

Assessment of Non-economic Loss and Damages through Socio-economic tipping points in flash-flood prone areas: Insights from Sunamganj, Bangladesh

Submitted by

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Acknowledgments

From the beginning, I want to be grateful to God for his infinite grace and making all things and situations affable and favorable for me for the task undertaken. I owe a debt of gratitude to my wonderful parents and husband for their undefined love, affection, and invaluable guidance throughout my life.

I am highly grateful and thankful to Savio Rousseau Rozario, Programme Coordinator, Locally Led Adaptation (LLA), ICCCAD. I would also like to thank and extend my heartfelt appreciation to Rawnak Jahan Khan Ranon, Research officer, ICCCAD for their imperative guidance to conduct my research. Their mentorship and guidance have been crucial in the successful completion of this work.

I am sincerely thankful to Swapan Chanda, Program Manager, ESOLVE International Ltd, for his immense support in organizing all field activities, ensuring smooth data collection and research execution.

Additionally, I would like to thank Md. Rakibul Alam (Upazila Agriculture Officer, Sunamganj Sadar, Sunamganj) for generously sparing his valuable time to participate as a Key Informant Interviewee. His insights and expertise on agricultural patterns greatly enriched my understanding and contributed significantly to this research.

Furthermore, I want to be thankful to Okhil Bormon, and lovely Talukdar Former NGO Worker, who helped me a lot during my field data collection. Their support in organizing Focus Group Discussions (FGDs) and facilitating In-Depth Interviews (IDIs) with farmers was invaluable in ensuring the smooth execution of the research process.

Abstract

This study was carried out to examine the non-economic loss and damage (NELD) experienced by farmers in the flash flood-prone Haor region of Sunamganj, Bangladesh, where early flash floods, erratic rainfall, and financial stress severely impacted Boro rice cultivation, the primary livelihood source. Seasonal embankments offered temporary protection, but severe floods frequently breached them, leading to crop failure, financial hardship, and forced migration. Farmers relied on NGO loans to sustain their livelihoods, but loan-induced financial stress often trapped them in a cycle of debt, forcing many to mortgage or sell their land. This economic instability contributed to mental distress, weakened social cohesion, and disrupted cultural traditions, as many could no longer participate in community festivals like Boishakhi Mela, Shivbari Mela, and religious adherences. The study also found that climate change altered flood patterns, making farming more unpredictable and increasing the vulnerability of smallholder farmers. Limited access to training and reliance on traditional planting methods further exacerbated risks, leading to lower yields and higher flood damage. Additionally, blast disease remained a significant challenge, although the introduction of climate-resilient rice varieties such as BRRI-96, BRRI-88, BRRI-89, BRRI-92, BRRI-100, and Bina-25 will likely reduce crop losses in the future. Beyond agricultural challenges, inadequate education, poor healthcare, and deteriorating infrastructure made it even harder for communities to recover from repeated disasters.

To enhance climate resilience, the study recommended: (1) expanding farmer training programs on optimal planting and harvesting schedules, (2) strengthening earthen embankments and conducting regular river dredging to improve flood control, (3) promoting alternative livelihood opportunities to reduce dependence on Boro farming, (4) improving financial support systems to prevent debt dependency, and (5) investing in rural infrastructure and basic services such as education, healthcare, and transportation. Without effective adaptation strategies, Haor farmers remained highly vulnerable to extreme weather events, leading to continued economic losses, increased migration, and long-term socio-economic instability. If this trend continues or intensifies, they will approach the tipping point.

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Chapter 1: Introduction

1.1 Background and Rationale of the Study

Climate change is intensifying extreme weather events worldwide, causing severe effects and related loss and damage. Regions and people with significant development limits are particularly vulnerable to climate hazards (IPCC, 2023). Flash floods have become one of the most frequent climatic occurrences in Bangladesh, causing significant loss of life and widespread social and economic damage (CRED, 2020; Saha et al., 2024). The Haor wetlands in northeastern Bangladesh, particularly Sunamganj, are highly vulnerable to climatic threats, especially early flash floods, which frequently destroy agricultural livelihoods (BBS, 2021; Dey, Parvez, & Islam, 2021). These floods can destroy up to 80% or even total rice crop loss (BWDB, 2018; Rahman et al., 2018). The 2017 flash flood resulted in the loss of 0.88 million metric tons of Boro rice in the Haor region (Kamruzzaman et al., 2022). Rice production is a major source of rural employment in Bangladesh, supporting nearly half of the agricultural workforce (Bairagi et al., 2021; Rahman et al., 2021). In 2022, Bangladesh faced an unprecedented flood that began in the Sylhet and Sunamganj districts before spreading to nearby areas. It marked the worst flood in the region's 120-year history, breaking nearly all prior records (Paul & Hussain, 2022). The Haor region produces 18% of Country's Boro rice and 17% of its total rice production (MoDMR, 2023). Boro crops are crucial to the existence of the farmers in Sunamganj, and they frequently take loans for cultivation (Bhuiyan, Paul, & Abdussabur, 2024). Changes in precipitation patterns can lead to crop failures (Nimma et al., 2025). Smallholder and marginal farmers in the Haor wetlands are highly susceptible to crop loss and have low adaptive capacity (Pörtner et al., 2022). Additionally, their access to alternative production methods is limited (Fahad & Wang, 2018). Sunamganj, a Haor-dominated district in Sylhet near India's Meghalaya border, experiences flash floods during the rainy season and droughts in the summer (Bhuiyan, Paul, & Abdussabur, 2024). Financially measurable losses and damages are classified as 'economic,' while those that are challenging to quantify are considered 'non-economic,' encompassing eight main types proposed by the UNFCCC (2013): loss of life, health, human mobility, territory, cultural heritage, Indigenous knowledge, biodiversity, and ecosystem services (UNFCCC, 2013). The few assessments that

apparently address non-economic loss and damage are typically based on predetermined typologies resembling the recommendations of the UNFCCC (2013) (e.g. Andrei et al., 2014; Chiba et al., 2017; Hirsch et al., 2017; McNamara et al., 2021; van Schie et al., 2022). Climate change-induced migration may indicate the failure of local adaptation efforts. Communities will reach a critical point where migration becomes an essential part of their adaptation strategy (Bardsley & Hugo, 2010). According to the Internal Displacement Monitoring Centre report, floods in Bangladesh displace one million people annually, while 2,000 migrate to Dhaka daily, with 70% driven by climate-related disasters (Illius, 2023).

This paper aims to broaden perspectives on the intricate nature of loss and damage experiences and individuals' responses by utilizing a values-based approach (van Schie, Ranon, Mirza, & Anderson, 2022).

1.2 Objectives of the Study

- To quantify non-economic losses in the Haor Region due to pre-monsoon flash floods.
- To investigate whether the impact of non-economic loss and damage has approached a critical tipping point.
- To identify the barriers that hinder more effective adaptation initiatives aimed at enhancing resilience in climate-vulnerable Haor communities.

1.3 Scope and Limitations

The Scope of the study includes the impact of flash floods on Boro crops, which not only affecting farmers' livelihoods but also their socio-cultural aspect. However, previous studies may not have considered these impacts as part of loss and damage. This study aims to evaluate these overlooked effects and analyze how Boro crop losses lead to non-economic loss and damage for farmers' families. By doing so, this research will provide a deeper understanding of the social and cultural aspect.

The limitation of this study is that it only considers migration as a leading factor contributing to socio-economic tipping points due to time constraints and a limited sample size of 110 respondents. Since socio-economic tipping points are broad and complex, multiple factors

influence their occurrence, but this study focuses only on a specific aspect and could not cover all contributing factors. Furthermore, the study was conducted in only two unions, which may not be sufficient to represent the entire district.

Conceptual Framework

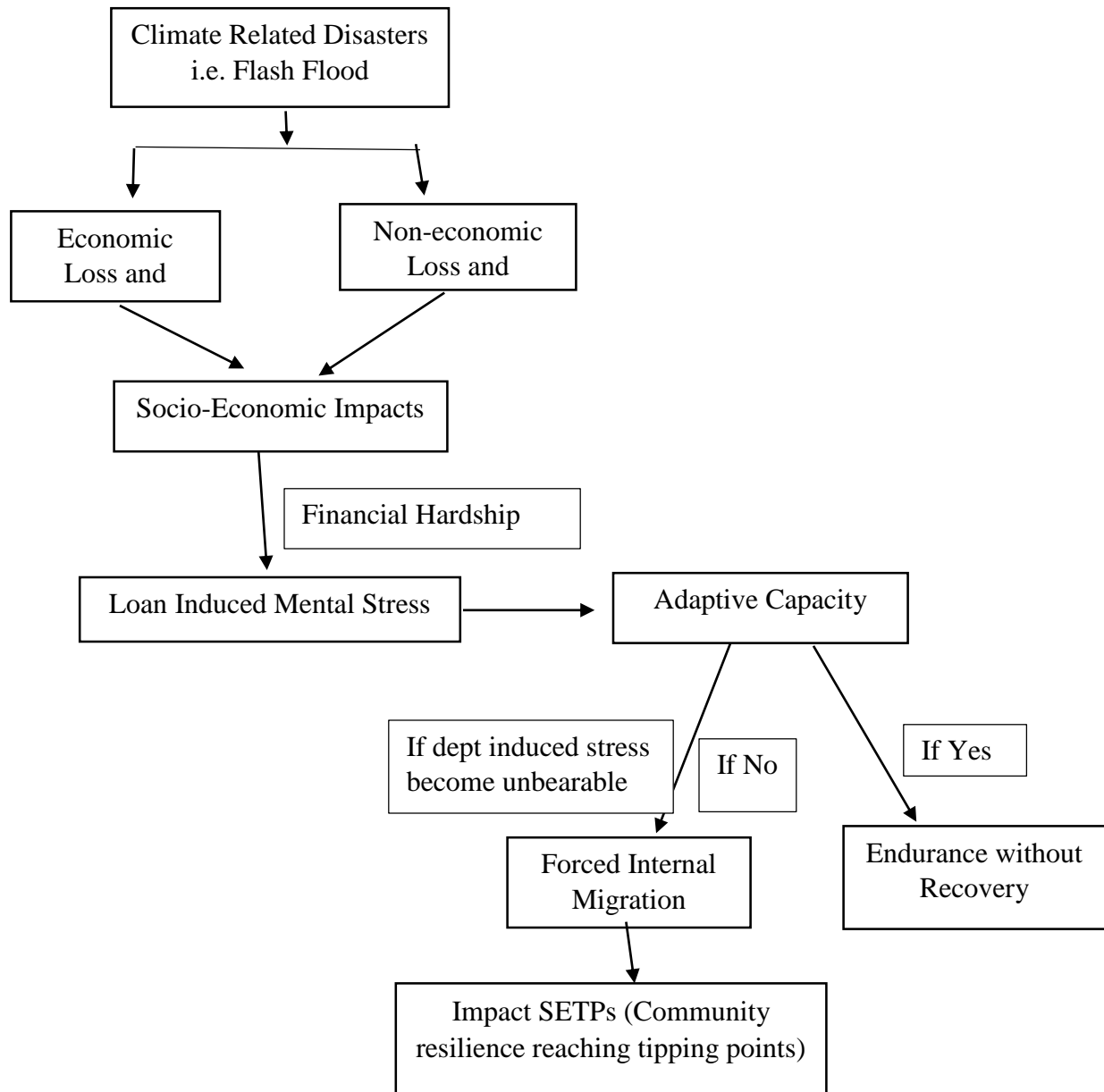


Figure 1: The Conceptual Framework Adopted in This Study

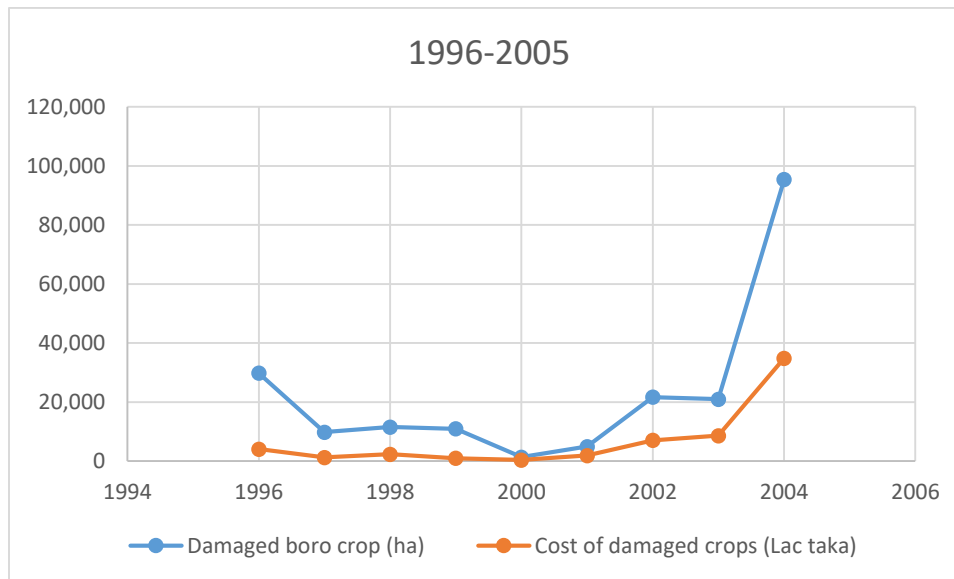
Chapter 2: Literature Review

2.1 Loss and Damage

Loss and Damage occurs when people experience climate change impacts despite adaptation efforts or when they lack the capacity to adapt, leading to unavoidable consequences (Warner & Van Der Geest, 2013, p. 369).

2.2 Economic Loss and Damage of Boro Crops

Kamruzzaman and Shaw (2018) analyzed agricultural practices and cropping patterns in the Haor Basin, identified Boro-Fallow-Fallow as the predominant pattern. The study also explored the nature and impact of floods on agriculture, highlighted that annual flash floods frequently caused significant damage to standing Boro rice crops shortly before harvest.



Source: (Center for Natural Resources Studies [CNRS], 2009)

Rahman et al. (2021) conducted an empirical analysis to determine the threshold level of flooding for rice production in Bangladesh. The study highlights that flooding up to 22% of the geographical area can be beneficial for rice cultivation. However, exceeding this threshold leads to significant reductions in crop land and production. The study used a threshold regression model to assess historical flooding data and its impact on rice yields.

Baishakhy et al. (2023) identified the lack of submergence-tolerant rice varieties, limited market access, and restricted input availability as the primary barriers to adapting rice farming to recurring flash floods in Bangladesh's Haor wetlands. The study found that 85% of

farmers face moderate to severe adaptation challenges, with socio-economic factors such as family income, extension media exposure, and climate change awareness playing a significant role in their ability to cope. The research underscores the importance of government support, improved extension services, and targeted adaptation strategies to enhance farmers' resilience against climate-induced flash floods.

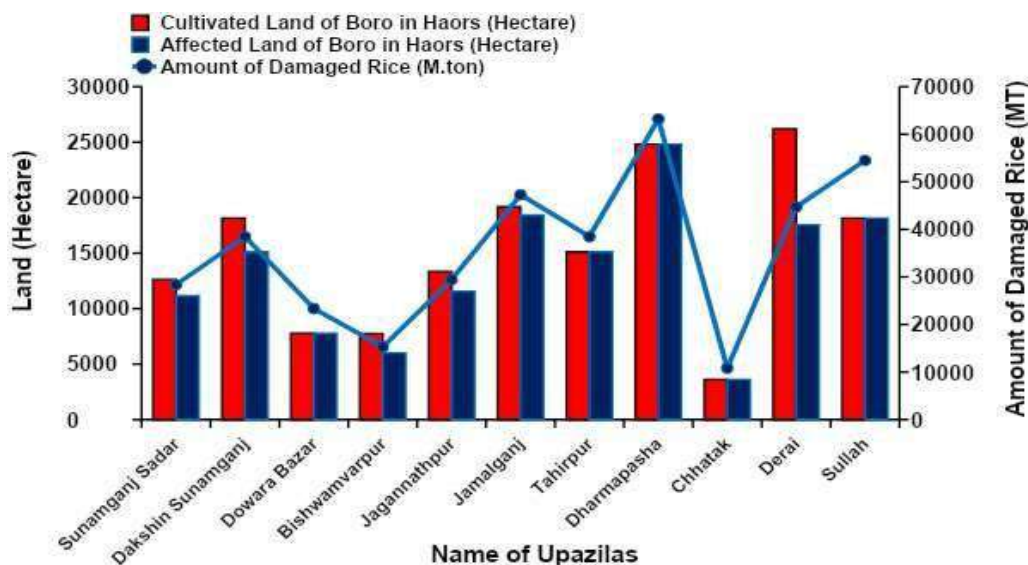
Bhuiyan, Paul, and Abdussabur (2024) examined the causes and impacts of recurrent flash floods in the Haor region of Sunamganj, Bangladesh, with a specific focus on the 2022 flash flood. The study identifies riverbed siltation, excessive upstream water flow, heavy rainfall, poor embankment infrastructure, and unplanned development as major causes of flash floods. The findings highlight the devastating socio-economic consequences, including loss of lives, destruction of property and infrastructure, displacement, and agricultural losses. The study also emphasizes the urgent need for comprehensive flood management strategies that include river dredging, sustainable embankment construction, early warning systems, and resilient agricultural practices. The study suggests stronger coordination between the government, NGOs, and local communities to mitigate future flood risks. Furthermore, it advocates for policy reforms that address corruption in Haor development projects and ensure better governance in flood management.

Table 1: Significant Floods in Bangladesh

Year	Inundated area	Number of affected people	Number of death	Amount of economic Losses
Flood of 1974	50%	More than 13.7 million	Around 1110	\$114,000,000
Flood of 1987	More than 57,000 square kilometer	-	2055	\$ 1.0 billion
Flood of 1988	61%	45 million	2300	\$ 1.2 billion
Flood of 1998	68%	31 million	1100	\$ 2.8 billion
Flood of 2000	24%	-	-	shrimp and rice productions etc.
Flood of 2004	38%	36 million	750	\$ 2.2 billion
Flood of 2017	-	No less than 8 million	145	-
Flood of 2020	20%	5.4 million	220	Over 170,000 hectors of agricultural land were affected

Source: ReliefWeb (2017); Hofer and Messerli (2006); Huq et al. (2015); USAID & icddr, b (n.d.)

Mondal et al. (2021) examine the impact of the 2017 early flash flood on agriculture in the Haor areas of Sunamganj, Bangladesh, focusing on Boro rice and fish production losses. The study reports that 149,224 hectares of Boro rice fields were affected, leading to a loss of 393,855 metric tons of rice, which severely impacted 315,084 farmers. Additionally, the flood damaged 49.75 metric tons of fish, resulting in economic losses of 158.70 lakh BDT, affecting 44,445 fishermen.



[Source: Khan et al., 2012]

Figure: Cultivated and affected land of Boro rice and amount of damaged rice among different Haors.

Among the eleven upazilas studied, Dharmapasha (24,800 ha), Jamalganj (18,414 ha), Sullah (18,160 ha), Derai (17,550 ha), Dakshin Sunamganj (15,100 ha), and Tahirpur (15,100 ha) suffered the greatest losses. The total damaged rice yield was 393,855 metric tons (MT), with Dharmapasha (63,189 MT), Sullah (54,480 MT), Jamalganj (47,271 MT), and Derai (44,712 MT) experiencing the heaviest losses. However, Derai upazila was partially spared due to higher elevated lands that floodwaters could not reach. Overall, 149,224 hectares of Boro rice fields were damaged in the Haor region (Khan et al., 2012).

2.3 Non-Economic Loss and Damage

Tschakert et al. (2017) conducted a study that critiqued traditional risk assessments for failing to capture intangible losses, such as identity and social connections, which were crucial to people's lives. The study emphasized that loss was emotional and relational, shaped by attachments to places, and advocated for a value- and place-based approach to decision-making,

which can better assess slow, incremental climate impacts while respecting people's visions for the future. A value-driven, actor-centered research agenda focused on people's perceptions, emotions, and actions was considered essential for effectively addressing these losses in climate adaptation strategies.

Van Schie et al. (2023) conducted a study that explores the concept of assessing and addressing climate-related losses and damages through a values-based approach in Durgapur Upazilla, Bangladesh. The research emphasizes the importance of understanding local values such as family, health, nature, and culture in assessing non-economic losses and damages. The study used qualitative and participatory methods, including interviews and group discussions, to identify 10 core local values and understand how climate change impacts these values.

Van Schie et al. (2022) conducted a study in Burigoalini and Gabura Unions, Bangladesh, to explore local responses to climate-related non-economic losses. The study found that climate hazards like salinity intrusion, flooding, and cyclones severely impact livelihoods, health, and culture. The research highlighted gender inequalities, with women facing more challenges and having less capacity to adapt. The study also found that local responses, including migration and disaster preparedness, are insufficient due to limited resources and poor access to services.

2.4 Poverty Traps:

Azariadis and Stachurski (2004) conducted a comprehensive study on poverty traps and explained why some countries stay poor for a long time. They argue that market failures, institutional weaknesses, financial constraints, poor education, and small businesses stop poor countries from achieving Sustainable growth. Some countries remain poor, while others develop because they have better systems. Their research highlights that good governance, financial support, education, and industrialization can help countries in overcoming these traps, emphasizing that poor countries often fail to adopt modern technologies due to coordination failures and insufficient investment. Using empirical evidence, they demonstrate how global income distribution is becoming increasingly bimodal, with rich nations continuing to grow while others stagnate. The study suggests targeted government policies, financial inclusion (giving low-interest loans to poor people), and support businesses, improve education, and institutional reforms as key solutions to breaking the cycle of poverty and achieving long-term economic development.

2.5 Socio-Economic Tipping Points (SETPs)

The concept of socio-economic tipping points (SETPs) is defined as a critical point where a socio-economic system undergoes rapid, abrupt change, transitioning from one stable state to another, fundamentally different state. This transition may result from climate hazards or other stressors, often due to insufficient human response or intervention (Van Ginkel et al., 2020). SETPs are

categorized into impact tipping points, where the shift occurs autonomously due to system dynamics, such as migration triggered by slow-onset climate hazards (Kabir et al., 2018), and response tipping points, driven by proactive human action (Van Ginkel et al., 2020; Maier et al., 2020). SETPs often occur when communities can no longer adapt to challenges (Thomas et al., 2021).

Transformative mitigation, or social tipping, means a quick and widespread change in people's behaviors, beliefs, knowledge, technology, and social norms that leads to a major shift in society (Otto et al., 2019; Winkelmann et al., 2022).

Chapter 3: Methodology

3.1 Selection and Description of the Study Area

This study was conducted in two unions of Tahirpur Upazila: North Sreepur Union and South Sreepur Union. Four villages were selected for the research: Indrapur village from North Sreepur Union, and Bhavanipur, Janjail, and Santoshpur villages from South Sreepur Union. Sunamganj, located in northeastern Bangladesh, is a region renowned for its natural beauty and abundant water resources. It is home to 133 Haors, covering approximately 268,531 hectares (Kamruzzaman & Shaw, 2018). The region is bounded to the north by Meghalaya, a neighboring territory of India, to the south by the districts of Habiganj and Kishoreganj, to the east by Sylhet district, and to the west by Netrokona district (Bhuiyan, Paul, & Abdussabur, 2024). This study employed Purposive sampling and Snowball sampling to select participants and meet the research requirements. 110 respondents were selected as desired sample size. To capture a range of perspectives on the causes, consequences, and dynamics of flash floods, a diverse group of respondents was included in the study. The majority of participants were Boro farmers to meet the study's specific requirements. The final sample comprised 103 Boro farmers, 2 local government representatives, 3 NGO workers, 1 local boatman, and 1 primary school teacher.

This study employed values-based loss and damage methodology, utilizing qualitative and participatory social science methods to explore local narratives and contexts and to understand how values influence impacts (O'Brien & Wolf, 2010; McShane, 2017; Vaioleti, 2016). The research was structured into three sections: the first section focused on socio-economic information. The second section examined participants' experiences with flash flood impacts and the response measures implemented at the household level, with discussions on the effectiveness of preventative, coping, and adaptation strategies. The final section explored how flash floods impacted participants' values, identifying which values were most, somewhat, and least affected, followed by discussions on strategies to protect these values. Interviews were recorded and transcribed into Word documents, with quantitative data analyzed using SPSS (v23) and qualitative data subjected to content analysis using Atlas.ai tool to identify key themes.

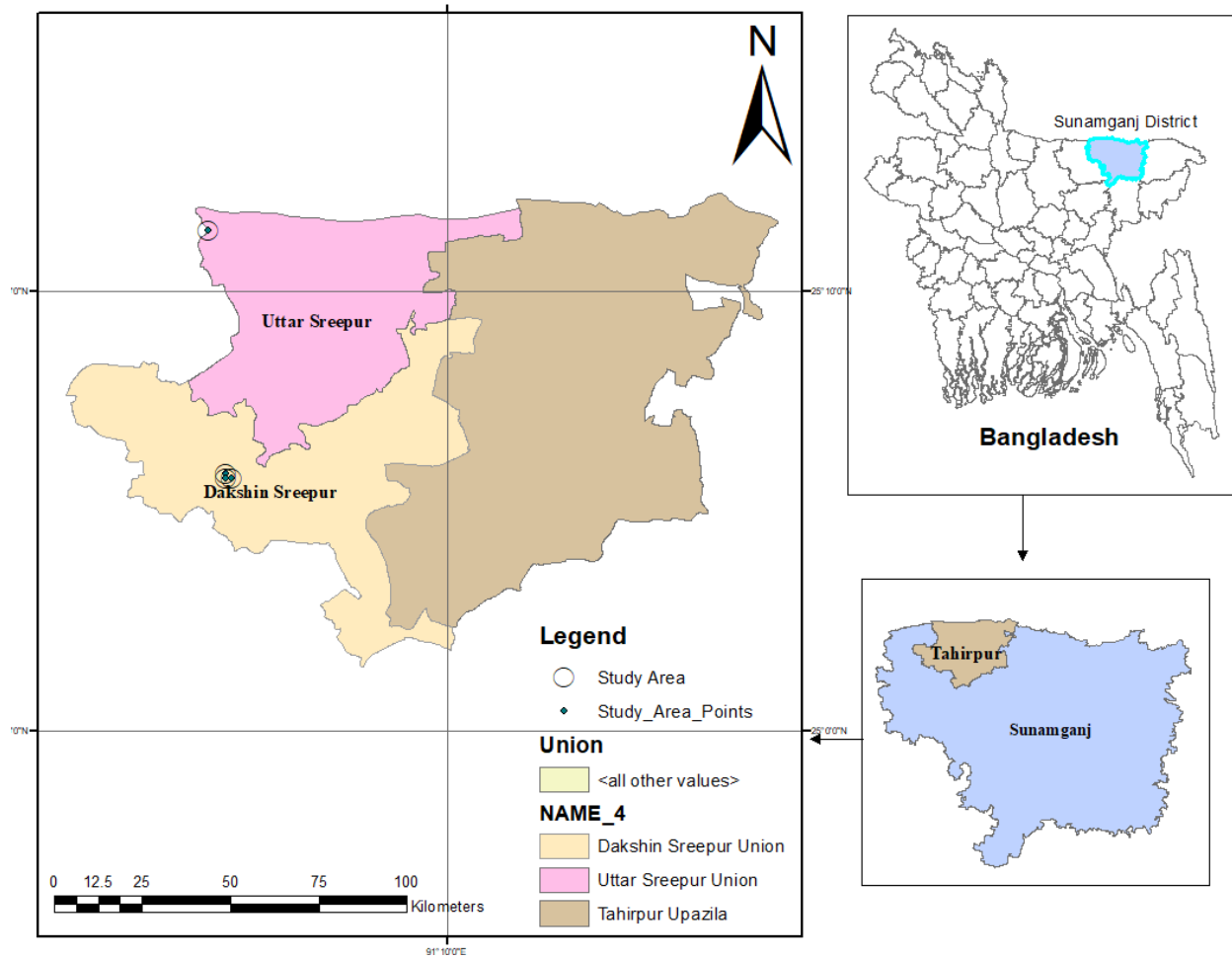


Figure: Study Area Map of the Assessed Unions in Tahirpur Upazila, Bangladesh

Chapter-4: Results and Discussion

4.1 Socio-Economic Characteristic of the Respondents

4.1.1 Age Groups

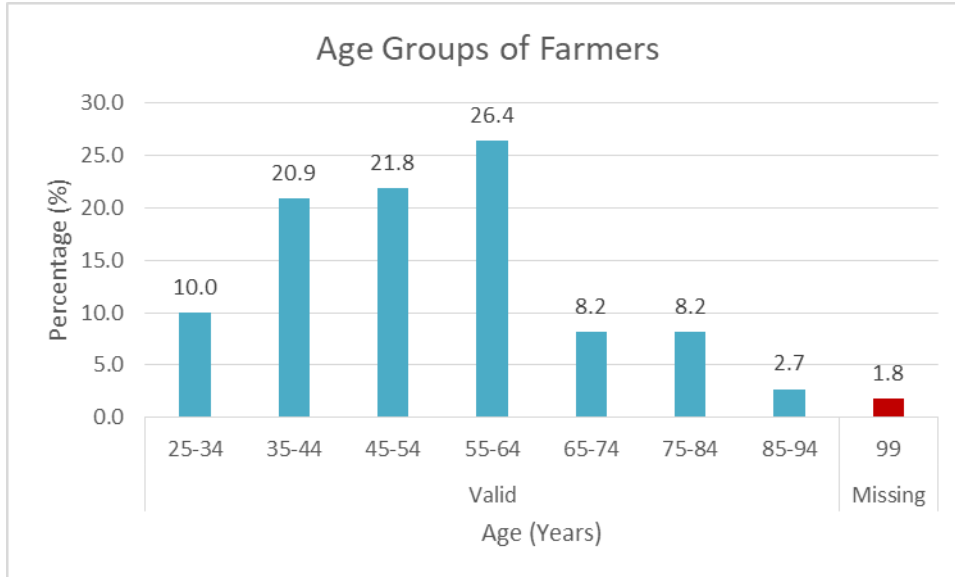


Figure: Age of the Respondents

The graph indicates that the largest proportion of farmers are aged 55-64 (26.4%), followed by 45-54 (21.8%) and 35-44 (20.9%), while younger farmers (25-34) make up only 10%. Participation decreases further in older age groups, with minimal representation in the 85-94 range (2.7%), and 1.8% of data is missing.

4.1.2. Boro Farming



The graph shows that 100% of respondents identified Boro farming as their main occupation.

4.1.3. Gender

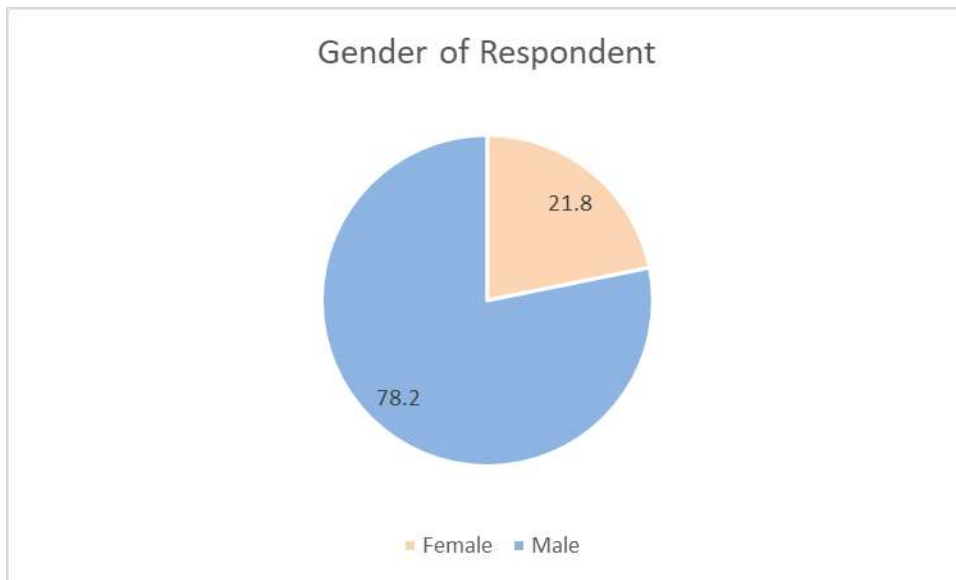


Figure: Gender of Respondent

This chart shows that 78.2% of respondents are male, while 21.8% are female.

4.1.4. Marital Status

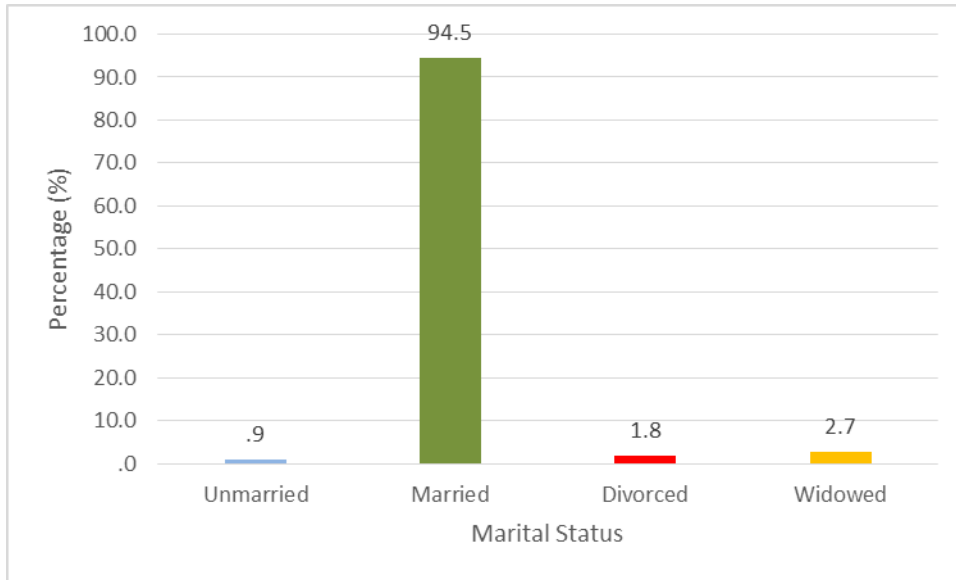


Figure: Marital Status of the Respondents

This graph shows that 94.5% of respondents are married, while 2.7% are widowed, 1.8% are divorced, and only 0.9% are unmarried.

4.1.5 Educational Background

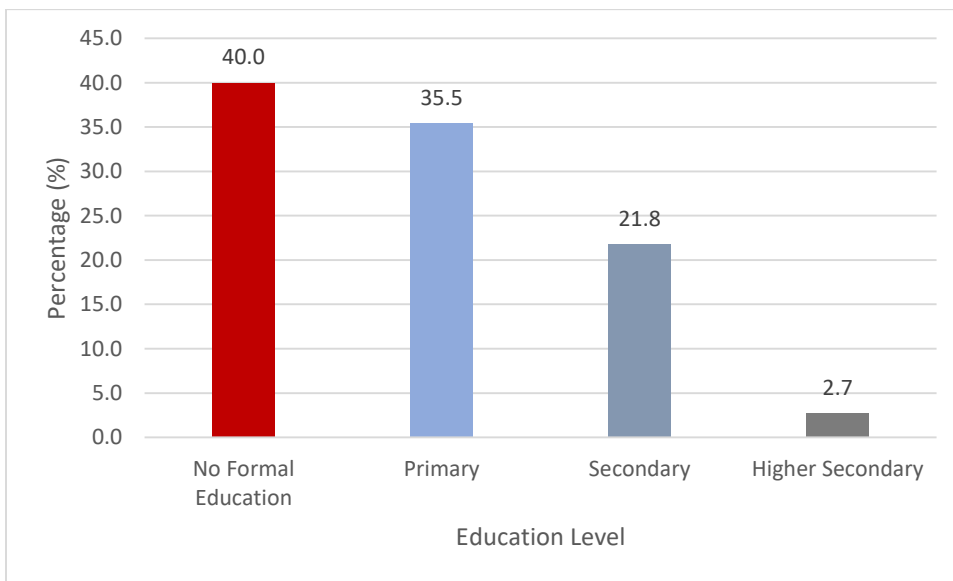


Figure: Educational Background of the respondents

The graph represents that 40% of respondents have no formal education, while 35.5% completed primary education, and 21.8% reached the secondary level. Only 2.7% of respondents attained higher secondary education, indicating a low overall level of educational attainment.

4.1.6 Additional Income Sources beyond Boro Farming

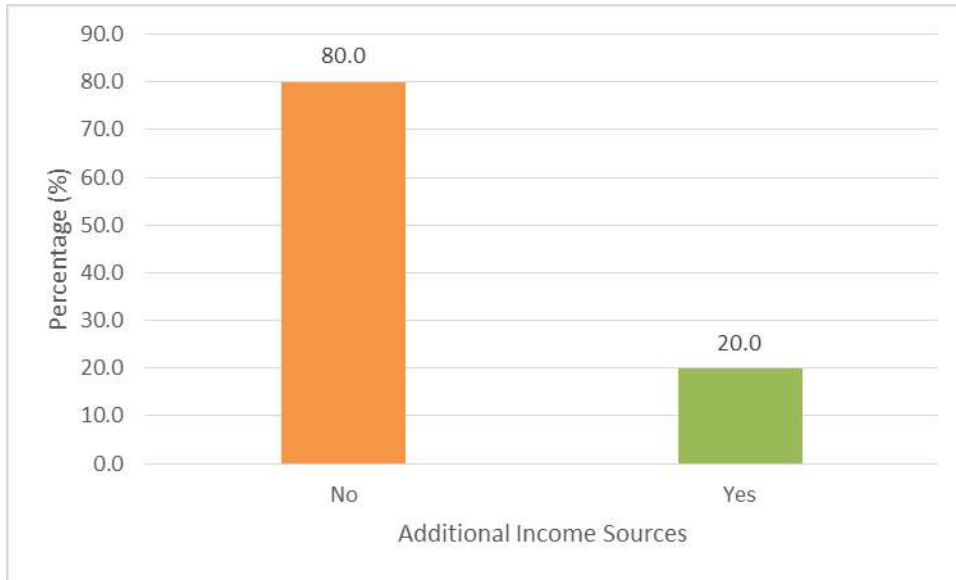


Figure: Additional Income Sources beyond Boro Farming

This graph shows that 80% of respondents do not have additional income sources, while only 20% reported having other sources of income. This highlights a significant reliance on primary income source (Boro crop farming) among the respondents.

4.1.7 Non-Boro Season Income Source

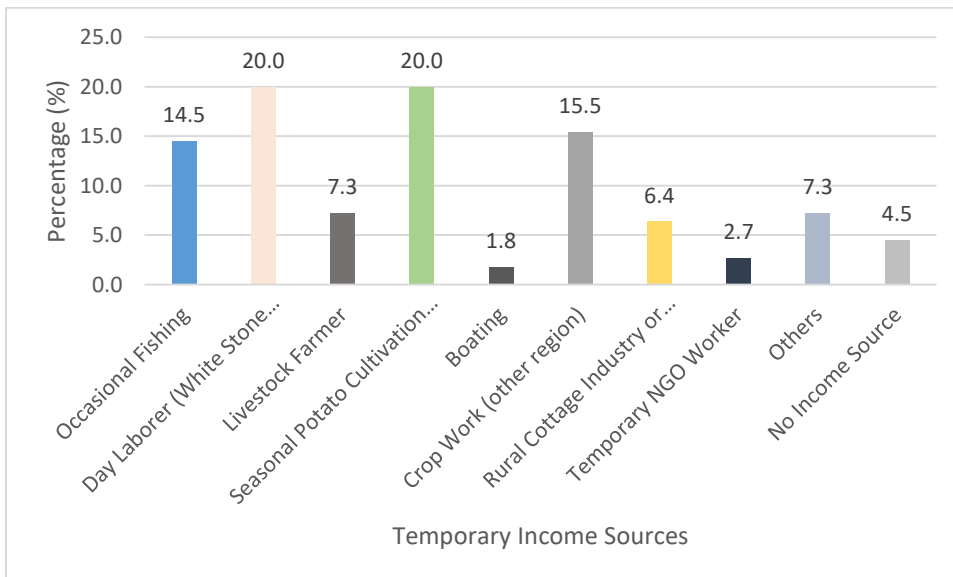


Figure: Non-Boro Season Income Source

The graph represents that Day Laborer (White Stone Collection) and Seasonal Potato Cultivation are the most common temporary income sources, each accounting for 20%. Other notable sources

include Crop Work (15.5%), Occasional Fishing (14.5%), and Livestock Farming (7.3%), while 4.5% of respondents reported having no income source.

4.1.8 Normal Annual Income from Boro Cultivation

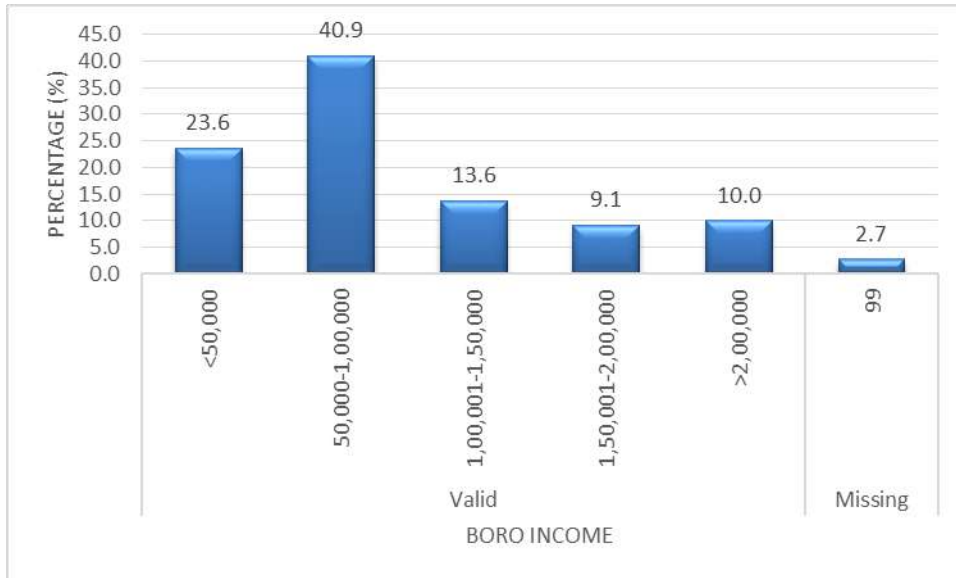


Figure: Normal Annual Income from Boro Cultivation

This graph shows that the majority of respondents (40.9%) earn between 50,000–1, 00, 000 from Boro farming, followed by 23.6% earning less than 50,000. Smaller proportions earn between 1,00,001–1,50,000 (13.6%), 1,50,001–2,00,000 (9.1%), and more than 2,00,000 (10%), while 2.7% of data is missing.

4.1.9 Expenditure on Boro Rice Cultivation

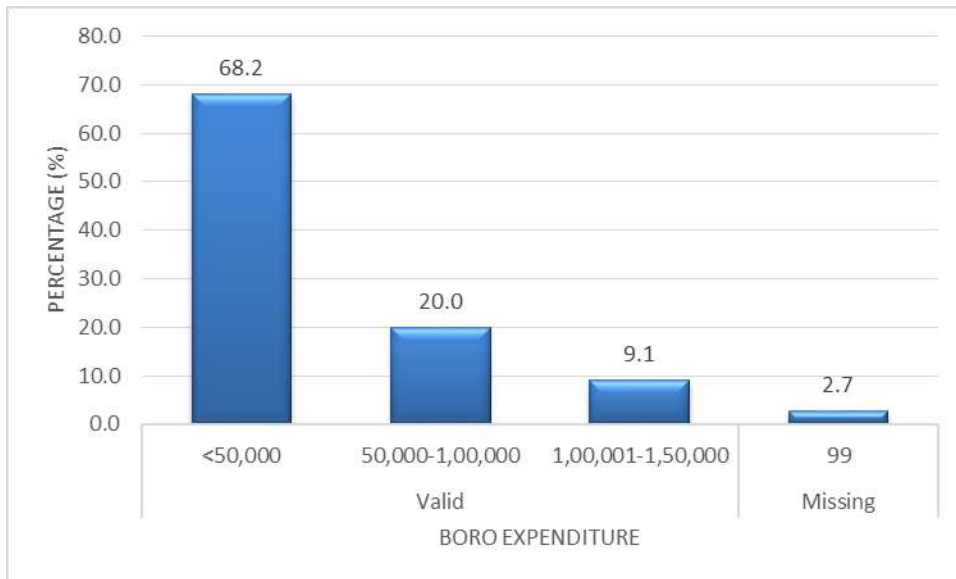


Figure: Expenditure on Boro Rice Cultivation

The chart shows that 68.2% of respondents reported Boro expenditures of less than 50,000, followed by 20% spending between 50,000–1, 00, 000. A smaller proportion (9.1%) reported expenditures between 1,00,001–1,50,000, while 2.7% of the data is missing.

4.1.10 Monthly Income of the Respondents



Figure: Monthly Income of the Respondents

The chart shows that the majority of respondents (33.6%) earn a monthly income between 1,000–5,000, followed by 26.4% earning 6,000–10,000. Smaller proportions include 15.5% earning 11,000–15,000, 11.8% earning 16,000–20,000, and only 2.7% and 0.9% earning between 21,000–25,000 and above 25,000, respectively. Additionally, 7.3% earn less than 1,000, while 1.8% of data is missing.

4.1.11 Monthly Expenditure of the Respondents

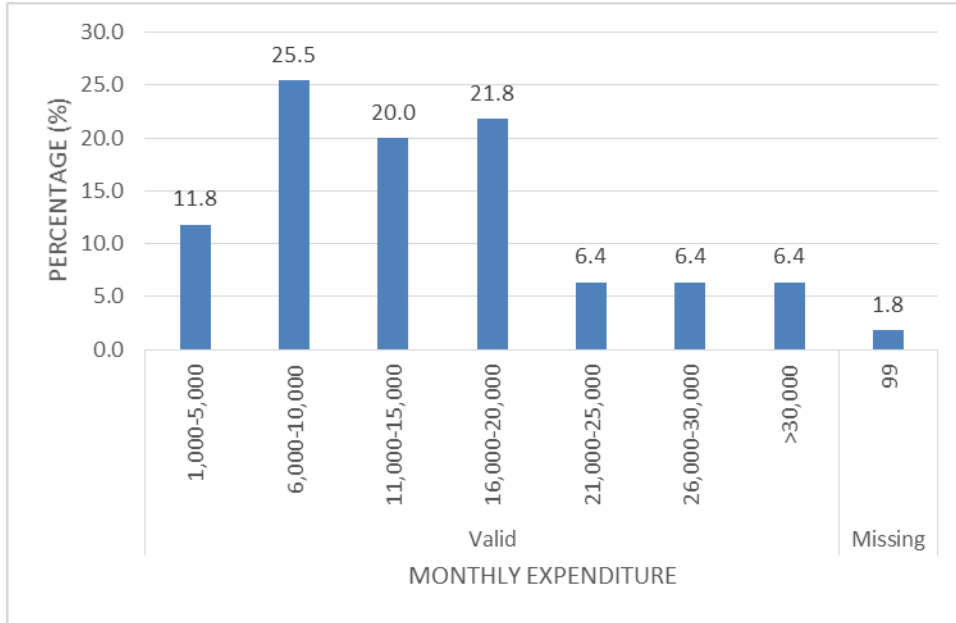


Figure: Monthly Expenditure of the Respondents

The chart shows that the largest proportion of respondents (25.5%) have a monthly expenditure between 6,000–10,000, followed by 21.8% spending 16,000–20,000 and 20.0% spending 11,000–15,000. Smaller groups reported expenditures of 1,000–5,000 (11.8%) and 6.4% each for the ranges 21,000–25,000, 26,000–30,000, and over 30,000, while 1.8% of data is missing.

4.1.12 Satisfaction Level: Educational Opportunities

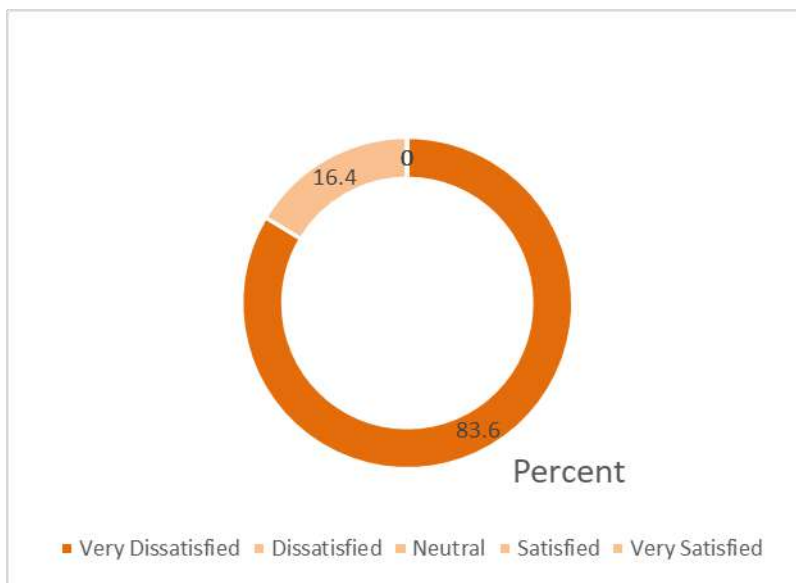


Figure: Satisfaction Level: Educational Opportunities

The chart shows that 83.6% of respondents are very dissatisfied, while 16.4% are dissatisfied, with no respondents reporting neutral, satisfied, or very satisfied opinions.

4.1.13 Factors behind Educational Deprivation

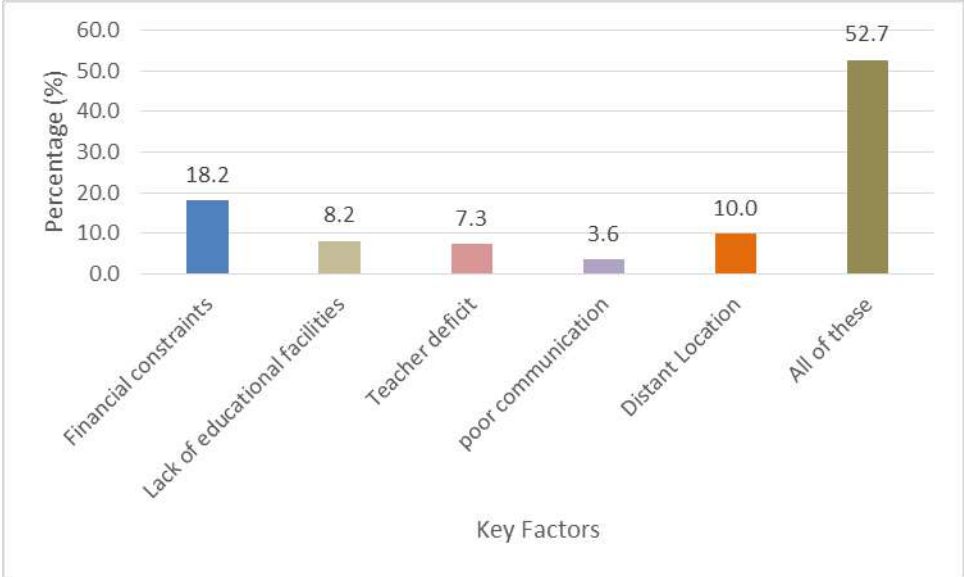


Figure: Factors behind Educational Deprivation

The chart shows that 52.7% of respondents identified "All of these" as key factors affecting their situation, followed by 18.2% citing financial constraints. Other factors include 10% for distant location, 8.2% for lack of educational facilities, 7.3% for teacher deficit, and 3.6% for poor communication.

4.1.14 Key Factor for Boro Loss

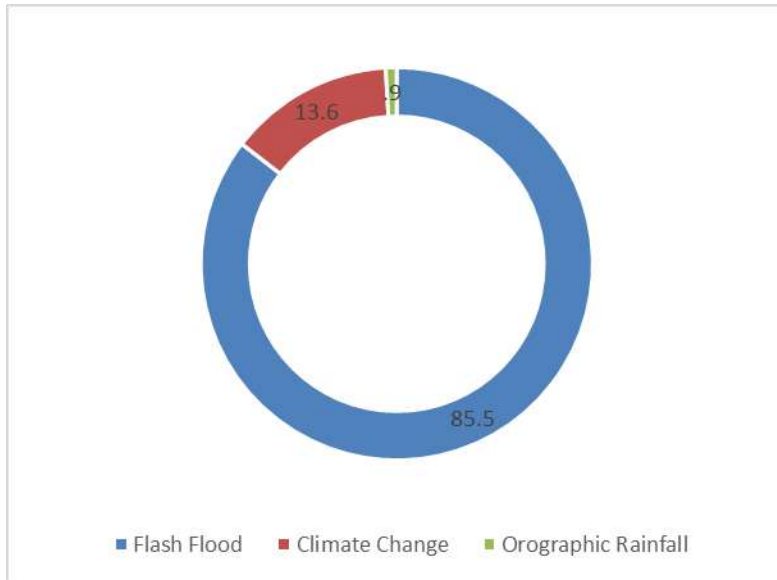


Figure:

The chart shows that 85.5% of respondents identified flash floods as the primary factor, while 13.6% attributed it to climate change, and only 0.9% mentioned orographic rainfall.

4.1.14 Effects of Climate Change

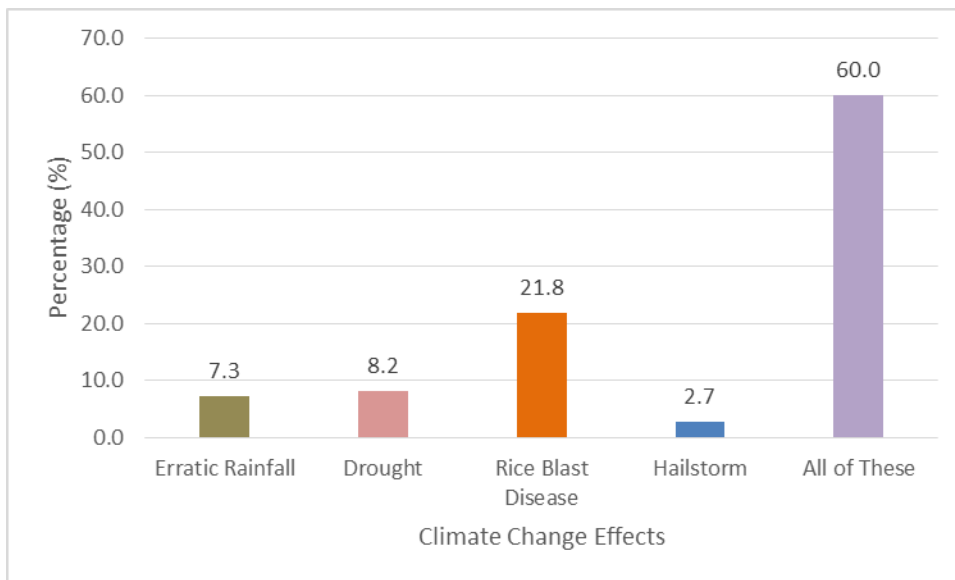


Figure: Effects of Climate Change

The chart shows that 60.0% of respondents identified "All of These" as the effects of climate change, while 21.8% cited Rice Blast Disease. Smaller proportions mentioned Drought (8.2%), Erratic Rainfall (7.3%), and Hailstorm (2.7%).

4.1.15 Major Disaster in Locality (According to Local Inhabitants)

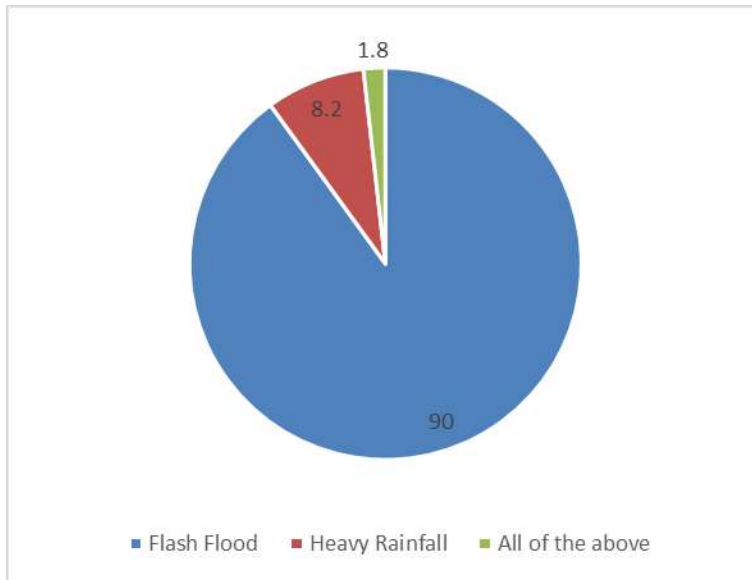


Figure: Major Disaster in Locality

The chart shows that 90% of respondents identified Flash Flood as the primary issue, while 8.2% cited Heavy Rainfall and only 1.8% mentioned all of the above.

4.1.16 Significance of Impact

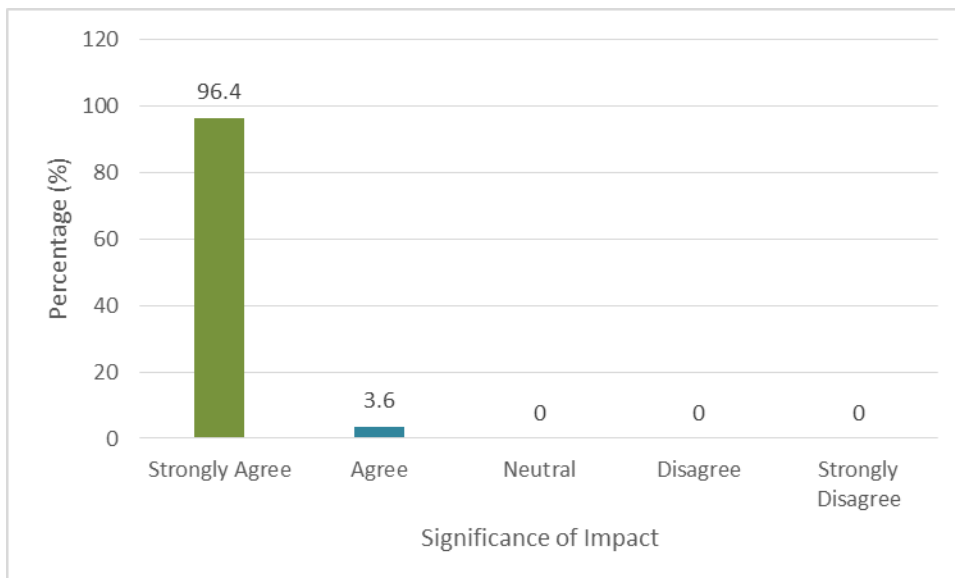


Figure: Impact of Development and Education on Economic and Non-Economic Distress

The chart shows that 96.4% of respondents strongly agree on the significance of the impact, while 3.6% agree. No respondents selected neutral, disagree, or strongly disagree.

4.1.17 Driving Factors of Continuing Boro Cultivation

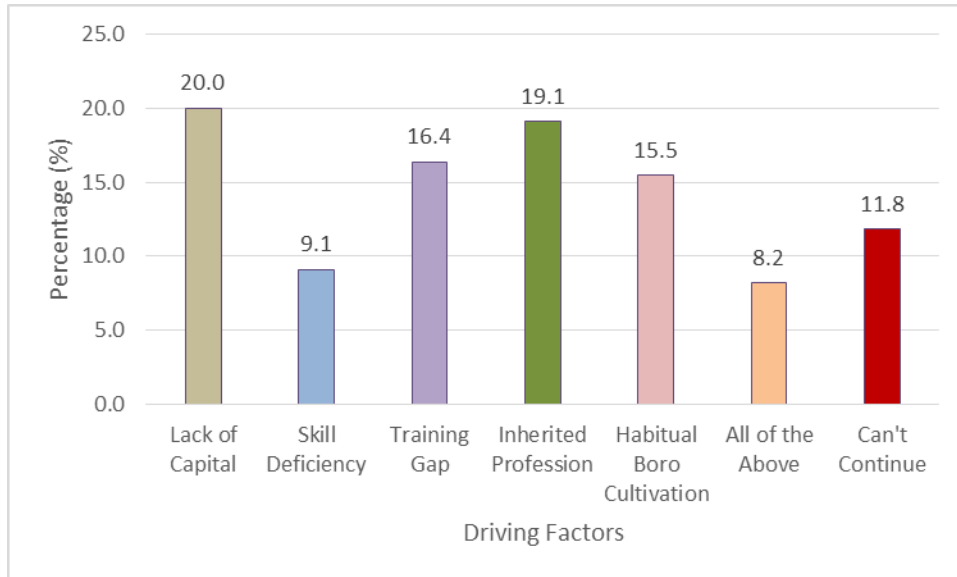


Figure: Reason for Continuing Boro Cultivation

The chart represents that 20.0% of respondents identified Lack of Capital as the primary driving factor, followed closely by Inherited Profession (19.1%) and Training Gap (16.4%). Other factors include Habitual Boro Cultivation (15.5%), Can't Continue (11.8%), Skill Deficiency (9.1%), and All of the above (8.2%).

4.1.18 Impact on Cultural Practices

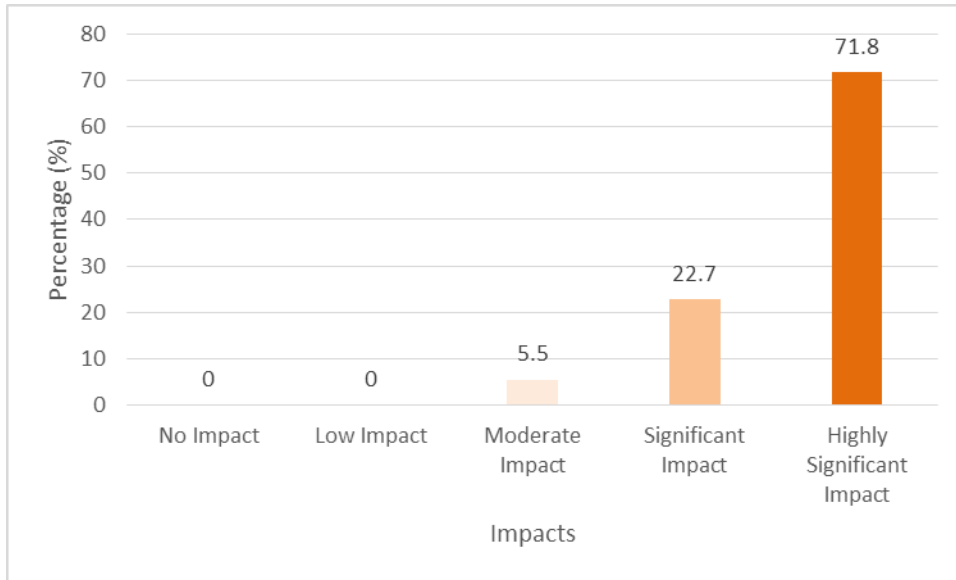


Figure: Boro Loss Impact on Cultural Practices

4.1.19 Loss of Intergenerational Knowledge:

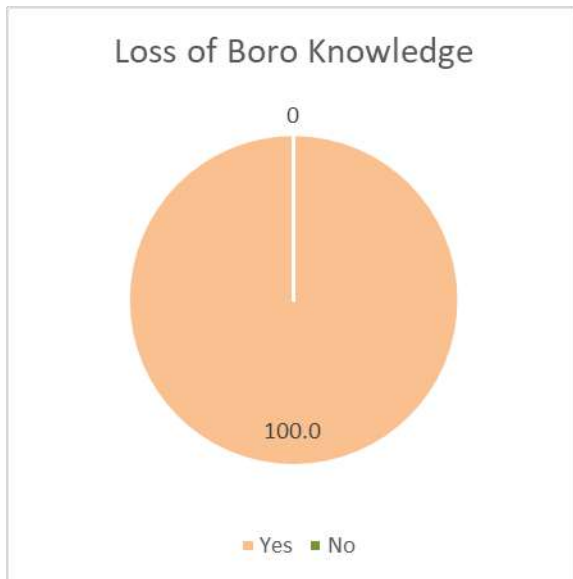


Figure: Loss of Intergenerational Knowledge in Boro Cultivation

The chart shows that 100% of respondents reported a loss of Boro knowledge, with no respondents indicating otherwise.

"In the previous generation, farmers used to grow only Boro rice. They plowed the fields using bulls and wooden plows and manually created field boundaries. If they could just prepare the seedbed properly, the crops would grow well. Back then, fertilizers and pesticides were not needed, as the seeds were prepared at home. The traditional rice varieties had natural disease

resistance. But now, foreign hybrid rice varieties have been introduced. These require fertilizers, vitamins, and pesticides. Additionally, Blast disease affects the crops, causing the rice plants to turn white and die” (Participant# 9, Bhabanipur village in South Sreepur Union)

4.1.20 NGO Loan:

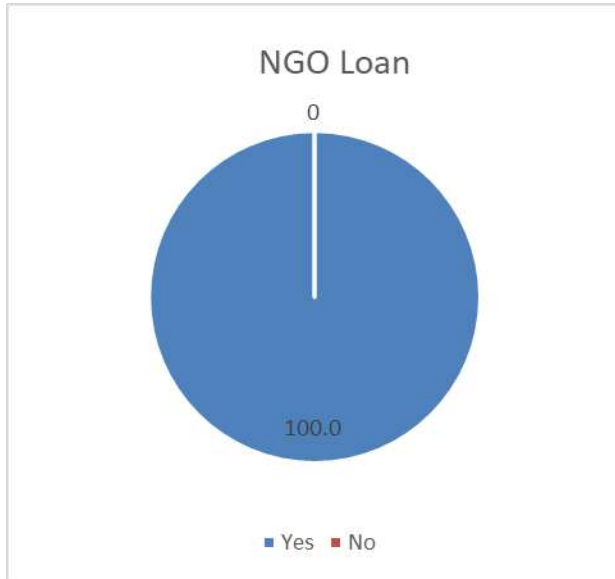


Figure: NGO Loan for Financial Crisis Assistance

4.1.21 NGO Loan Amount

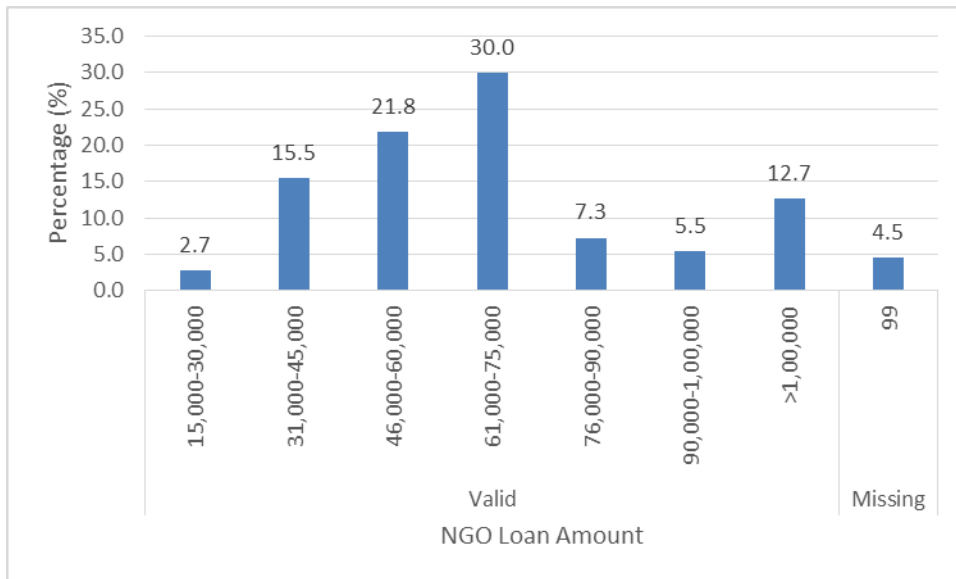


Figure: NGO Loan Amount

The chart shows that 30.0% of respondents received NGO loans in the range of 61,000–75,000, followed by 21.8% in the 46,000–60,000 range and 15.5% in the 31,000–45,000 range. Smaller proportions received loans of >1,00,000 (12.7%), 76,000–90,000 (7.3%), 90,000–1,00,000 (5.5%), and 15,000–30,000 (2.7%), while 4.5% of data is missing.

4.1.22 Repayment Options:

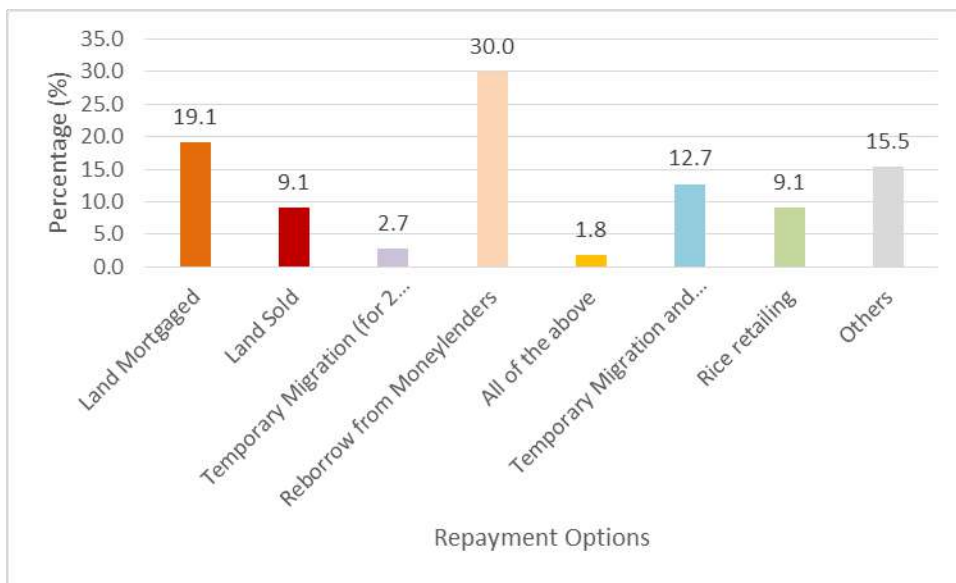


Figure: Repayment Actions for NGO Loan after Boro Loss

The chart shows that 30.0% of respondents selected all of the above as repayment options, while 19.1% mortgaged land, and 15.5% chose others. Smaller proportions include 12.7% opting for Temporary Migration and Rice Retailing, 9.1% selling land or engaging in Rice Retailing, 2.7% borrowing from moneylenders, and 1.8% using Temporary Migration (for 2 years).

4.1.23 Mental Stress Levels

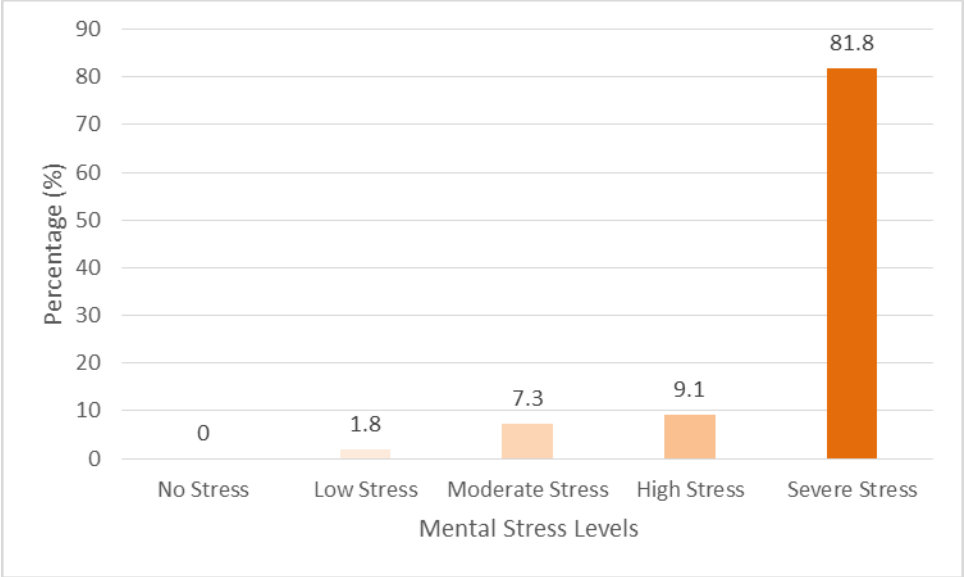


Figure: Loan-Induced Mental Stress Levels

The chart shows that 81.8% of respondents reported experiencing severe stress, while 9.1% indicated high stress and 7.3% reported moderate stress. Only 1.8% experienced low stress, and no respondents reported having no stress.

4.1.24 Community Migration:

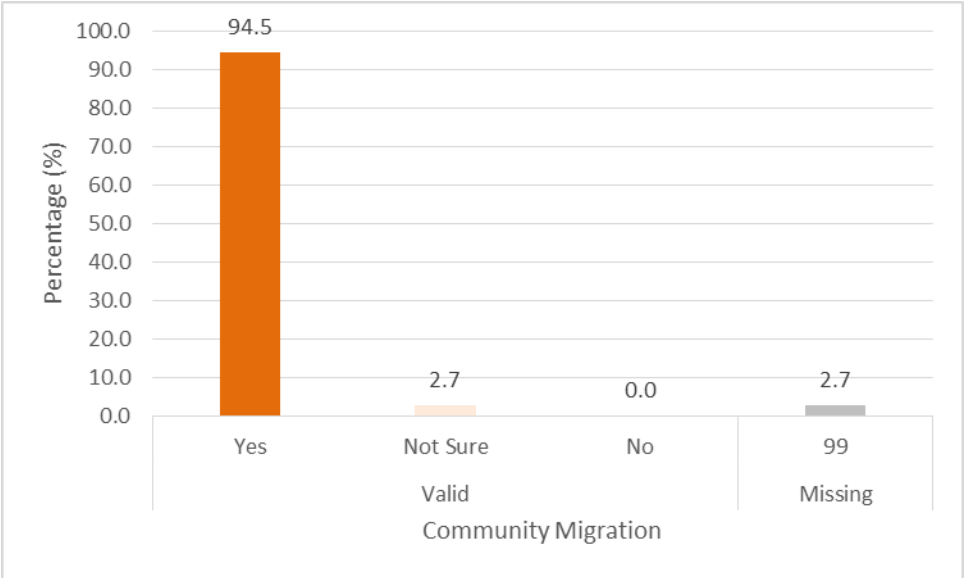


Figure: Loan-Induced permanent Internal Migration in the Community

The graph shows that the majority of respondents (94.5%) reported "Yes" to community migration, indicating a significant trend toward migration within their communities. A small proportion (2.7%) were "Not Sure" about community migration, while no respondents (0%) reported "No" to migration. Additionally, 2.7% of the data is missing. This highlights a strong prevalence of community migration, with minimal uncertainty and no outright disagreement.

4.1.25 Migration Status in Household:

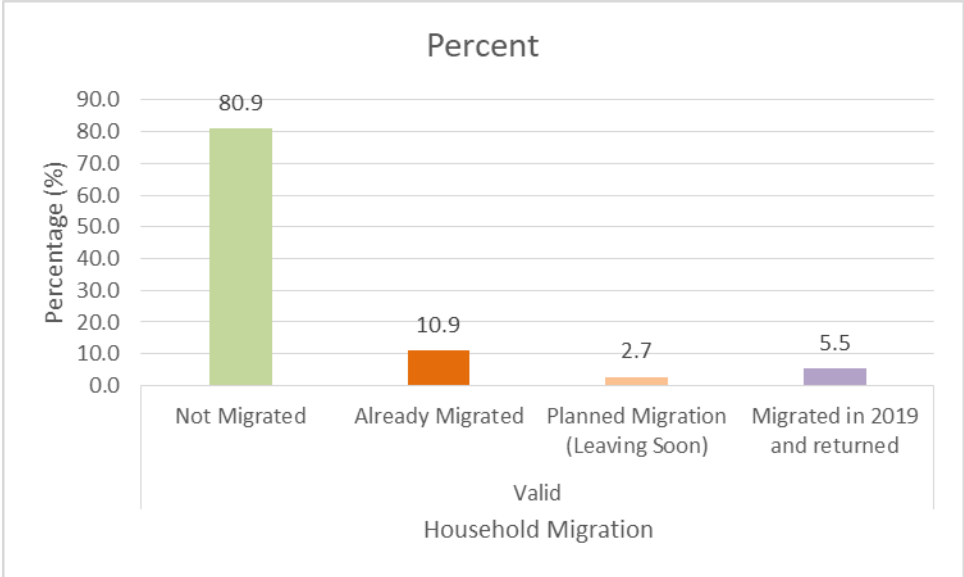


Figure: Loan-Induced Permanent Internal Migration in the Household

The graph shows that the majority of households (80.9%) reported "Not Migrated", indicating they have not relocated. A smaller percentage (10.9%) had already migrated, while 5.5% returned after migrating in 2019, and 2.7% reported planned migration (leaving soon). This highlights that migration is limited, with most households remaining in place.

4.1.25 Migration Timeline:

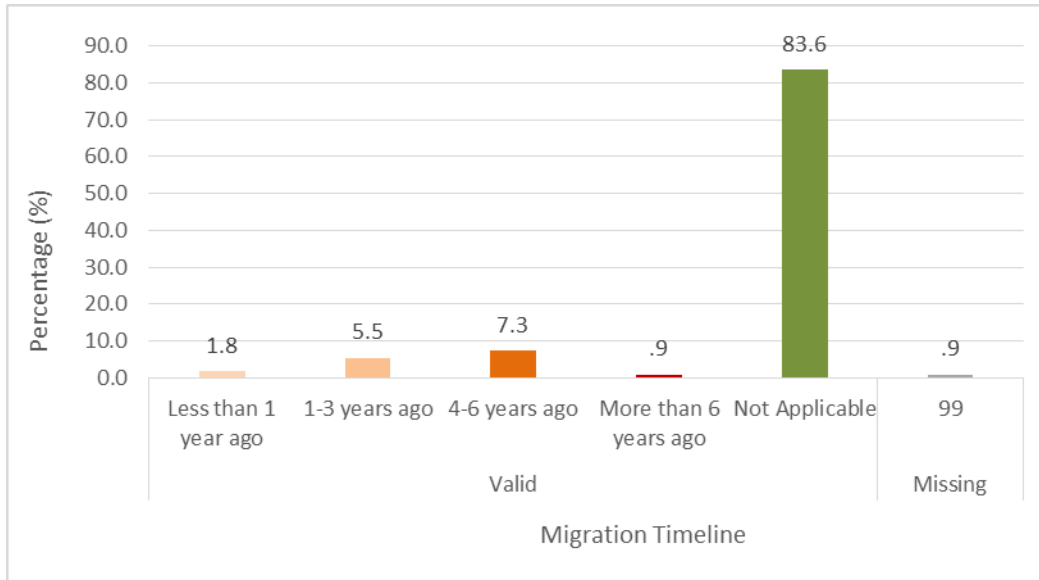


Figure: Years since Loan-Induced Migration

For those who migrated, the graph shows that 7.3% migrated 4–6 years ago, 5.5% migrated 1–3 years ago, and 1.8% migrated less than 1 year ago. A very small percentage (0.9%) reported migrating more than 6 years ago, while 83.6% indicated migration was not applicable, and 0.9% of the data is missing.

4.1.26 Family Structure:

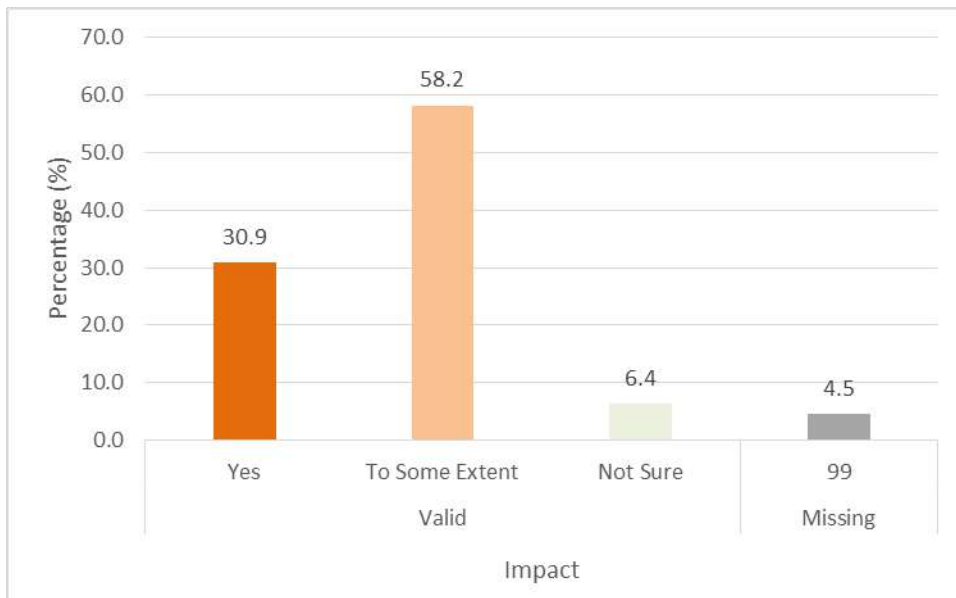


Figure: Impact of financial crisis on family structure

4.1.27 Social Cohesion:

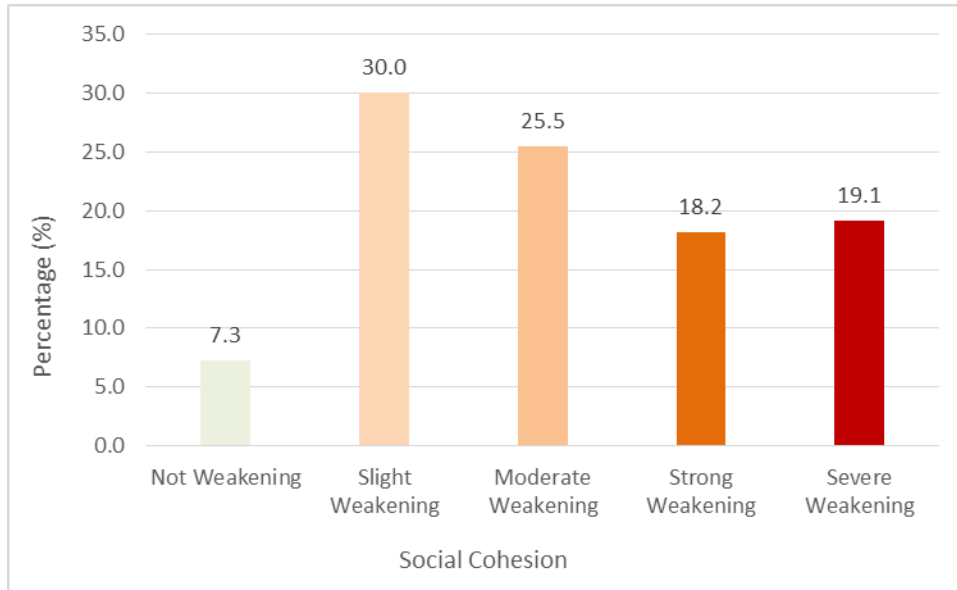


Figure: Perceived Weakening of Social Cohesion in Recent Years

The graph shows that 30.0% of respondents reported slight weakening of social cohesion, followed by 25.5% who observed moderate weakening. Additionally, 19.1% reported severe weakening, and 18.2% indicated strong weakening. Only 7.3% of respondents stated there was no weakening of social cohesion.

4.1.28 Rainfall Timing:

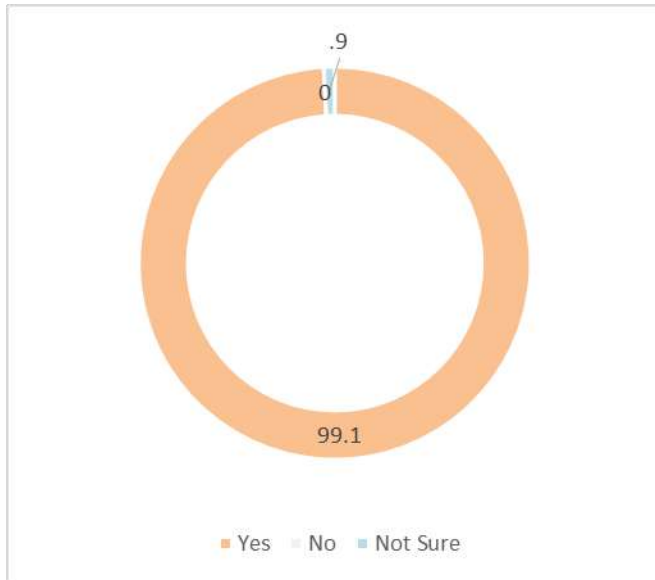


Figure: Change in Timing of Rainfall (Recent Years)

The chart shows that 99.1% of respondents believe the rainfall timing has changed, while 0.9% are not sure. No respondents indicated that the rainfall timing has not changed. Changes in precipitation patterns can lead to crop failures (Nimma et al., 2025).

4.1.29 Maternal Mortality:

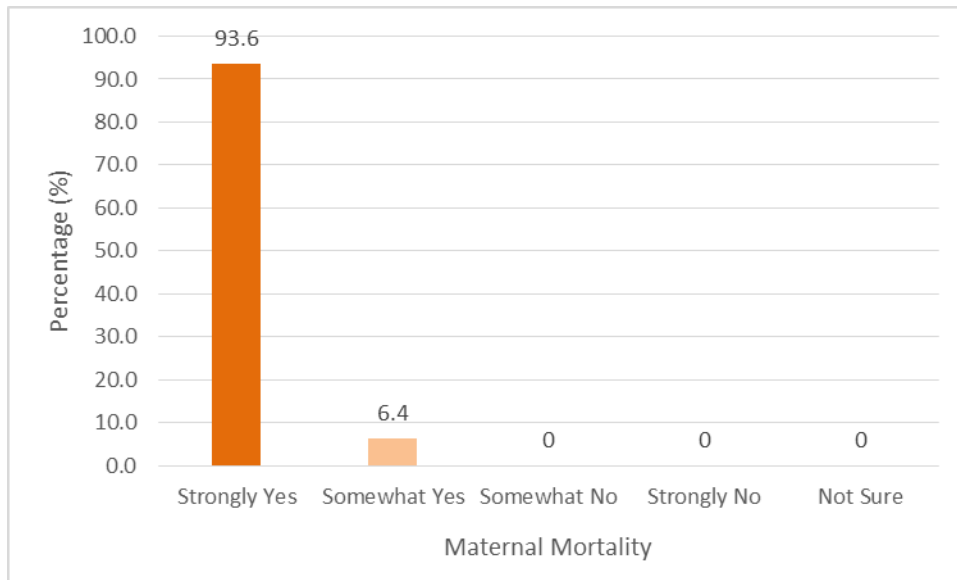


Figure: Impact of Inadequate Healthcare on Maternal Mortality

The chart shows that 93.6% of respondents answered "Strongly Yes" regarding maternal mortality, attributing it to poor communication and lack of medical facilities in their locality, while 6.4% responded "Somewhat Yes". For medical treatment, people have to go to pharmacies, as even in Sunamganj, advanced healthcare is no longer available. Due to the absence of a proper health complex and financial constraints, many women have lost their lives. At Tahirpur Health Complex, immediate treatment is not always available. In case of serious health complications, patients have to be taken directly to Sylhet for treatment (FGD, 2024).

4.2 Local Values Related to NELD Identified with Participants:

4.2.1 Development:

“A pregnant mother finally had the chance to have a baby after a long time, and this would have been her first child. However, due to poor transportation and the lack of a health complex in the area, she had to be taken to Mymensingh for delivery. Unfortunately, before reaching the hospital, the baby passed away. She had borrowed 50,000 BDT from many people for medical expenses, but despite all her efforts, she had to return home heartbroken and devastated” (Participant# 5, Indrapur village).



Photo: Muddy roads in Indrapur Village, North Sreepur Union (Credit: Author)



Photo: Raising the house with soil in Sontospur village, South Sreepur Union



Photo: Earthen Embankment in Janjail village, South Sreepur Union (Credit: Author)

4.2.2 Education:

“We want to educate our children, but we cannot send them outside for studies. If they study away from home, we have two household expenses, and we can barely afford our own food and daily needs. The high school is 2.5 kilometers away. For higher studies, students have to go to Sunamganj, Bandaghat, or Netrokona, where they need to stay in lodging. Because the school is so far, education opportunities are limited. The monthly cost is 5,000-6,000 BDT, including boarding rent, food expenses, and boat travel costs”(participant# 7, Indrapur village).

4.2.3 Religion:

Hindu: “During Puja, my daughters wanted to have some good food and wear new clothes, but because of so much debt, I could not fulfill any of their wishes. I try to celebrate religious festivals in a very simple way, just following the basic rituals to keep the tradition alive. During floods, when the temple entrance is underwater, even maintaining these rituals becomes difficult. I cannot even perform daily family prayers properly. Religious practices are greatly affected. The budget for the biggest religious festival has been reduced a lot, but still, many people cannot pay the full amount. We cannot join the celebration with the same joy as before.”(Participant# 2, Sontospur village).



Photo: Temple entrance submerged in floodwater (Credit: Author)

Muslim: Faith has been a part of our lives since birth, and practicing religion is the most important aspect of our existence. As the holy month of Ramadan comes closer, our worries increase-what will we eat for Suhoor? How will we manage the day while fasting? We already have taken groceries on credit from different shops, and now we worry whether they will allow us to take more. Just 15 days before Ramadan, we had managed to repay previous debts to buy new essentials. There have been times during Ramadan when we had only water for Suhoor, yet we never missed a single fast. We wish to observe fasting with proper nutritious meals, but often, due to a lack of wholesome food and essentials, we cannot. The joy of Eid celebration no longer feels the same as before. When my husband was alive, we could celebrate with new clothes, good food, and joy, but now, even having proper clothes is difficult. I wear old, worn-out clothes, as there is no way to buy new ones. Yet, despite all hardships, we hold onto our faith and continue fasting with devotion, patience, and gratitude. (Participant# 5, Sontospur village)

4.2.4 Culture/ Songskriti:

We, the people of Haor areas, depend on Boro crops for our happiness, festivals, travel, good food, and traditions. In the past, when we had a good harvest, we made many types of pitha (traditional rice cakes), shared them with everyone, and celebrated with joy. Many special festivals used to happen, like Boishakh Mela (fair in Boishakh month), Shivbari Mela (Ashtami Mela), Maa Manosa Puja in Shrabon month, and Charak Puja on the last day of Chaitra month. But when floods destroy our crops, we cannot join these happy celebrations. Instead, we spend our time alone at home, feeling sad, while others celebrate outside. (Participant# 4, Sontospur Village)

4.2.5 Nature / Birthplace:

"I will survive on eating dried fish paste, but I will never leave my birthplace." "Mother and motherland are greater than heaven" (Participant# 1, Indrapur village). This means that even if they have nothing to eat, they will stay in their homeland and survive with whatever is available, like dried fish.

However, not every family thinks this way. *Some say, "Right now, we can manage two meals a day out of three. But what if the time comes when we can afford only one meal? If my child cries, 'Father, I am hungry,' or my wife says, 'There is no rice at home,' my head will spin. I cannot just sit in my birthplace and suffer" (Participants# 7, Indrapur village). Without development, education, and healthcare, their basic needs will not be met. Their future generations are at risk because the environment is changing, and the population is growing. They hope their children can stay in their homeland and survive, but they do not expect good crop production or successful business opportunities. They stay with the hope that their next generation will be able to feed themselves and continue living here.*

4.2.6 Social Cohesion:

*"If this village has 150 families and there are a few grocery shops in the area. If one more person decides to open a grocery shop, then the other shopkeepers will lose customers. The reason why there are fewer boatmen in this area is the same. For example, one boatman bought a boat for 100,000 BDT and has been using it for 10 years. He earns 20,000 BDT per month, but without the boat, he would earn only 10,000 BDT. If five more people started boating, his income would drop from 20,000 BDT to much less. Right now, demand is high, and products are limited, so they make a good profit. Many other families want to do business, but they cannot due to a lack of capital". (Participant# 10, Indrapur village). This represent their **sense of unity and social bonding**.*

4.2.7 Health:

"We use latrines covered with paper or jute bag fences, but diseases never leave our bodies. We suffer from many skin diseases(i.e., allergies and rashes). The biggest problem is that the dignity

of our women is very important. We can survive hunger, but because of open latrines, we often cannot go to the bathroom at night, even when we need to. During floods, even this small facility (the paper-fenced latrine) gets destroyed, making our situation even worse” (Participant# 12, Indrapur village).



Figure: A Bamboo Latrines used by villagers (Credit: Author)

4.2.8 Mental Health:

A farmer in debt often mortgages their land, hoping that one day they will earn enough money to get it back. But in reality, the moneylender takes full control of their land. If the borrower fails to repay the loan, the moneylender keeps the land. They cannot repay the loan and cannot reclaim their land. Seeing someone else use their land while they remain in debt causes deep mental stress.

All of the above values are interrelated with each other.

4.3 Boro Culture: *On the day of Bengali Chaitra Sankranti, along with the Nabanna (New Harvest) festival, people celebrate the Boro Festival when the harvest is good. Those who have bulls decorate them with bright colors and take them to an open field in front of their homes (called "Arong" in the local language). There, a bull-fighting event takes place, where bulls compete against each other. The owner of the winning bull feels very happy and proud. This festival is a way for people to express their happiness for a good harvest. When new rice is stored at home,*

they show their joy by painting their bulls in different colors and celebrating together. But if floods cover the seedbeds in Chaitra month, the farmers lose their crops and cannot celebrate. Instead of enjoying the festival, they stay at home feeling sad, as they are unable to share the happiness of a good harvest. (Participant# Ashim Talukdar, Indrapur Village)

Discussion

Boro rice takes 120 days (4 months) to grow, but the timing of flash floods has changed previously occurring in the Bengali month of Chaitra, now happening in Baishakh. Farmers must choose between early-harvesting rice with lower yield or late-harvesting rice with higher yield but greater flood risk. For example, one variety yields 30 maunds but cannot be harvested before the 15th-20th of Baishakh, while another yields only 15 maunds but can be harvested early, around the 2nd, 4th, or 5th of Baishakh. Due to flash flood risks, farmers near Tanguar Haor do not expect high yields, so they prefer early-maturing varieties to reduce losses, even though this lowers overall production. As a result, the yield per land area remains low, and farmers struggle to grow high-yield crops due to frequent disasters. BR-28 produces less but is safer as it can be harvested early, whereas BR-29 gives higher yield but is completely destroyed if floods arrive. Because of flood fears, most farmers prefer BR-28 over BR-29, sacrificing higher yield for crop security.

4.4 Why Boro farmers do not switch to other professions: This is a remote area with no signs of development. There are no factories, no industries, and no job opportunities nearby. Business is the only option, but since there are no mills or factories, business is also very limited. There is no development and no capital, so people cannot start businesses outside their village.

“Farming is my family’s profession, and I was born into it. If I leave farming and start a business, I will need a big amount of money, but I do not have that capital. Since agriculture is my family profession, I know how to do it, but I never received training for other jobs, so I cannot do anything else” (Participant# 8, Janjail village).

4.5 Adaptation Measures:

i. Loan from NGOs:

Farmers can take loans from BRAC or Asha. BRAC charges 12% interest, and borrowers must repay weekly installments based on the loan amount. BRAC provides loans ranging from 35,000 BDT to 100,000 BDT. However, NGOs do not give large loans suddenly. For example, if someone manages a 35,000 BDT loan well, they may qualify for a 50,000 BDT loan next time. If a person takes a 20,000 BDT loan, they have to repay 2,000 BDT per week. If there is no income, they must borrow again to pay installments. For example, after a flood destroys everything, they may sell fish worth 1,000 BDT and borrow another 1,000 BDT from a moneylender just to pay the weekly

installment. Borrowers must repay weekly, even after losing crops in floods. If someone misses payments 1-2 times, a meeting is held like a local court to discuss the issue. BRAC also has a savings system. If someone takes an 80,000 BDT loan, they are supposed to pay 2,000 BDT weekly, but BRAC collects 2,200 BDT (extra 200 BDT is saved). This extra money is used to cover loan payments when borrowers have no income. If they fail to repay for four weeks, BRAC deducts the installment from their savings instead of taking action. This savings option helps borrowers manage payments during financial crises (Focus Group Discussion, 2024)

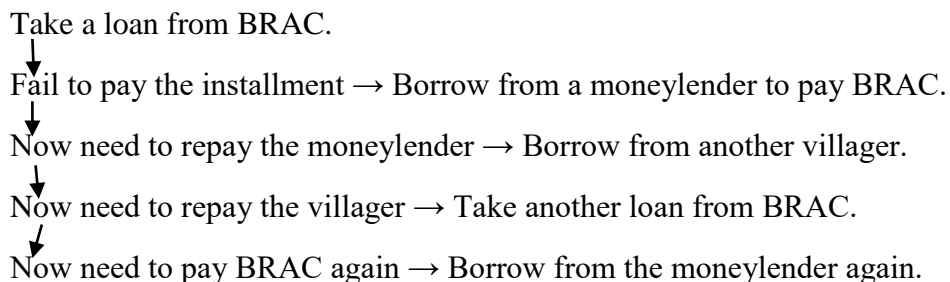
➤ **Endless Loan Cycle in Haor Region: Poverty Persists**

A farmer named Anil Barmon said *“Loans circulate in a continuous cycle to sustain the livelihoods of Haor residents, but poverty never goes away”*.

Cyclic Order of Loan

Almost All farmers take loans from BRAC. If they fail to repay, they borrow 10,000 BDT from a moneylender to pay BRAC’s installment. If BRAC's loan is cleared, they now have to repay the moneylender. To do this, they take a loan from another person in the village and pay back the moneylender. Later, they borrow from BRAC again to repay the village lender. When BRAC’s installment is due again, they borrow from the moneylender once more. This cycle keeps repeating, and they never escape poverty (FGD, 2024).

Loan Cycle Step by Step:



This cycle never stops, keeping them **trapped in debt**.

ii. Women's Adaptive Mechanisms: Empowering Women through Box Associations

❖ **Women's Box Association: A Community Savings and Support System**

At first, 20 to 25 women come together to form a Box Association (a three-layered shelf for savings). Three women are responsible for it, each holding a separate key, but they cannot keep the box themselves. On the meeting day, they bring the box, and all members gather. They keep a record book to track savings and contributions. To receive help from the association, members need to collect seals (stamps), where each seal costs 100 BDT. A woman can buy at least 1 seal and at most 5 seals at a time. Members contribute every 15 days and complete 24 installments in a year.

- If someone deposits 500 BDT, she gets 5 seals.
- If someone deposits 100 BDT, she gets 1 seal, and the remaining 4 boxes in the record are left empty or marked with red ink.
- If no deposit is made, all 5 boxes are marked with red ink.

Use of the Money: If a woman faces a financial problem, she can take a loan. For example, if she takes 5,000 BDT, she has to repay in small amounts (250 BDT per month) as a service fee. However, it is not considered interest, as the money belongs to the women themselves, and they take it when needed. The reason for forming the Box Association is that many poor women cannot save money at home, so they save here for emergencies. It also creates a sense of unity among them.

Money Distribution: After completing 24 installments, the group holds a final meeting where they break the box and distribute the total savings. Those who contributed 500 BDT per installment (full 5 seals) receive more than 15,000 BDT. The amount is calculated using the following formula: **(Total Money / Total Seals) × Individual Seal Value**

How the Money is used: Most women use the money for household development, such as buying cows, goats, or livestock. They try to grow financially and become independent. They also pay service fees on time so others can benefit in emergencies. New members start with 100 BDT per seal, but old members know the benefits and usually deposit 500 BDT per installment. After 24 installments, all savings are distributed, and the process restarts the next year. Members repay their loans with service fees, and the cycle continues.

The rule is simple:

- ❖ Whoever needs money first gets it first, but
- ❖ Repeated borrowing is not allowed unless necessary.

When the women first received training, they realized that forming an association would be beneficial. Now, they can save between 200,000 BDT and 350,000 BDT. This system has helped solve financial problems during emergencies. For the **past three years**, this **Box Association service** has been running successfully in the village, helping women save, support each other, and overcome financial difficulties. Box Association in Other Villages: In some villages, the cost of 1 seal is 200 BDT, so women can save up to 1,000 BDT per installment (for 5 seals). These groups are making good progress (FGD, 2024).

Support from NGO in 2016: The Sohardo-3 program, supported by Care Bangladesh and Dhaka Ahsania Mission, provided training for the Box Association service in Shantiganj, Sunamganj in 2016. Besides training, they helped poor and helpless families by providing goats, financial assistance, and soil worth 7.86 lakh BDT in 2017 to build embankments. They also gave 6,500 BDT to the poorest families and 10,000 BDT to vulnerable families during COVID-19. Additionally, they raised the entire village ground to protect it from floods. Before ending, Sohardo-3 introduced this program to help rural women learn new skills and survive in difficult

conditions. The villagers were divided into three groups based on their economic condition: rich (A group), poor (B group), and extremely poor (C group), but later, only the poor and extremely poor received support. Each group had a leader responsible for record-keeping, and they were given two touchscreen phones and a tablet. A total of 92 families in the village benefited from the Sohardo-3 program (FGD, 2024).

4.6 Permanent Internal Migration:

Even after taking local adaptation measures, many boro farmers could not bear the burden of debt and left their village with their families. Some farmer could not repay their loans, so they mortgaged their land, while others sold their land. One farmer mortgaged land worth 50,000 BDT but did not sell it. Before, he had 22 katha of land, but to survive, he had to sell 6 katha. The more debt a person has, the more mental stress they suffer. Another farmer took a loan of 120,000 BDT for his daughter's wedding and now worries all the time about how to repay the debt. Many of farmers have loans of 150,000 BDT or more. Many families, unable to handle this pressure, have moved to Dhaka. Local inhabitants say that 8–10 boro farming families have already left. The huge burden of debt is forcing them to migrate, as they can no longer survive in their birthplace due to extreme economic hardship. The farmer named Umendra Barman has left his village for 9 years due to financial struggles. Jaykumar Das and his family left one year ago because they had a huge loan of 140,000 BDT, which was confirmed in a village meeting. Last year, another farmer, Swapan Das, had to mortgage his house and move to Dhaka because he had a loan of 100,000 BDT. He could not pay back the loan or the weekly installments. He hopes to return to his village someday, but only if he can clear his debt. This causes him a lot of mental pain. Similarly, Sanjit Barman had a loan of 65,000 BDT. Since he could not pay it back, he left the village. Many other families also had to migrate because of too much debt (FGD, 2024).

In an interview, the farmer named Jagannath Das said, "I did not get a good harvest, so I moved to Dhaka three years ago. My loan was 150,000 BDT, but with interest, it became more. I borrowed 100,000 BDT from moneylenders and had to repay 150,000 BDT with interest. Over time, the interest keeps increasing, and if I had stayed there one more year, it could have reached up to 400,000 BDT. That is why I still have not been able to repay my loan. I borrowed 250,000 BDT to arrange my daughter's wedding. Now, after moving to Dhaka, I have to pay 4,000–5,000 BDT per month to repay the debt. Every year, flash flood waves destroy houses, and I have to spend 20,000–30,000 BDT on digging soil to repair my home. Before the flood, we raised our houses with soil,

which costs 30,000–40,000 BDT per year. But when water pressure increases, the mud walls break down. This happens every year, making our livelihood very difficult. Many people cannot afford to rebuild their homes every year, so they leave their village. I did not get enough crops, so I struggled to meet daily expenses. I could not afford school fees for my children. One father feels sad and helpless because he could not educate his eldest daughter properly. In previous years, I earned 20,000–30,000 BDT per month from selling fish. But now, because of new fishing restrictions, I can no longer earn money from this business.

No one wants to leave their birthplace, but after three years of continuous crop loss, families fall into heavy debt. I borrowed money to survive, but my land was low, and floods covered it easily. At that time, I did not see another option to repay my debt, so I had no choice but to leave. If one year's crops are destroyed by floods, it takes five years to recover. Many people migrate before moneylenders start putting pressure on them”.

SETP: The Haor communities have struggled to implement sufficient proactive measures to manage or mitigate these impacts. If this trend continues or intensifies, they may gradually move toward a significant socio-economic shift in a system, where the risk of widespread livelihood disruptions, increased migration, and diminished community stability could become more pronounced, pushing them closer to a socio-economic tipping point.

4.7 Story Telling:

Case Study-1: Mr. Bipul Sarkar



Mr. Bipul Sarkar, born in 1976, a resident of Indrapur village, comes from a modest background. He is the sole breadwinner in his family, earning his livelihood by tutoring students. At the age of eight, he contracted typhoid fever, which resulted in one side of his body becoming paralyzed. Despite his physical challenges, Mr. Sarkar pursued education to a certain level, which enabled him to provide tuition and support his family.

Over time, he expanded his income sources by opening a small shop. However, despite his best efforts, his business struggled due to outstanding debts from local customers, leaving him unable to sustain the shop. As a result, he eventually faced unemployment and was unable to regain a stable income.

When his family noticed his ongoing financial difficulties and lack of sufficient income, tensions escalated within the household, eventually leading to a divorce. It has been over 12 years since Mr. Sarkar has lived separately from his family. He has two children: a daughter, who is married, and a son, who resides with his mother. Although Mr. Sarkar owns a plot of land, he is unable to cultivate it due to his physical condition. At one point, he took a loan of 150,000 BDT to finance his daughter's wedding. However, the burden of this debt weighs heavily on him, leaving him deeply concerned about his ability to repay it, which causes him significant mental distress. The anxiety over his financial situation, combined with his health issues, has taken a considerable toll on his emotional and psychological well-being.

In conclusion, Mr. Bipul Sarkar's life story is one of perseverance in the face of numerous challenges ranging from physical disability to financial instability and personal loss. In this case, these challenges give rise to non-economic losses, particularly in terms of mental health, social isolation, and loss of self-worth.

Case Study-2: Gopika Talukdar

Gopika Talukdar, a resident of Bhabanipur village, has faced numerous hardships in recent years. In 2019, 2020, and 2021, consecutive flash floods devastated his crops, leaving him without a harvest for three straight years, severely affecting his livelihood, which depended heavily on agriculture. Three years ago, an accident caused significant injury to his lower back, resulting in the loss of bone structure, and as a result, he can no longer perform agricultural work, worsening his financial difficulties. Unable to work the land, he fell into substantial debt, and his medical treatment was halted due to lack of funds, putting him in a dire situation both physically and financially. To manage the mounting debts, his wife took up work as a cattle herder in other people's cow sheds. This situation weighs heavily on him, and he feels immense emotional distress. In the local community, it is customary for women to stay at home, managing household duties, but his wife is forced into this labor-intensive work, which causes great discomfort and pain of him. He has two children, but due to financial constraints, he is unable to afford their education. During festivals, he cannot buy them new clothes, and as a result, his children miss out on the joy and celebrations that others in the village experience. His inability to provide these basic comforts for his family deepens his sense of helplessness.

In the absence of his ability to farm, other villagers cultivate his land. In exchange for allowing them to use his land, he receives a portion of the harvest, approximately five “mon” (a traditional unit of weight) of rice, which generates an income of about 6,000 BDT. However, this amount is far from sufficient, as his monthly expenses range from 10,000 to 12,000 BDT. To cover these costs, during the rainy season, they feeds the cattle and cleans the cow sheds at other households, earning 3,000 BDT per month for their labor. He also takes on other manual labor, including cutting wood, carrying harvested rice, and assisting with boat transportation, which brings in a small but essential additional income.

Despite his ongoing health issues and physical limitations, he has relentlessly worked to repay his debts, relying on his wife’s labor, his own small earnings, and community support. However, his challenges extend beyond financial hardship, with the emotional toll being equally profound. The strain of seeing his wife take on work traditionally not expected of women in their village only deepens his mental anguish and emotional distress.

Chapter 5: Conclusion and Recommendations

5.1 Farmers' Expectations and Requirements

- Rivers should be dredged to improve water flow. The suggested rivers are Baulai River, Patlai River, and Rakti River.
- Permanent embankments should not be built. Instead, strong, raised embankments made of soil should be constructed.
- Rice varieties should be changed to suit flash floods. Farmers want the same good-quality rice varieties they had before the floods. Currently, they use BRRI (BR 28, BR 29).
- They want agricultural extension training to learn better farming methods.
- They prefer natural rice varieties that do not harm the environment and can resist floods and droughts. In Sunamganj, during an IUCN meeting, agriculture officers informed the farmers that research has developed a middle-variety rice through agricultural studies.
- They need training on planting schedules. Farmers want to know when to plant seedlings to get an early harvest and avoid flood damage. They said no such training has ever been given in their village. Right now, they follow the same farming methods as past generations, which results in more crop loss due to floods.

These are the main demands of the local people to improve farming and protect their livelihoods from flash floods.

5.2 Climate Change Adaptation Techniques

According to the Upazila Agriculture Officer (UAO, 2024)

- In the Haor region, farmers are trained in climate-resilient technologies and modern agricultural methods. During training with farmers key topics include the optimal timing for planting Boro rice, the appropriate planting area, and effective crop management practices.
- Throughout April, the Agriculture Office runs a strong awareness program, reminding farmers that all harvesting in the Haor must be completed by April 30. This is done every year and has now become a tradition.

Different local technologies are being used to adapt to climate change. In the Haor region, farmers face drought in May-June and blast disease in rice during Chaitra month (March 15 -

April 15). However, the amount of blast disease in rice has decreased compared to before. Last year, the minimum amount of blast disease was found in rice fields (UAO, 2024).

5.3 Recommendations:

To prevent blast disease, new rice varieties are being introduced. The process of expanding cultivation of these new varieties is ongoing (UAO, 2024). Some of the new rice varieties include:

- ❖ **BRRI-96** and **BRRI-88** are recommended as alternatives to **BRRI-28**.
- ❖ **BRRI-89, BRRI-92, BRRI-100, and Bina-25** are suggested as replacements for **BRRI-29**.
- ❖ These new rice varieties have a lower risk of blast disease compared to the older ones. By increasing the cultivation of these varieties and taking proper care of the crops, farmers can reduce the chances of disease.
- ❖ Farmers need to follow a systematic care routine instead of planting seedlings and returning only at harvest time.
- ❖ Proper monitoring, timely maintenance, and disease prevention measures must be taken to ensure healthy crop growth and better yields.
- ❖ Government and agricultural officers should strengthen farmer outreach programs to guide them in effective field management.
- ❖ Regular dredging of rivers and drainage canals is necessary to improve water flow
- ❖ Overbridges instead of roads should be constructed in vulnerable areas like Tahirpur, Uttar Sreepur to allow water to pass naturally, preventing water blockage and redirection that could cause further damage.

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Appendix A: Key Informant Interview (KII)

In the Haor region, major disasters include flash floods, heavy rainfall, and drought. Flash floods usually occur between March and April, and every year, a seasonal earthen embankment is built to protect Boro crops. This embankment is not strong enough to withstand extreme flash floods, but it usually prevents floodwater from entering the Haor for two months (March-April). The construction of the embankment starts in December and is completed by February or March, ensuring no water enters the Haor during these two months. However, by May, water must enter the Haor for fish production, or else fish numbers decrease. In June last year, floodwater entered late, and due to drought, fish production dropped. In the higher areas of Haor, flash floodwater does not come from rivers but from the Meghalaya Hills, where water flows down through small hill streams that turn into temporary rivers during heavy rainfall. When it stops raining, the water recedes quickly. In areas where Boro crops grow near rivers, unnecessary embankments are removed to allow natural water flow. If the embankment is 5 feet high, sometimes water levels rise above 7 feet, causing damage. In Tahirpur, Uttar Sreepur, the floodwater come from the mountain river cannot be stopped by an embankment, so a natural drainage path must be provided. Instead of making roads, overbridges can be built to let water pass, as blocking floodwater will only force it to flow elsewhere. To adapt to Boro crop losses, planting and harvesting must follow a strict schedule. Seedbeds for long-duration rice varieties should be prepared between November 1- November 15, while short-duration varieties should be planted by November 30 in lower areas. Harvesting starts around April 7-8 and must be completed by April 30 to avoid flood damage. Due to climate change, rainfall has decreased during the monsoon season, but pre-monsoon rainfall (March-April) still occurs, so if harvesting is completed early, the risk of flash floods is lower. The May floods are normal, but March-April floods are not yearly events; they occur every 2-5 years, so their frequency is low. Even though flash floods are less frequent, small to medium ones happen, and seasonal embankments can usually protect against them. Normally, light rainfall starts in February and continues into April, which does not flood the Haor, but if heavy rainfall occurs in the hills, the floodwaters can damage farmlands. Extreme flash floods, like in 2019 during COVID-19, broke several embankments, and in March 2017, early floods destroyed unripe paddy crops. Since 2017, there have been no severe floods like that, and even if they occur again, only a few areas may suffer losses, not as widespread as in 2017. Low-intensity flash floods can still be

managed with embankments. Farmers receive training on crop planning from field officers, but the number of farmers is high, and available training programs are not enough to meet their needs. These programs were not available before, but since last year, efforts have been increasing, and it is expected that things will improve gradually. The main problem with disasters in the Haor region is that the water is always flowing; it is not stationary but continuously moving. The natural water flow channels are gradually getting blocked, making the situation worse over time. In Sunamganj, there is a common saying among rice researchers: "A major flash flood occurs every seven years." Historical records show such floods happened in 1996/1997, 2004, 2010, and 2017. (UAO, 2024).



Figure: Conducting a Key Informant with Md. Rakibul Alam (Upazila Agriculture Officer, Sunamganj Sadar, Sunamganj)

Appendix-B: Photographs of Focus Group Discussions



Figure: Focus Group Discussions-1 with Boro Farmers in Indrapur Village



Figure: Focus Group Discussions with Boro Farmers in Indrapur Village



Photo: Focus Group Discussions-2 with Female Participants in Indrapur Village.



Photo: Focus Group Discussions with Female Participants in Indrapur Village, North Sreepur Union



Photo: In Depth Interviews (IDIs) with Farmers in Bhabanipur village, South Sreepur Union
(On rainy days, there is no income, so they spend their time at home in frustration.)