Original Research Article

An Analysis of Income Sources and Food Security Status in Haor Regions of Kishoregonj District

Abstract

This study aims to investigate income diversity and food security status among people living in the Haor area, with the objective of informing development policies for these regions. The research focused on assessing the socioeconomic characteristics, income diversity, and food security status of 120 randomly selected households in the Nikli and Tarailupazilas within Kishoregonj district, Bangladesh. Data was gathered through direct face-to-face interviews. The study revealed that the majority of households (91.66%) were male-headed, with an average family size of 5.10 members. A significant proportion (62.5%) of respondents fell within the 30-64 age group. Education-wise, a substantial portion (39.16%) of respondents had a secondary level of education, while 25% were employed in the agriculture sector. Approximately 45.83% of households were constructed with tin materials. The average monthly income and expenditure were Tk. 9536 and Tk. 8316, respectively. Income diversification was found to be prevalent among the respondents; however, within individual households, diversification was limited. The Simpson's and Shannon's indices of diversity for income were 0.84 and 0.88, respectively. About 25% of households were classified as ultra-poor, 29.17% as hard-core poor, and 20.83% were in the category of absolute poverty. On the positive side, 25% of the sample households were deemed non-poor. These findings underscore the urgent need for policy changes to address poverty eradication and enhance the standard of living in the study area. By understanding the socioeconomic dynamics and food security challenges faced by Haor communities, policymakers can devise targeted interventions to uplift the living conditions and well-being of the residents in these regions.

Keywords: income diversity, food security, income diversification, expenditure, absolute poverty, ultra pore, hard-core pore.

Introduction

Bangladesh, a densely populated developing country, is home to 166.3 million people, with 20.5% living in poverty and 10.5% facing extreme poverty (MoF, 2021). While the country has made commendable strides in its overall economic, social, and health indicators, the progress in the Haor areas has been less satisfactory. Encompassing approximately 8600 km2, the Haor area constitutes the upper Meghna river basin and heavily relies on agriculture and fisheries as its primary economic activities. Notably, Boro, the main crop cultivated in this region, contributes around 16% (5.3 million tons per year) of the country's total agricultural production (BBS, 2020).

However, the Haor area faces a significant challenge posed by flash floods triggered by intense rainfall in the adjacent mountainous regions of India during the pre-monsoon period. These floods inflict severe damages to paddy fields, occurring right before the harvest, jeopardizing the livelihoods and food security of the local population. Given that the Haor region encompasses a

substantial portion of the country's land and population, it warrants special attention and targeted development initiatives. The Haors in Bangladesh's northeast are vast floodplain depressions with unique hydro-ecological features, covering approximately 1.99 million hectares (19,998 sq km) and hosting a population of around 19.37 million. These haors are distributed among several districts, namely Sunamganj, Sylhet, Habiganj, Maulvibazar, Netrakona, Kishoreganj, and Brahmanbaria, with 373 haor or wetlands found in each district. A substantial portion, about 43% (over 859,000 hectares), of the entire Haor district area is covered by these 373 haor (BWDB, 2021). The region consists of diverse wetland environments, encompassing rivers, streams, canals, extensive agricultural plains that experience periodic inundation, and beels.

This study focuses on the northeastern haor basin in Bangladesh, classified as a "major floodplain basin" (Brammer, 1990), making it particularly vulnerable to habitation. The Haor basin spans approximately 8000 sq. km. with an extent of roughly 2,045,000 hectares (BWDB, 2005). The primary Haor region comprises five districts: Mowlovibazar, Habigonj, Sunamgonj, Kishoreganj, and Netrokona. The region remains submerged for about 5 to 6 months of the year, known as the non-crop season, while the remaining period allows for boro (dry-season paddy) agriculture. Agriculture is the main economic activity in the study area, providing employment opportunities to the local population. However, crop harvesting significantly impacts other income sources in this underdeveloped region, either directly or indirectly. Unfortunately, early flash floods frequently cause substantial crop damage, posing a serious threat to food security.

Studies predict that Bangladesh will face a severe food crisis by 2050 if early flash floods continue to damage significant boro crops in the northeastern Haor district. Climate change has led to alterations in the rainy season, resulting in more frequent future flash floods. During the peak period of boro production from April to June, water logging in the Haor area is likely to affect boro yields significantly. This situation calls for urgent attention and the development of robust strategies to enhance resilience and mitigate the adverse effects of flash floods on agriculture and food security in the Haor region.

Bangladesh, a village-oriented society heavily reliant on agriculture for livelihood, faces the dire consequences of climate change. With its geographic location making it susceptible to frequent floods, riverbank erosion, cyclones, variable rainfall patterns, droughts, and saline intrusion, the agricultural sector has become highly vulnerable. To ensure the resilience of rural communities in risk-prone areas, income diversification emerges as a crucial strategy. Income diversification serves as both a risk management tool and a coping mechanism, mitigating the impact of economic adversity in both formal and informal sectors. Studies conducted by Castells and Portes (1989), Ersado (2006), Soares (2005), Minot et al. (2006), and Schgtman et al. (2006) have revealed that over 60% of the workforce in less developed nations engages in multiple occupations. This diversification of income sources aims to combat poverty, reduce income inequality, stabilize consumption patterns, and enhance household standards of living. A key aspect of income diversification lies in its ability to create a balance among various income sources, rather than relying dominantly on a single one. This approach ensures that no one source becomes the sole lifeline for a household, making it less susceptible to livelihood shocks (Joshi et al., 2003).

Moreover, income diversification involves transitioning from low-value crop farming to more lucrative alternatives such as high-value crops, livestock, and non-farm industries. These diversified sources of income include non-crop agricultural activities like livestock rearing,

fisheries, and forestry, as well as non-agricultural pursuits encompassing off-farm wage work and non-farm self-employment (Escobal, 2001). The concept of "food security" serves as a critical measure of the availability and accessibility of food to all individuals. As defined by the World Food Summit (WFS) in November 1996, food security is achieved when every person, at all times, has the physical, social, and economic means to access sufficient, safe, and nutritious food that meets their dietary requirements and preferences, enabling them to lead an active and healthy life.In view of all these, the present study was conducted to make an empirical analysis on socio economic condition,incomediversity,food security status and major problems of haor households in selected areas.

Materials and Methods

The research employed a simple random sampling technique to select a representative sample of 120 households from the haor area. The aim was to include residents from various backgrounds whose livelihoods were influenced by the river, without any specific focus on particular groups. The study area mainly focused on NikliHaor, along with Tarail and Itnaupazilas in the Kishoregonj district, as they were identified as the most vulnerable areas in the district. The study heavily relies on accurate and reliable information, which necessitates the use of both primary and secondary data. Primary data were collected by conducting direct interviews and home visits with the subjects in the study region. Prior to data collection, the participants were informed about the study's objectives.

Figure 1. Map of Kishoregonj District

Analytical technique

Relevant analytical methodologies were applied in the current study to reach certain research goals. The tabular technique was employed for the majority of the data analysis. This method is frequently used since it has the inherent ability to present sociological features in their most basic form. To study the data and determine the socioeconomic characteristics of respondents, such as kind of job, duration of service, and so on, relatively simple statistical procedures, such as percentage and arithmetic mean or average, were used.

Income Diversity Status Assessment

A commonly used metric for determining the biodiversity of an ecosystem is the Simpson Index of Diversity (SID). The Simpson Index of Diversity was employed in this study as a measure of income diversification and is denoted as follows:

$$SID=1-\frac{\Sigma n(n-1)}{N(N-1)}$$

Where n denotes the number of individual sources of income and N is the total number of sources of income. SID is a number that varies from 0 to 1, with 0 indicating only one source of income and 1 indicating the greatest number of sources of income.

The Shannon-Wibener Index, often known as the Shannon Diversity Index. The symbol for it is H. Equation was utilized to determine this index.

$$H= -\Sigma p^i \times \ln (p^i)$$

Where,

Σ= A Greek symbol that means "sum"

Ln= Natural log

p^i= The proportion of the entire income made up of income sources i

The term "Evenness" simply refers to how the abundances of different sources of income are in a community. It is denoted as EH which is shown in equation

$$EH = H / \ln (S)$$

Where,

H= Shannon Diversity Index

S= Total number of unique sources of income

Result and discussion

Socioeconomic characteristics of sample households

Gender is essential in making decisions, including stakeholders, communicating with them, and choosing which interventions to use, gender is essential (Tannenbaum*et al*., 2016). According to Figure 1, the majority of respondents—approximately 91.66%—are men who are the head of the

household in their families. Just 8.33% of respondents are female and serve as the family's leader. In the majority of countries, women are not considered household heads until no adult male continues to reside in the home. The assumption that an adult male is always the head of the household, regardless of whether a woman makes an equivalent or more financial contribution than a man does, is known as gender bias (ILO, 2007).

In Bangladesh, widowed or divorced women head over the majority of female-headed households. The following table shows the gender distribution and head of the family among the respondents of study area.

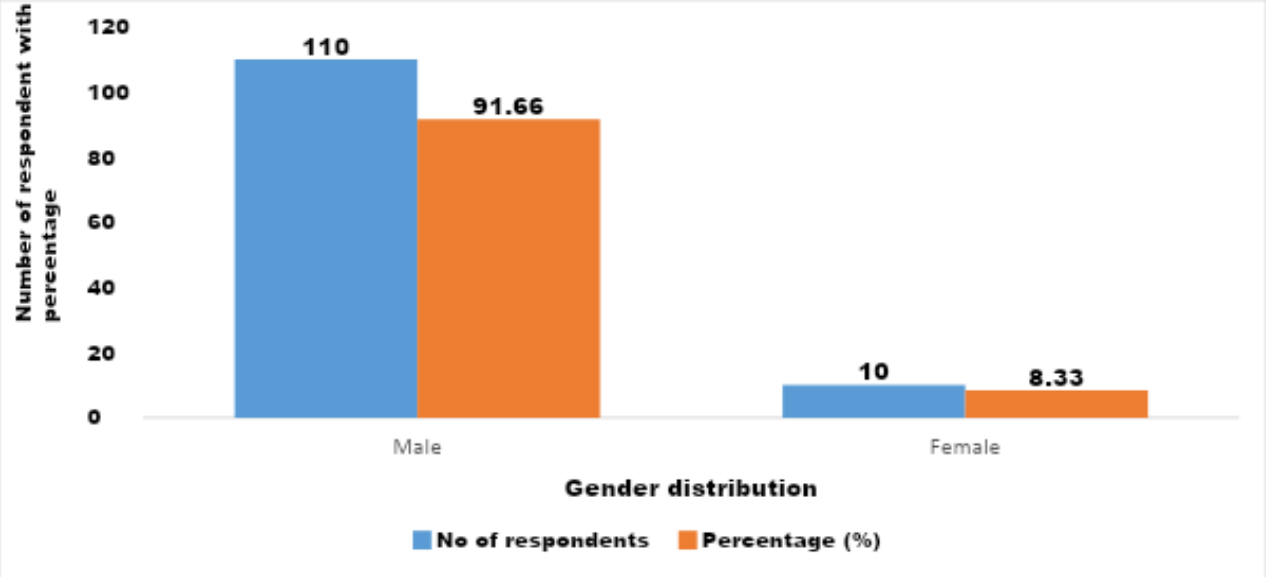


Figure 2. Gender Distribution of Head of the Family among the Respondents

Age of the Respondents

Table 1 reveals that the respondents aged between 15 to 29 years accounted for 27.5% of the total respondents while 62.5% were between 30-64 years. There were only 10% respondents who belonged to 65 or above. It can be concluded that middle aged group were the maximum portion of the respondents.

Table 1. Age Distribution of the Respondents

Age Group of Respondents (Years)	No. of the respondents	Percentage (%) of the respondents
15 – 29	33	27.5
30 – 64	75	62.5
65 and above	12	10
Total	120	100

Source: Field Survey, 2022

Family Size of the Respondents

Table 2 reveals that only 30.89% of the 120 households are tiny in size. The average family size is 5 to 6 people, which makes up around 50% of all homes. On the other hand, 19.16% of households—those with more than 6 members—are categorized as large families. The average family size in the research area is 5.10, which is higher than the average family size nationwide.

Table 2. Family Size of the Respondents in the Study Area

Family size	Number of households	Percentage (%)	Total members	Average family size
Small (1 to 4)	37	30.83	146	
Medium (5 to 6)	60	50	313	5.1
Large (> 6)	23	19.16	154	

Source: Field Survey, 2022

Educational Qualification of the Respondents

It is believed that the most major part in a nation's ability to develop its human capital is its level of literacy. The abilities and knowledge acquired via education determine a person's capacity. Adult literacy in Bangladesh is 72.30 percent (MoF, 2017).

According to Table 3, of the 120 respondents, 23.33% only had a primary level of education. 9.16 percent of respondents lack any form of education. Yet, only roughly 39.16% and 25% of respondents, respectively, have completed their secondary and higher secondary education. Just 3.33% of respondents in the study region have graduate degrees, which is a discouraging situation that can be seen from the table.

Table 3. Educational Qualification of the Respondents in the Study Area

Level of education (Years of schooling)	Number of respondents	Percentage (%)
Illiterate	11	9.16
Primary	28	23.33
Secondary	47	39.16
Higher secondary	30	25
Graduate and above	4	3.33

Source: Field Survey, 2022

Occupation of the Respondents in the Study Area

Table 4 shows that among the 120 respondents, 4.1% are unemployed that means for their livelihood, they depend on the other members of their family. 25.00% respondents' households involve in agriculture as their main income source. Here about 16.66% work as a day-labor and 21.66% respondents engage in various types of small businesses. The percentage of government and non-government job holders is very low and these are 4.1% and 5.00% respectively. About 10.83% respondents takes other sources of income as their main occupation.

Table 4. Occupational Status of the Respondents in the Study Area

Occupation	No of respondents	Percentage (%)
Unemployed	5	4.1
Agriculture	30	25
Day labor	20	16.66
Small business	26	21.66
Rickshaw/van puller	15	12.5
Govt job	5	4.1
Non govt job	6	5
Others	13	10.83

Source: Field Survey, 2022

Housing Patters of Respondents in Study Area

Table 5 shows that among all sample households 45.83% houses are tin-shed and 20.83% houses are kaccha houses. The table also provide that 25% of the sample households are semi brick build and 8.33% are brick build. Housing patterns are changing as a reflection of changing people's life style. For that reason, housing pattern is changing from raw and tin-shed to pucca houses.

Table 5. Housing Pattern of Respondents

Housing pattern	No. of household	Percentage
Kaccha	25	20.83
Tin	55	45.83
Semi brick	30	25
Brick	10	8.33

Source: Field Survey, 2022

Monthly Income of the Households

The sample households' average monthly income in the study region is displayed in Table 6. Data shows that the average monthly income for all households is Tk 9,536, while the average monthly income for small households is Tk 9,320. The average monthly income for medium and big households, respectively, is Tk. 8,750 and Tk. 10,540. In Bangladesh, the average monthly income is Tk 15,988, and in rural areas, it is Tk 13,998. (HIES, 2016). The above result is really startling because it shows sample households' monthly incomes, which are lower than

Bangladesh's rural residents' average monthly income. It shows that the individuals in the studied area have worse living conditions.

Table 6. Monthly Income of the Sample Households

Family size	No of respondents	Percentage (%)	Average income
Small (1 to 4)	37	30.83	9320
Medium (5 to 6)	60	50	8750
Large (> 6)	23	19.16	10540

Source: Field Survey, 2022

Monthly Expenditure of the Households

The households of the respondents are represented by their average monthly spending in Table 7. For small, medium, and big households, the average monthly spending for consumption is Tk 8,150, Tk 7,500 and Tk 9,300, respectively. The average monthly expense for all households is Tk. 8316. Average monthly costs for medical and educational services are very low, at Tk.191 and Tk. 223, respectively.

Table 7. Monthly Expenditure of the Households

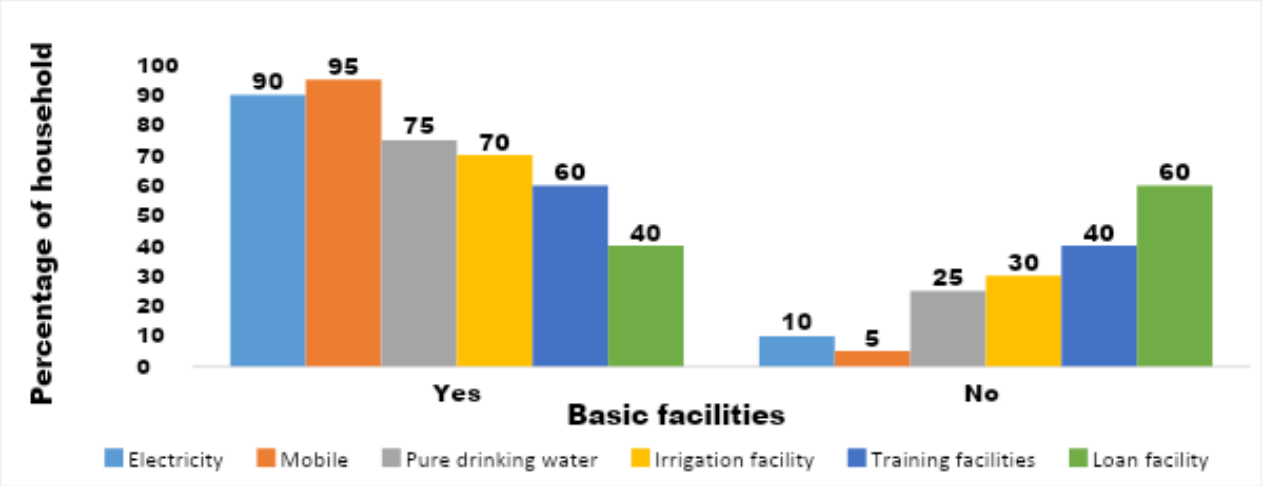
Family size	Average consumption expenditure (Tk.)	Average educational expenses (Tk.)	Average medical expenditure (Tk.)
Small (1 to 4)	8,150	200	215
Medium (5 to 6)	7,500	250	150
Large (>6)	9,300	220	210
Total	8,316	223	191

Source: Field Survey, 2022

Access to Basic Facilities of the Respondents' Households

According to figure 2, the sample residences in the study area have access to electricity in nearly 90% of cases. Approximately 75% of the sample households currently have access to clean drinking water, while about 95% of the sample households use mobile devices.

Figure 2, however, shows that when it comes to irrigation facilities, training facilities, and loan access, the situation is different. Despite the fact that many households in the entire sample still receive these facilities, many people still lack access to them. Additionally, it shows that approximately 70% of respondents' houses have access to irrigation systems, and 60% of households have access to training programs for women's empowerment, youth development, and other topics. Nonetheless, 40 percent of respondents' families receive credit opportunities from loan from formal, semi-formal and informal sources.



Source: Field Survey, 2022

Figure 3. Access to Basic Facilities of the Respondents' Households in the Study Area

Women's Income Generating Facilities of the Respondents' Households

Table 8 finds that 40% of the 120 families with responses provide a work environment where female family members can earn money for the household. In the homes of about 60% of the respondents, women are not allowed to engage in any income-generating activities. In reality, every woman puts in a lot of effort for her family, day and night, but she never receives compensation for her efforts.

Table 8. Income Generating Facilities of Women

Item	No. of respondents	Percentage
Yes	48	40%
No	72	60%

Source: Field survey, 2022

Access to Medical Facilities

Table 9 shows that among 120 respondents about 52.5% respondents go to MBBS or specialized doctor. On the other hand about 40% seek treatment from village doctor. It is dangerous that about 7.5% go to kabiraj for their treatment. In summary, it shows that people today are concerned about their health. People now have the ability to quickly access the type of specialized medical care that was previously unavailable. For the development of many government hospitals, health complex centers, missionary hospitals, and charitable dispensaries at the upazila and even village levels. Yet, it has not been able to provide this health treatment to everyone. A minority still does not receive the appropriate care from MBBS doctors or specialists as a result of financial difficulty and ignorance. Also, some households want to treat their illness using kabiraj rather than a doctor.

Table 9. Access to Medical Facilities of the Respondents' Family in the Study Area

Types of medical facilities	Number of respondents' households	Percentage (%)
Kabiraji	9	7.5
Village doctor	48	40
MBBS doctor	63	52.5

Source: Field survey, 2022

Income diversity status:

Income Diversity of the Respondents in the Study Area

The occupational status and index value for the study area's income diversification are shown in Table 10 It indicates that the diversity indices for Simpson and Shannon are both 0.80. A very high level of diversification is indicated when the index value is larger than 0.75, as per the category of diversification based on value (shown in table 10). So, in this instance, both the value of the diversity index and the respondents' very high level of income diversification in the research area are represented. . Again and, the Shannon equitability index evaluates how evenly distributed the sources of income are. When the value is 1, it means that there are approximately the same number of households with the various sources of income throughout the community. Yet, in this case the value is 0.88 rather than 1, indicating that there are different numbers of engaged people and income sources. Generally speaking, there is still some diversity.

Table 10. Income Diversity of the Respondents in the Study Area

Occupation	Number of respondents	Percentage (%)	Simpson index of diversity	Shannon index of diversity
Unemployed	5	4.1	0.84	0.88
Agriculture	30	25		
Day-labor	20	16.66		
Small business	26	21.66		
Rickshaw/van puller	15	12.5		
Government job	5	4.17		
Non-government job	6	5.00		
Others	13	10.83		

Source: Field Survey, 2021

It is believed that a household's income level is increased by its income diversification. A household can buy more food and non-food products and services if their income increases. Most of the time, this is the case since households that have multiple sources of income and where no single source is particularly strong when compared to the other sources benefit more from income diversification.

Income Diversity Status among the Family Members of the Respondents

Floods and river bank erosion are frequent natural hazards in the Kishoregonj district along the NikliHaor. Every year, the river erodes a large portion of the land in the river basin around Haor.

People experiencing both poverty and financial distress. In these conditions, obtaining basic necessities like education and healthcare opportunities become secondary concerns for most individuals. People in the affected area engage in a variety of low-wage jobs that fail to sustain their level of living, and in this instance, other household members also engage in that type of wage-earning activity. The majority of residents of the riverside region are either illiterate or have only a limited level of education, hence there is a wide range of income among them. The following table shows the income diversification status within the family members of the respondents' households in the study area.

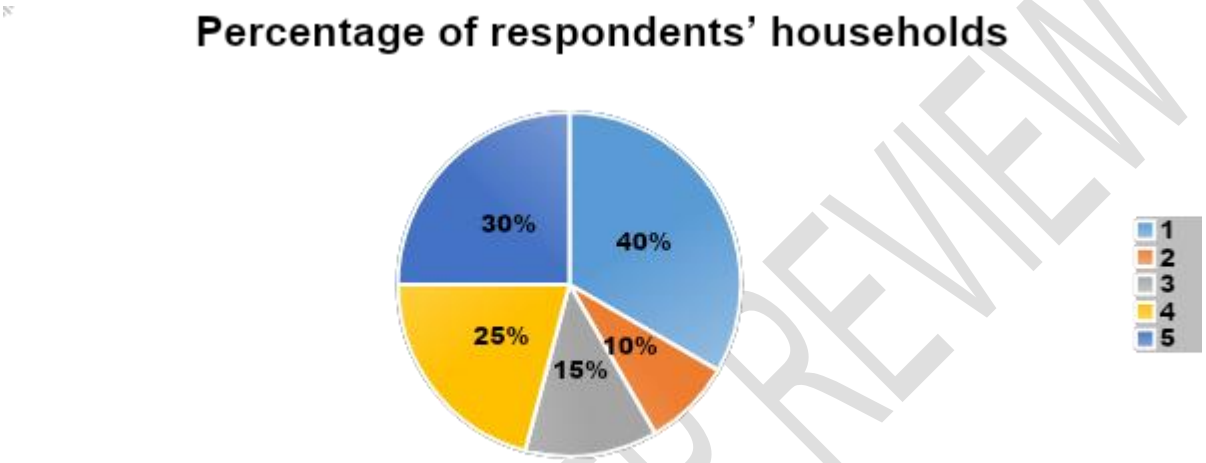


Figure 4. Income Diversity Status within the Family Members of the Respondents in the Study Area

The status of income diversity in the household of each respondent in the research area is shown in figure 4 It shows that there is no occupational diversity within roughly 40% of families. Each family member in a given household has the same type of occupation, but there may be differences between households. All the same, 30% of respondents' family members work at different types of jobs, which suggests that each member of a household has a separate occupation. Approximately 15% of households have a medium level of income diversification, while 25% of household members have a high level of occupational diversification.

Calorie intake of the sample households:

Food Consumption Status

Table 11 displays the daily food intake for each person. Rice intake per person per day was 500.46g, followed by potato consumption at 66.54g and wheat consumption at 52. At the household level, meat consumption was 42.97g and sugar consumption was 25g, both of which were higher than the national average for those food items. Vegetables, pulses, oil, eggs, and fish were consumed at levels per person that were lower than the national average at 100.90g, 11.66g, 40.15g, 13.70g, and 35.84g, respectively. The term "national average" refers to an item's average value across a specific country.

Table 11. Food Intake per Person per Day

Major food items	Per person per day food intake (gm/person/day)	National Average per person per day food intake (gm/person/day)	Difference between national average (gm/person/day)
Rice	500.46	367.19	133.27
Potato	66.54	64.8	1.74
Wheat	52	19.83	32.17
Vegetables	100.90	167	-66.1
Pulses	11.66	15.60	-3.94
Oil	40.15	51.11	-10.96
Meat	42.97	19.8	23.17
Egg	13.70	21.13	-7.43
Milk	30.26	27.3	2.96
Fish	35.84	62.58	-26.74

Source: HIES, 2016

Calories Intake

The amount of energy in food and beverages is measured in calories. The quantity of energy eaten through food and beverages is referred to as calorie intake. The amount of heat energy needed to raise 1 gram of water by 1 degree Celsius is known as a calorie, which is a unit of energy. For women, 2142 calories were advised daily, while for men it was 2394 calories (Heck *et al*., 2010). The per capita calorie intake was calculated based on how much food the respondents and their family members consumed. The average daily calorie consumption per person was calculated and divided into four categories in Table 12.

Table 12. Categories of People According to Calorie Intake

Category	Calorie (k.cal)
Ultra poor	<1600
Hard-core poor	<1805
Absolute poor	<2122
Non-poor	>2122

Source: Bangladesh Economic Review, 2012

The percentage of daily caloric intake relative to the sample homes' daily average caloric intake per person is shown in Table 13. A whopping 25% of respondents fell into the ultra-poor category, where the average daily calorie consumption was 1410.92 Kcal. Hardcore poverty was represented by 29.17% of the respondents, and the average daily calorie intake was 1735.09 Kcal per person. 20.83% of respondents identified as being extremely poor, with an average daily caloric intake of 2082.25 Kcal per person. The average daily calorie consumption for the 25% of respondents who did not fall into the poverty category was 2190.86 K. cal. As a result, it can be said that the majority of respondents fell into the hard-core poor category. The majority of respondents had enough money to buy food, but they were less knowledgeable about the food's

nutritional value and how to use it properly. Because of this, the majority of respondents fell into the category of extreme poverty.

Table 13. Number and Percentage of Calorie Intake per Person per Day

Categories (K. cal)	No. of respondents (Percentage, %)	Per person per day average calorie intake (K. cal)
Ultra poor <1600	30 (25%)	1410.92
Hard-core poor 1600-1804	35 (29.17%)	1735.09
Absolute poor 1805-2122	25 (20.83%)	2082.25
Non-poor>2122	30 (25%)	2190.86

Source: Author's Estimation

Problems Faced by the Households

The majority of respondents in the research region experienced a variety of issues, including health issues, inadequate income, poor housing, inadequate waste management, inadequate sanitation, and more frequent water shortages than necessary. In a haor area there is a plenty of water but pure drinking water in inadequate still. For that reason the people of haor area suffer from various illness. The significant issues in this chapter are listed in Table 7.1.

Table 14. Problem Faced by the Household in the Study Area

Problems	No of respondents	Percentage (%)
Health	12	10
Pure drinking water	36	30
Sanitation	20	16.66
Food	12	10
House	10	8.33
Electricity	7	5.83
Education	13	10.83
Security	3	2.5
Others	7	5.83

Source: Field Survey, 2022

From Table 14 we find that about 10% respondents said that they don't get proper health facilities. About 30% respondents suffer from pure drinking water which was higher than the other problems. The second major problem was sanitation problem which was 16.66%. The third and fourth problems were education and health problem both were about 10.83% and 10&. About 10%, 8.33%, 5.83% and 2.5% of the respondents faced food problem, house problem, electricity and security problem respectively.

Conclusion

Every year, the haor basin suffers strange weather patterns and significant flooding. Their access to land and fishing sites is severely restricted. People in the haor area suffer greatly as a result of the geographical disparity. The primary goal of the study was to learn about the socioeconomic conditions caused by flooding and erosion, as well as the level of income diversity among the population and their food security status. Another goal of the study was to identify respondents' difficulties and generate ideas for how to improve their situation. The research was carried out in the Kishoregonj districts of Nikli and Tarailupazela.

Haor is a vast source of natural resources, offering considerable economic and livelihood advantages to the local community and the nation. Natural resources are not growing at the same rate as Bangladesh's population, which is growing faster than natural resources. Poverty has a tremendous impact on the climate, and it is rapidly approaching a tipping point in the study area, where people will begin depleting natural capital. The socioeconomic level of persons living in the surrounding area is influenced by income diversity. This land is mainly used for mono-crop farming, primarily winter boro rice cultivation. During the wet season, it submerges and becomes freshwater floodplains for fishing. The local populace faces food insecurity as a result of the haor-based economy's high seasonality and long periods of unemployment. They are consuming less calories than they require. This leads to health issues. For the future growth of Bangladesh's Haor regions, an integrated management plan and efficient strategies, including the use of wood and non-wood products, agriculture, fisheries, and biodiversity protection, are essential.

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