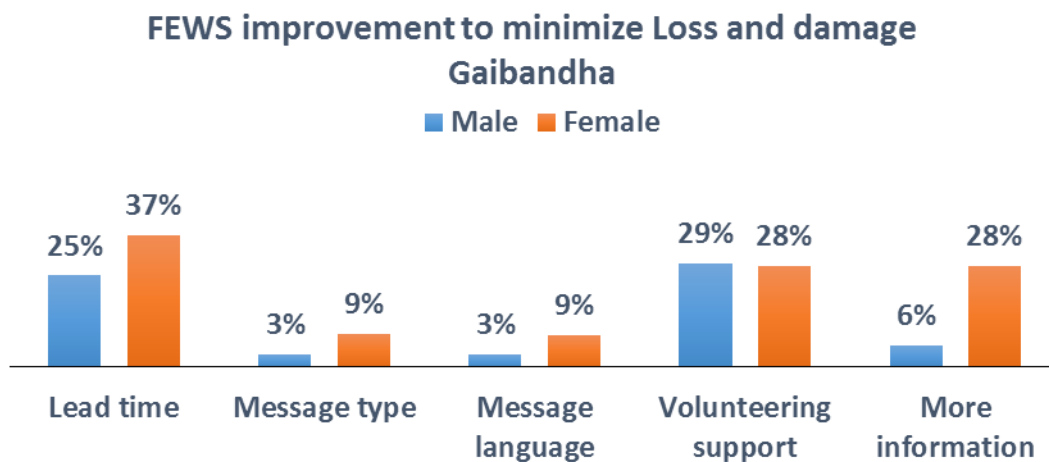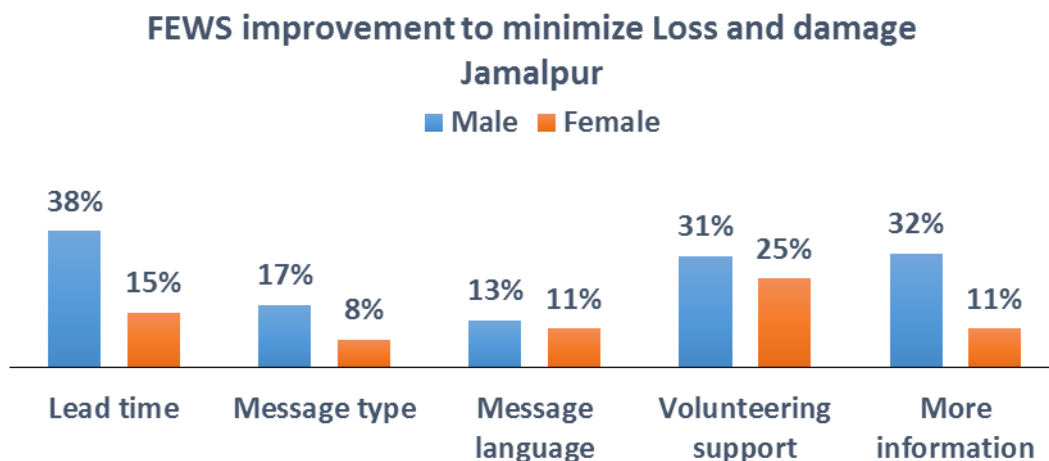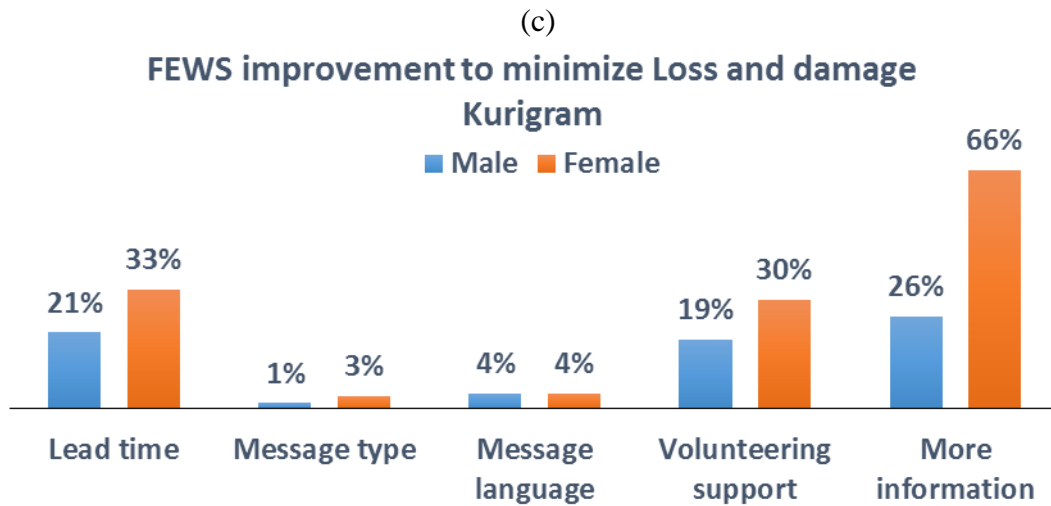
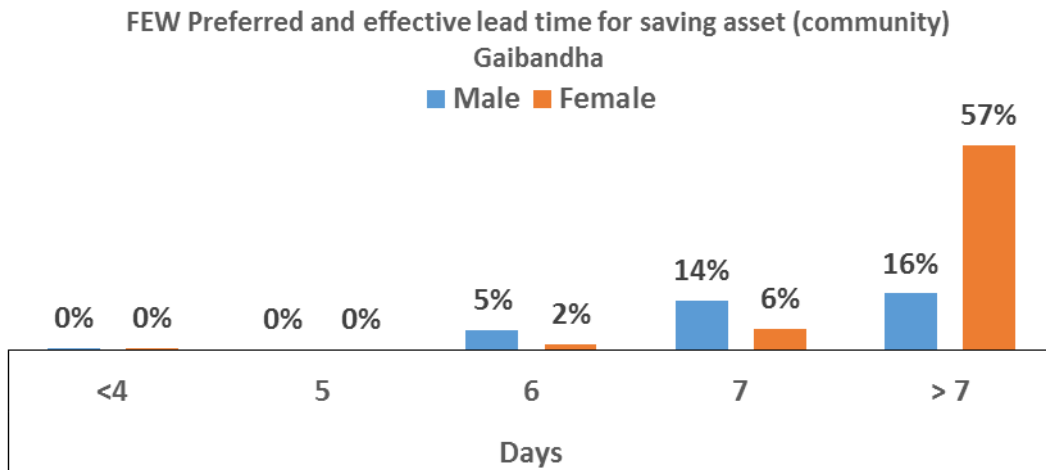**Figure 7.23FEWS improvement to minimize flood-related loss and damage by district (a) Gaibandha, (b) Jamalpur, and (c) Kurigram.**

7.10 Notable reasons for not taking FEA

As per their experience, none of the year flood warnings properly matched. That way they have very little confidence in it. Also, social security, distance flood shelter, or no shelters are the major causes.

Limitations for not taking Flood Early Action

■ Male ■ Female

Gaibandha:
- Early Warning messages: Male 11%, Female 5%
- Communication actions: Male 29%, Female 55%
- Household Ability: Male 1%, Female 3%

Jamalpur:
- Early Warning messages: Male 31%, Female 9%
- Communication actions: Male 29%, Female 24%
- Household Ability: Male 6%, Female 2%

Kurigram:
- Early Warning messages: Male 7%, Female 28%
- Communication actions: Male 20%, Female 43%
- Household Ability: Male 1%, Female 1%

District

Figure 7.24Limitation(s) for not willing to take measures after receiving FEW message.

It is also discussed they don't have any cash money in their hand for daily livelihood. If they lose their small property and belongings it may be a serious problem for them. Almost all Char lands communication system is so difficult especially in the evening. There is no communication system in the evening. A sudden increase in water level in the evening or night time makes their lives horrible.

The people who are living in a remote Char lands they don't have mobile network access. The poor or out of income level people are not willing to take any precaution or partial actions before the flood.

In the HHS it was asked, what is the limitation(s) for not willing to take measures after receiving early warnings for Flood message thorough an open question. Respondents have given their opinion. Finally, we have segregated all the opinion in the three categories as follows-

1. Early Warning messages (no flood warning, not believe FEW, no time, believing Almighty, don't know, etc.).

2. Communication actions (lack of shelters, transport, river current, remote location, previous experience, etc.). and

3. Household Ability (e.g. no cash money, disability, single person, security, dacoits, crop-season, etc.).

In the Gaibandha district, 84%, Kurigram district 63%, and Jamalpur district 53% of respondents have mentioned that communication actions are the major barriers (Figure 7.24). In Jamalpur District, 40% of respondents think that the Early Warning message and 8% of respondents think household ability limitations are also the barrier of not taking any early action initiative due to flood.

7.11 Conclusions

In the study, it is observed that the local people have traditional knowledge of Flood warning and action which has immense value. They may lack scientific data and information on impact-based forecasting and the FbA. This study is an important initiative to minimize this gap. It is evident that there is an adverse impact of floods in the study region. By analyzing HHS data and as per FGD Discussion and KII the following conclusion can be drawn-

- There is a lack of understanding of the Flood Early warning message. Absence of early warning message translation mechanism and dissemination channels.

- Transportation and communication in remote Char lands are difficult. Due to a lack of understanding of the FEW, it is difficult to take early action at the community level. Simultaneously, there is a lack of flood shelters and some areas have no shelter at all which need to be considered for future management aspect.

- Emergency financial support may help the vulnerable communities to face flood situations as respondents have mentioned that household ability also one of the core reason for not taking Flood early Action.

- Unavailability of electricity and poor mobile network make the flood situation dangerous. Emergency boat ambulance facilities are not available which are very much important for sick, pregnant women and disabled people of the remote locations. An effective and time demanding initiative will reduce death tolls of the localities.

- Flood usually affected agricultural land, crop, livestock sector, fisheries, etc. The flood recurrently damages roads, embankments, culverts, houses like infrastructures which is a great loss for lives and livelihood. An effective, trustworthy, understandable, and location-specific FEW messages will help to take Flood Early Action among the community.

CHAPTER EIGHT: FLOOD MANAGEMENT MECHANISM AND FINANCING

8.1 Introduction

Flood management comes from response and recovery of flood damage. Flood management mechanism and financing plays an essential role either encourage people to recue themselves and resources or re-build in the same manner in the same places. Despite the current paradigm shift towards multilevel flood risk management (Thaler & Priest, 2014), national governments play a significant role in FRM: 'They shape regulatory frameworks, bear the ultimate responsibility for crisis management and often provide a critical amount of money for post-disaster emergency relief and flood prevention measures' (Slavíková, 2018, p. 1). Financial schemes are among the key governmental approaches to post-flood recovery. It is recommended, however, that financial schemes aim at flood risk reduction by linking recovery strategies with prevention and mitigation strategies (Suykens, Priest, van Doorn-Hoekveld, Thuillier, & van Rijswick, 2016). It has been indicated that in countries where central governments have traditionally played a strong role (such as in post-socialist European countries), state flood recovery funding tends to crowd out individual efforts (Raschky, Schwarze, Schwindt, & Zahn, 2013; Slavíková, 2018). The research has performed a comparative analysis of flood affected community and other legislative mechanism in flood management and financing at local level.

Key findings

- There is none designated flood loss recovery mechanism exist
- Government did not introduced any social safety net program to recover flood induced loos and damage
- Government only plays role to relief
- Some non-government organization (national and international) works to provide external support as food, medicine, water during the flood
- A small amount of support are available to reconstruct houses which is not sufficient

8.2 Access to social safety nets for flood risk management

Social Safety Net Programs (SSNPs) are administered in the study areas by several line departments. But there is no specific SSNP related to flood in the study areas though some of SSNP is administered under the Ministry of Food and Disaster Management along with Ministry of Social Welfare and the Ministry of Women and Children's Affairs. Most of the SSNPs is administered in collaboration with NGOs. In the study areas, during the field study, it is found that Vulnerable Group Development (VGD), Vulnerable Group Feeding (VGF), Relief Service are actively performing but some of the respondents have mentioned that they receive disaster insurance from government agencies but the DRRO of Kurigram, Gaibdnha and Jamalpur have mentioned that there is no disaster insurance scheme performing by the government even now. During the Focus Group Discussion (FGD) with farmers group in Sapdhori and Hatiya union of Islampur and UlipurUpazila, it is found that they do not receive any disaster insurance for their crop recovery. Relief service is actively performing in the study areas which is being operated by District Relief and Rehabilitation Office (DRRO) along with NGOs and national and local volunteer groups during disaster which is found in the household study. In Gaibandha district, 76% of respondents mentioned that they receive relief during the flood which is 84% in Jamalpur and 100% in Kurigram (Figure 8.1).

Access to social safety nets for flood risk management
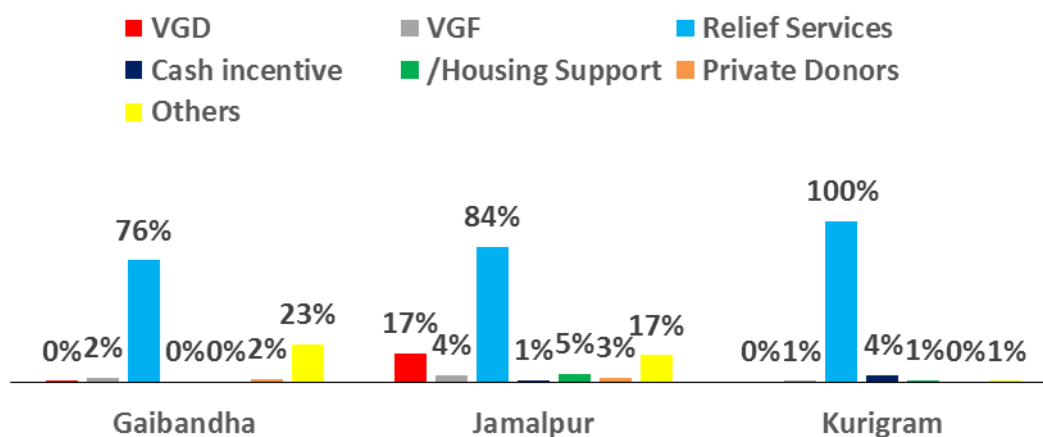
Figure 8.1: Access to social safety net (Others= rehabilitation service, CFW (Kabikha), No response)

8.3 External support to manage flood

The study has attempted to find out the types of support that are availed by the flood affected community. Respondents have mentioned receiving support for food, medicine, cocking fuel, cash incentive water for drinking and other purposes, sanitation support, agricultural input, livestock and poultry support, fishing equipment for fishing communities, housing support for homeless people. The study found that respondents of the project areas have never received agricultural input, livestock and poultry feed, fishing equipment as support in pre-flood period, flood period and post flood period.

Table-8.1: External support to manage flood (number of organizations)

Support Criteria	Pre-flood	Flood period	Post flood	Never
Food	-	557	45	32
Medicine	2	173	10	38
Cocking Fuel	78	18	1	59
Water (Drinking and other uses)	-	80	5	57
Sanitation	-	2	-	59
Cash money	-	5	10	59
Agri. input	-	-	-	59
Livestock	-	-	-	59
Poultry	-	-	-	59
Fish culture	-	-	-	59
Fishing equipment	-	-	-	59
Housing support	1	14	2	59

Food products is the prime support for the flood affected area which is mentioned by the respondents and it is found that 557 respondents receive food products during flood and 32 respondents receive post flood period though no one received food support pre-flood period whereas 32 respondent have mentioned that they never receive food support (Table).

Medicine is another support for the flood affected people which is provided by different organizations and individuals during flood mainly and 178 respondents argue that they receive medicine support during flood, only 2 person receive pre-flood and 10 person receive post-flood.

The Civil Surgeon of Kurigram district says, "We always provide health support to the flood affected people and no one is out of our support".

8.4 Flood management supporting agent/organization

Many organization including government and non-government and individuals are involved with flood management support in flood affected areas as well as Gaibandha, Jamalpur and Kurigram. The respondents have mentioned that government organizations are more active than non-government organizations and individuals in flood management support. The study illustrates that in Gaibandha 71.429%, in 34.00% and in Kurigram 28.477% respondents get support for flood management. In flood management support, non-government organizations are playing second role which is found in the household study. In the FGD session with farmers in Sapdhari and Hatiya uion, it is found that government organization like UNO, Upazlia Administration, DPHE, and UHC supports them for flood management in terms of food support, medicine support, and water support and so on.
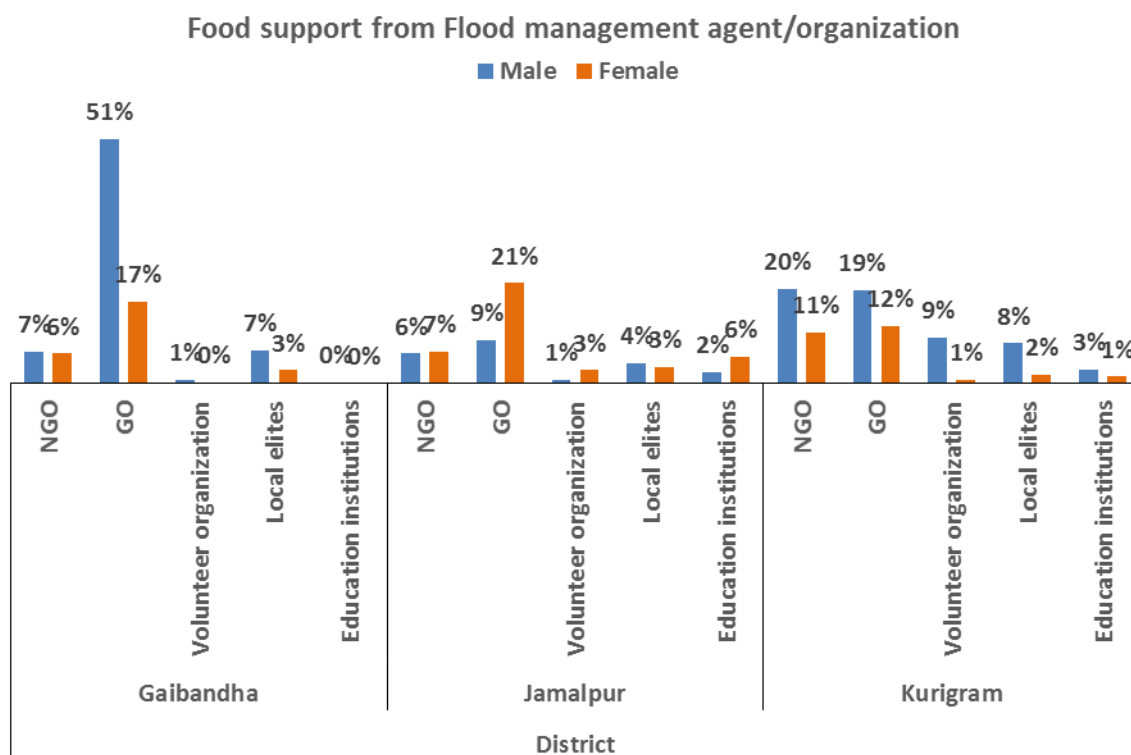
Figure 8.2: Food support from Flood management supporting agent/organization

8.5 Loan burden due to flood

Flood causes financial hardship for the affected people. People lose their natural and social assets due to flood and some people also face various diseases due to the effect of flood. To recover these losses they need more loan. The study found that in Gaibandha, 53% people overcome their loss through loan burden which is 63.5% at Kurigram and 62.60% at

Jamalpur (Figure). Almost every year the people who suffer from flood, their loan burden is also increasing.
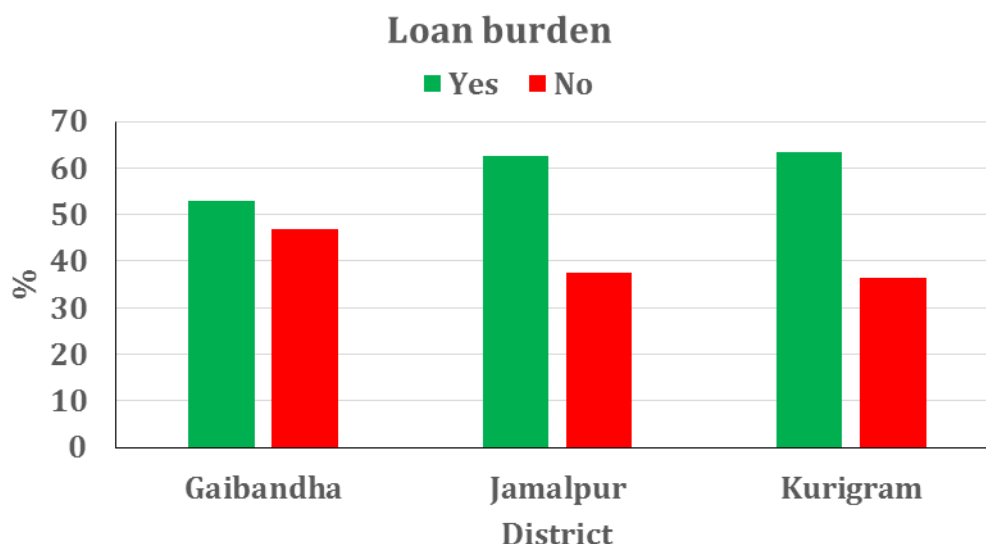
Figure-8.3: Loan burden

The descriptive report of loan amount by different sectors and by district and overall as well provided in the table8.3 and figure 8.4a, 8.4b and 8.4c.

Table-8.2: Status of loan amount (BD Taka) by different sectors and by district and overall as well.

District	Statistical measure	Local NGO	National NGO	Cooperatives/ MFI	Govt. Agency	Friend/rel atives	Mohaj on	Bank	Others
Gaibandha	N	37	3	11	3	94	1	1	6
	Minimum	3000	10000	5000	100000	200	5000	2500	5000
	Maximum	60000	30000	50000	100000	30000	5000	2500	50000
Jamalpur	N	18	3	8	2	85	35	10	7
	Minimum	2000	20000	10000	20	1000	1000	10000	5000
	Maximum	80000	50000	30000	1000	175000	70000	50000	50000
Kurigram	N	44	8	1	-	105	31	7	1
	Minimum	4000	10000	12000	-	500	3000	14000	4000
	Maximum	130000	25000	12000	-	40000	100000	50000	4000
Total	N	99	14	20	5	284	67	18	14
	Minimum	2000	10000	5000	20	200	1000	2500	4000
	Maximum	130000	50000	50000	100000	175000	100000	50000	50000

The study found that in Gaibandha 37 local NGO, 3 INGOs from where flood affected people receive loan to recover flood induced loss. In Jamalpur 18 local NGOs and 3 INGOs are involved with flood loss recovery loan whereas it is 44 and 8 respectively in Kurigram. In the three studied districts, along with local and international NOGs, microfinance institute, government agencies, bank also involved loan sanction for affected people. Traditional money lending system is also active in the study area like Mohajon, asset mortgage, gold

mortgage are available. It is found that in Gaibandha minimum loan burden in an individual household level from local NGO is 3000.00 BDT, from INGO is 10000.00 BDT. The highest loan comes from government agencies in Gaibandha. In Kurigram, highest loan comes from Mohajon with high interest. In Kurigram. Flood affected people don't get loan from government agencies. In absence of government agency, traditional money lending system is exposing over burden to the flood affected people which is found during the focus group discussion. The DRRO of Kurigram mentioned that due to char areas and remoteness there is no government financial mechanism.
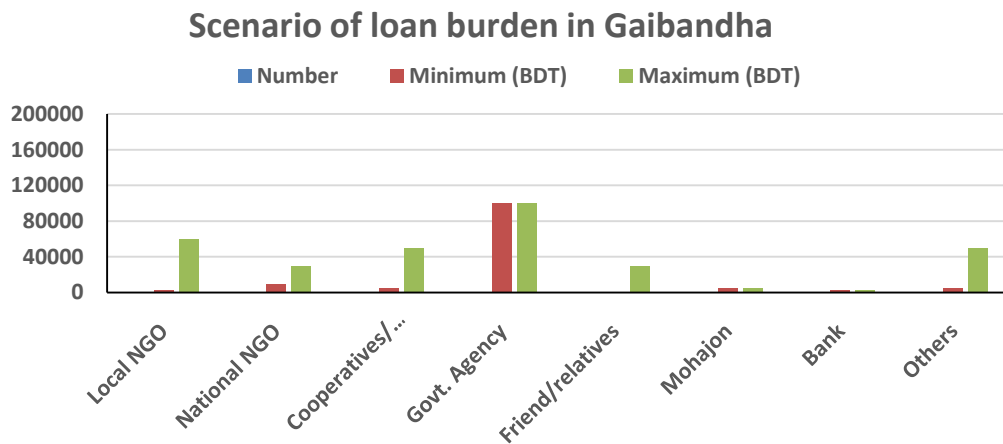
Figure 8.4a: Scenario of loan burden in Gaibandha (BDT)
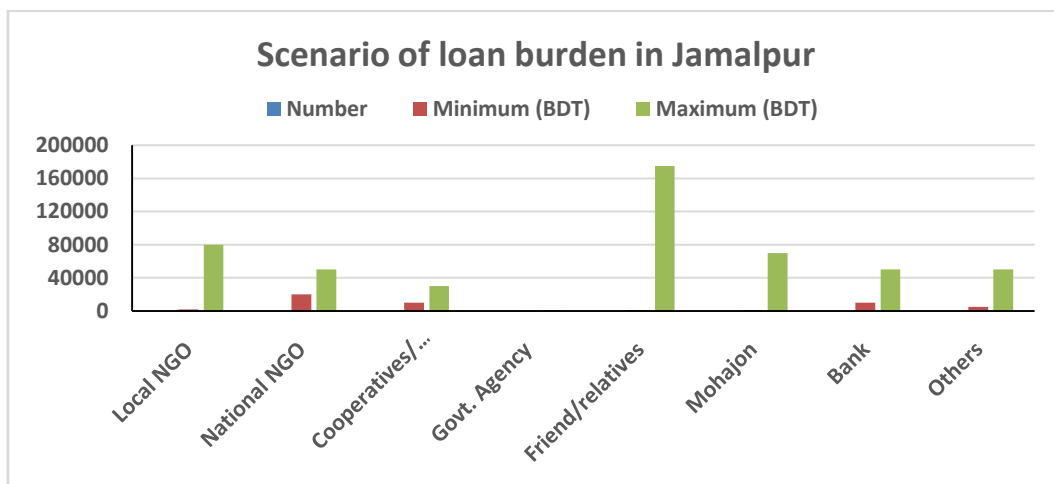
Figure 8.4b: Scenario of loan burden in Jamalpur (BDT)
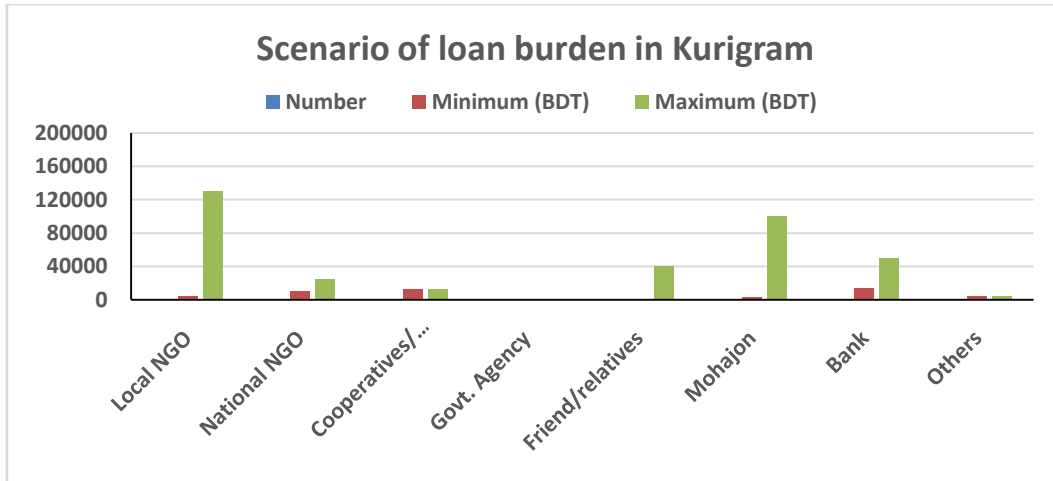
Figure 8.4c: Scenario of loan burden in Kurigram (BDT)

8.6 Flood loss recovery mechanism

There is no specific state owned flood loss recovery mechanism. Flood affected people recover their loss by own initiative and a several measures were identified during the field study. The study found that flood affected people co-opt loss recovery mechanism by using borrowing loan from local sources like NGOs, MFI, bank, relatives, mohajon. Some people spend their saving, sold their asset to recover their losses.
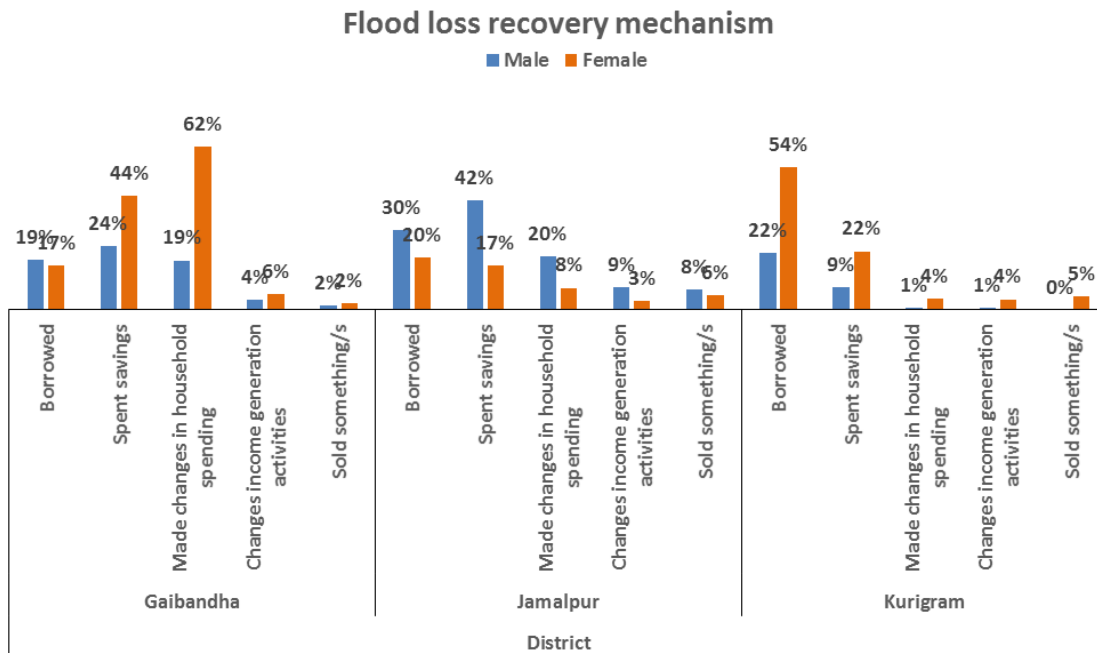
Figure-8.5: Flood loss recovery mechanism

The miserable thing is that some people drop out their children from schools to recover the flood incurred losses to reduce expenditure which is specifically found in Jamalpur for 3.30% and Kurigram for 0.70%. There are some coping mechanisms which were not mentioned by many respondents, but were found through observation and informal conversations (e.g. prostitution). Due to multiple response for flood loss recovery mechanism, we have calculated each option using multivariate variance and found reducing household expenditure

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is the top most mechanism for Gaibandha which is counted for 80.50% respondents and spend saving which is accounted by 67.60% respondents. On the other hand, in Jamalpur, spend saving is top most flood recovery mechanism which is accounted by 61.50% respondents and reducing household expenditure is the second choice for recover losses which is accounted for 30.40% respondents. In Kurigram, borrowing is the priority mechanism for flood loss recovery which is being practiced by 75.90% respondents. The PIO of Ulipur, Kurigram mentions that to reduce and recover flood induced loss, cash monetary support is essential before and after flood. He also says that most of the people cannot take preparation to go to shelter because most of the women don't have cloths to wear in outside of their home. If they get some financial support they they will be able to buy cloths and other essential issues for flood shelter. On the other hand, after flood, they don't get money to repair their houses and in that case they need cash monetary support.

8.7 Conclusion

The field level data shows a comparative analysis between the floods affected communities and relevant legislative mechanism in flood management and financing. One of the major flood management strategies is considered to be the Social Safety Net Programs (SSNPs), coverage of which has not been observed in the study areas. But relief distribution through district level offices has been mentioned by the local community. The respondents have mentioned that they basically received food supports in relief distribution and never received livelihood development supports and equipment to recover their livelihood means from flood. Government departments and offices are at the forefront of flood management in cooperation with local communities and Non-Government organizations (NGOs).

Local community face financial burden due to flood induced loss and damages. They have to resort to various coping strategies to overcome these loses among which getting loans from different sources is the major coping strategy. It creates financial burden to around 64% respondents of Kurigram followed by 63% respondents of Jamalpur and 53% respondents of Gaibandha. The project Implementation Officer (PIO) of Ulipur, Kurigram mentions that due to lack of adequate support for the recovery of such losses has often forced many households towards loan burden and financial hardship.

CHAPTER NINE: CONCLUSIONS AND RECOMMENDATIONS

9.1 Overall Conclusions

Bangladesh is one of the victims of continuous natural disasters almost every year including Floods. Frequent floods keep the immense impact on the lives and livelihood of the northern Bangladesh region during the monsoon season. The baseline study determines overall community practices following the objectives, goals, indicators and components of the program.

1. From the field study, it is found that the inhabitants of Jamalpur, Kurigram, and Gaibandha experienced deadly flooding during the studied period of 2015-2019. There was an active southwest monsoon in 2017 and 2019 over Bangladesh and adjacent neighborhood region and largescale flow of water leading to destructive flooding situations over northern Bangladesh.

2. As per the HHS, 59% of respondents are female and male respondents are 41%. In Kurigram district the female respondents are 71%. This finding indicates male members stay outside or migrate for certain times for making an income. Most of the respondents living in kutcha houses and the percentage is about 98%.

3. Sector-wise loss indicates more loss in the homestead including poultry and health sectors. In many places, there are no flood shelters and some location it is about 2 to 17 km far.It is important to have women-friendly flood shelters in the flood-prone regions. There is a demand for a separate room and a separate toilet facility for pregnant women at the shelters. Unfortunately, these kinds of arrangements are not available in most of the flood shelters.

4. As per the study the Flood Early Warning (FEW), Flood Danger Level (FDL) and Flood Forecast (FF) channels are not community-friendly. Although the respondents were leaving in the flood-prone areas, around 49.5% of them have no idea of flood early warning. It is stated that the local communities face flood induced loss and damages which creates a financial burden.

5. According to the household survey data, around 64% of respondents of Kurigram followed by 63% of respondents of Jamalpur and 53% of respondents of Gaibandha experienced flood induced financial burden. However, they do not recognize the importance of taking early actions to save their lives and assets.

6. The FbA is included in the standing order. As per the order, there needs to form a National level taskforce who will prepare guidelines, financing mechanisms. Also, there is a need for supporting institutions. There is a need for the community to understand what institutions are doing and also there is a need for strengthen local level government to able to do implement different forecast base processes for early action.

7. There is a need for electricity access, mobile network communication access in order for the project to succeed in terms of mitigating the need for disaster-affected vulnerable people.For providing emergency health service to the remote char land community it important to have boat ambulance facilities, necessary anti-venom at Upazila health complex level. These arrangements need to give priority to save lives of the vulnerable communities.

8. Advocacy for revision in policies regarding relief supports is a ground reality. The approach of the immediate solution with food and emergency supports need to be scaled up in a long term solution approach with livelihood improvement knowledge and mechanisms. Adequate resource allocation with proper distribution has also been recommended by the stakeholders.

9.2 Recommendations

A number of recommendations have appeared from the field survey and FGD and KII findings to minimize the gap in flood management mechanism, early action, and financing. These are as follows:

- Community mobilization activities e.g. awareness workshop, drill training, seminars, meetings are recommended which are participatory approach. The women, adolescent girls, and people with disabilities should be given priority in the flood rescue mechanism and awareness-building activities. To arrange employment opportunities for women in the flood-prone areas according to their skills. Ensuring social and family security of women before, during, and after flooding.

- There should be a Disaster Support Fund for the communities from government and NGOs to respond to disasters like floods. The community engagement and contribution for fundraising will be an appropriate dimension for the coping mechanism. There is a need for appropriate assessment of flood resilience for providing tube-wells and latrines to the vulnerable community.

- Social safety net programs need to be able to respond early. The study aims to promote early action before a disaster like flood and forecast based information needs to address with an adequate lead time. The increase of Social Safety Net Programs has been recommended by the local community and as well as by the other relevant actors to enhance the adaptive and resilient capacity of the local community. Transparency is a big challenge for better functioning of Safety Net Programs. Livelihood diversification with off-farm employment opportunities is another much sought after the need of the local community to mitigate unemployment situation during the lean period. NGOs have a big role to enhance livelihood opportunities by replicating their expertise and best practices from their existing working areas. In this area, there is a need for more SSFN which is a big challenge of the most vulnerable communities but it needs to be linked to the mechanism which is being promoted.

- More research, monitoring, and fact-finding are needed to measure the performance of the institutions and programs assigned for flood management and financing. The loopholes in activities need to be identified and addressed with coordinated and concerted efforts of all stakeholders.

- Functioning of existing flood management mechanism based on both experiential knowledge of the community and scientific knowledge should be enhanced. Local needs and practices should be taken into consideration for formulating and strengthening flood mechanisms and financing.

- To arrange separate interest-free loans for women to deal with disasters, such as for building dilapidated houses, for income-generating work, and for spending on children's education and for disaster treatment. They cannot manage the expenditure properly if the bulk is allocated. Most of the cases the money is spent on food.

References

Baten Abdul, (2018), Pedro Arcos González, Rafael Castro Delgado. Natural Disasters and Management Systems of Bangladesh: Special Focus on Flood. Omni Science: A Multi-disciplinary Journal. 2018; 8(3): 35-47p. Bangladesh Red Crescent Society, Strategic Plan (2017-20), January 2017

Béné, C., Chowdhury, F. S., Rashid, M., Dhali, S. A., and Jahan, F. 2016. Impact evaluation of the WFP "Enhancing Resilience to Natural Disasters and the Effects of Climate Change" program with a specific focus on the resilience dimension Coirolo, Cristina (2013) 'Climate Change and Livelihoods in Northwest Bangladesh: Vulnerability and adaptation among extremely poor people'. Brighton: Institute of Development Studies (IDS), University of Sussex

Fenton. A, Tallontire. A, October 2016, Paavola.J Autonomous adaptation to riverine flooding in Satkhira District, Bangladesh: insights for transformation Sustainability Research Institute, School of Earth and Environment, University of Leeds.

Flood plain management in Australia, (1998), In Disaster risk Management Study Guide for DIM 605: Module 2, Bloemfontein: University of the Free State.

Living with Risk (2002): A Global Review of Disaster Reduction Initiatives, Geneva Switzerland.

Mohapatra, K.P. and Singh, D.R. 2003. Flood Management in India. Journal, 28:131-143.

Ninno, D.C., Dorosh, A.P. and Smith, C.L. 2003. Public Policy, Markets and Household Coping Strategies in Bangladesh: Avoiding a Food Security Crisis Following the 1998 floods. Journal, 31 (7):1221

Nott, J., 2006, Extreme Events: A Physical Reconstruction and Risk Assessment, Cambridge University Press, New York.

Biswas, J.C., Haque, M.M., Maniruzzaman, M. *et al.* Natural hazards and livestock damage in Bangladesh. Nat Hazards 99, 705–714 (2019). https://doi.org/10.1007/s11069-019-03768-0

Hossain, S., Cloke, H. L., Ficchì, A., Turner, A. G., and Stephens, E. 2019: Hydro meteorological drivers of the 2017 flood in the Brahmaputra basin in Bangladesh, Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-286

Ahmad, N. (2012), Gender and Climate Change in Bangladesh The Role of Institutions in Reducing Gender Gaps in Adaptation Program, The World Bank Social Development, Washington

Annual Flood Report (2014), Bangladesh Water Development Board

Pulla, Venkat Rao and Tulshi Das. 2015. Coping and resilience: Women headed households in Bangladesh floods. International Journal of Social Work and Human Services Practice Vol.3 (5): 169-175, December. Horizon Research Publishing

BDRC, 2019 BANGLADESH: Monsoon Flood 2019 Situation Report 2, Bangladesh Red Crescent Society, Dhaka, Bangladesh, 2019

BDRC, 2019 BANGLADESH: Monsoon Flood 2018 Situation Report 1, Bangladesh Red Crescent Society, Dhaka, Bangladesh, 2018

NIRAPOD, 2016 Flood Situation Analysis, NIRAPOD, Dhaka, Bangladesh, August 02, 2016

NIRAPOD, 2017 Flood Situation Analysis, NIRAPOD, Dhaka, Bangladesh, August 22, 2016

BRAC, 2015, FLOOD SITUATION REPORT Waterborne diseases hit the flood-affected areas, BRAC, Dhaka, Bangladesh, September 10, 2015

Tapsell SM. Follow-up study of the health effects of the Easter 1998 flooding in Banbury and Kadlington. Report to the Environment Agency. Enfield: Flood Hazard Research Centre; 2000.

Howard MJ, Brillman JC, Burkle FM Jr, 1996 Infectious disease emergencies in disasters. Emerg Med Clin North Am. 1996 May; 14(2):413-28.

Centers for Disease Control (CDC), 1989 Health assessment of the population affected by flood conditions--Khartoum, Sudan. MMWR Morb Mortal Wkly Rep. 1989 Jan 6; 37(51-52):785-8

Biswas, J.C., Haque, M.M., Maniruzzaman, M. et al. Natural hazards and livestock damage in Bangladesh. Nat Hazards 99, 705–714 (2019). https://doi.org/10.1007/s11069-019-03768-0

Hossain, S., Cloke, H. L., Ficchì, A., Turner, A. G., and Stephens, E.: Hydro meteorological drivers of the 2017 flood in the Brahmaputra basin in Bangladesh, Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-286, 2019.

Mukherjee N., Rowan J.S., Khanum R., Nishat A., Rahman S. (2019) Climate Change-Induced Loss and Damage of Freshwater Resources in Bangladesh. In: Huq S., Chow J., Fenton A., Stott C., Taub J., Wright H. (eds) Confronting Climate Change in Bangladesh. The Anthropocene: Politik—Economics—Society—Science, vol 28. Springer, Cham

Adger, W.N., Nick Brooks, Graham Bentham, Maureen Agnew and Siri Eriksen, (2004), New Indicators for Vulnerability and Adaptive Capacity

Ahmad, N. (2012), Gender and Climate Change in Bangladesh The Role of Institutions in Reducing Gender Gaps in Adaptation Program, The World Bank Social Development, Washington Annual Flood Report (2014), Bangladesh Water Development Board

A Situation Analysis of Climate Change Adaptation Initiatives in Bangladesh, The Asia Foundation (2012)

Hossain Azad, A.K., K.M. & Nasreen, M. (2013). Flood-induced vulnerabilities and problems encountered by women in northern Bangladesh. International journal of disaster risk science, 4(4), 190-199

Bahadur, A. V., Ibrahim, M. & Tanner, T. (2013). Characterizing resilience: unpacking the concept for tackling climate change and development. Climate and Development 5(1):

55-65. Cannon, T. & Müller-Mahn, D. (2010). Vulnerability, resilience and development discourses in context of climate change. Natural Hazards 55(3): 621-635

Bangladesh Red Crescent Society, Strategic Plan (2017-20), January 2017

Bangladesh Climate Change Strategy and Action Plan (2009), Ministry of Environment and Forests, Government of Bangladesh

Béné, C., Chowdhury, F. S., Rashid, M., Dhali, S. A., and Jahan, F. 2016b. Impact evaluation of the WFP "Enhancing Resilience to Natural Disasters and the Effects of Climate Change" program with a specific focus on the resilience dimension.

Chambers, R and Conway, G.R. (1991), Sustainable Rural Livelihoods: Practical Concepts for the 21st Century, Institute of Development Studies, Brighton, United Kingdom.

Coirolo, Cristina (2013) 'Climate Change and Livelihoods in Northwest Bangladesh: Vulnerability and adaptation among extremely poor people'. Brighton: Institute of Development Studies (IDS), University of Sussex

Discussion paper on levels of resilience, 1 Billion Coalition for Resilience, IFRC, March 2015 Fenton. A, Tallontire. A, and Paavola.J Autonomous adaptation to riverine flooding in Satkhira District, Bangladesh: insights for transformation (October 2016), Sustainability Research Institute, School of Earth and Environment, University of Leeds.

H. C. Winsemius, L. P. H. Van Beek, B. Jongman, P. J. Ward and A. Bouwman (2013), A framework for global river flood risk assessments.

Heltberg, R. (2007) Helping South Asia Cope Better with Natural Disasters: The Role of Social Protection, Development Policy Review, 25 (6): 681-698

Hernandez, R., Ahmed, A. U., Akter, A., Hossain, N. Z., Choudhury, S., and Malek, M. (2016). An Evaluation of the Program on Enhancing Resilience to Natural Disasters and the Effects of Climate Change in Bangladesh

Huq, S and Rabbani, G (2011). Climate Change and Bangladesh: Policy and Institutional Development to reduce vulnerability. Journal of Bangladesh Studies. Volume 13, no, pp 1-10

Huq, S.M.S, Community-based Disaster Management Strategy in Bangladesh: present Status, Prospects and Challenges. European Journal of Research in Social Sciences, Vol. 4 No. 2 (2016)

Islam, M. N., (2012a). "Riverbank Erosion Induced Migration by the Char-dwellers in Bangladesh: Towards A Better Strategy" Asian Journal of Environment and Disaster Management, Singapore, Vol. 4 (3), pp. 243-268

Local Government and Disaster Risk Reduction, Good Practices and Lessons Learned, ISDR, ITC and United Nations (2010)

Majumdar, S. 2013, The Economics of Early Response and Resilience: Bangladesh Country Study

Martin-Breen, P. & Anderies, J. M. (2011). Resilience: a literature review. New York: Rockefeller Foundation

National Plan for Disaster Management (2016-2020), Building Resilience for Sustainable Human Development, Government of the People's Republic of Bangladesh, Ministry of Disaster Management and Relief (2017)

Participatory Approach for Safe Shelter Awareness, IFRC, April 2011

Pulla, Venkat Rao and Tulshi Das. 2015. Coping and resilience: Women headed households in Bangladesh floods. International Journal of Social Work and Human Services Practice Vol.3 (5): 169-175, December. Horizon Research Publishing

Road Map to Community Resilience, Operationalizing the Framework for Community Resilience, International Federation of Red Cross and Red Crescent Societies, 2016

Roberts, E., Andrei, S., Huq, S. & Flint, L. (2015). Resilience synergies in the post-2015 development agenda. Nature Climate Change 5 (December): 1024-1025

Sendai Framework for Disaster Risk Reduction 2015–2030, United Nations (2015) Strategy 2020, International Federation of Red Cross and Red Crescent Societies

The Impact of Climate Change on Livelihoods Case Studies from India, Bangladesh and Indonesia (September 2015), JustJobs Network, New Delhi and Washington, D.C

UNISDR, (2009), "Making Disaster Risk Reduction Gender-Sensitive: Policy and Practical Guideline", UNISDR, UNDP and IUCN. Geneva, Switzerland

Younus, Md Aboul Fazal. 2013. Community-based flood vulnerability and adaptation assessment: A case study from Bangladesh. Journal of Environmental Assessment Policy and Management.

Younus, Md Aboul Fazal. 2014. Flood vulnerability and adaptation to climate change in Bangladesh: A review. Journal of Environmental Assessment Policy and Management.

BDRC, 2019 BANGLADESH: Monsoon Flood 2019 Situation Report 2, Bangladesh Red Crescent Society, Dhaka, Bangladesh, 2019

BDRC, 2019 BANGLADESH: Monsoon Flood 2018 Situation Report 1, Bangladesh Red Crescent Society, Dhaka, Bangladesh, 2018

NIRAPOD, 2016 Flood Situation Analysis, NIRAPOD, Dhaka, Bangladesh, August 02, 2016

NIRAPOD, 2017 Flood Situation Analysis, NIRAPOD, Dhaka, Bangladesh, August 22, 2016

BRAC, 2015, FLOOD SITUATION REPORT Waterborne diseases hit the flood-affected areas, BRAC, Dhaka, Bangladesh, September 10, 2015

Tapsell SM. Follow-up study of the health effects of the Easter 1998 flooding in Banbury and Kadlington. Report to the Environment Agency. Enfield: Flood Hazard Research Centre; 2000.

Howard MJ, Brillman JC, Burkle FM Jr, 1996 Infectious disease emergencies in disasters. Emerg Med Clin North Am. 1996 May; 14(2):413-28.

Centers for Disease Control (CDC), 1989 Health assessment of the population affected by flood conditions--Khartoum, Sudan. MMWR Morb Mortal Wkly Rep. 1989 Jan 6; 37(51-52):785-8

Sharif Hossine Sajjad, Opola Akter Afroza (2017), The Socioeconomic Status of Rangpur District, International Journal of Social Science and Economic Research, 02 (02). https://www.academia.edu/42057290/THE_SOCIOECONOMIC_STATUS_OF_RANGPUR _DISTRICT

Dilshad,Tanzina., Mallick, Dwijen., Udas B, Pranita., Goodrich G. Chanda., Prakash, Anjal., Gorti, Ganesh., Bhadwal, Suruchi., Anwar Zubair Muhammad., Khandekar, Neha, Hassan Tanvir, S.M., Habib, Nusrat., Abbasi, Shakeel, Saqib., Syed, Md. Abu., Rahman, Atiq. (2019), Growing social vulnerability in the river basins: Evidence from the Hindu Kush Himalaya (HKH) Region, Environmental Development, 31, 19-33.

https://www.sciencedirect.com/science/article/pii/S2211464518302495?via%3Dihub

Kamal, Sabkat (2011). "Livelihood Dynamics and Disaster Vulnerabilities of Char Land Areas" MASTER OF URBAN AND REGIONAL PLANNING, Department of Urban and Regional Planning Bangladesh University of Engineering and Technology Dhaka.

http://lib.buet.ac.bd:8080/xmlui/bitstream/handle/123456789/4229/Full%20Thesis.pdf?seque nce=1&isAllowed=y

Ferdous, Ruknu., Wesselink, Anna., Brandimarte Luigia., Slager, Kymo., Zwarteveen, Margreet. & Baldassarre Di Giuliano., (2009) *Water*, 11, 1238; doi:10.3390/w11061238
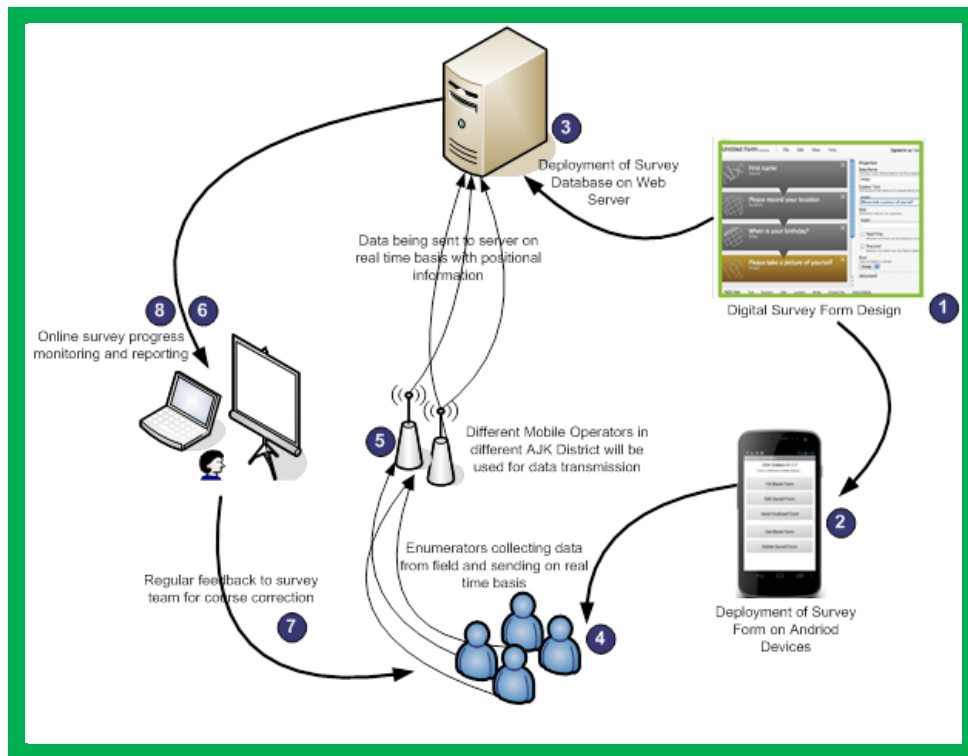
https://www.mdpi.com/2073-4441/11/6/1238

Figure-3.1: KoboToolbox Data Management Process

Data Processing and Analysis

Collected data processed and analyzed by the following ways:

1) **Automating the data downloads.** Included in this: a timer that will automatically pull new data submissions on a set schedule; a script to use ODK Briefcase to pull data so that encrypted submissions can be decrypted; a way of ensuring non-English alphabets are saved in UTF-8 format properly; saving all files in an acceptable format (.csv in my case) to a local or cloud (encrypted) server.

2) **Automating data cleaning and data associations.** Included in this: making sure labels are substituted for 1s, 2s, 3s, etc.; associating "repeat" data with their parent keys; translating data results into multiple languages (based on the ODK form); flagging duplicates.

3) **Automating data analysis.** Included in this: setting up standard indicators to be calculated based on the collected data (such as age categories if collecting age, or "time to complete questionnaire" based on start/end times).

4) **Automating data visualization (maybe this is combined with #3 above).** Included in this: loading clean data and visualizing indicators set up through data analysis; ideally, this visualization is via a URL that can be accessed by appropriate stakeholders through #5.

5) **Automating data dissemination.** Included in this: having a website that people can log into to view visualized data, ideally with user management capabilities to allow access to different dashboards by different stakeholders; or having a PDF report template set up that inserts new data automatically so that reports can be created automatically.