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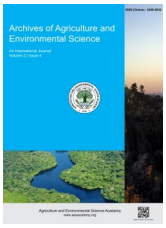

ORIGINAL RESEARCH ARTICLE

Assets possession and food consumption level of *haor* people in a selected area of Bangladesh

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ABSTRACT

Assets possession and calorie intake level of a household member reflect the livelihood patterns and food security condition of the household. The study was conducted to analyze the socioeconomic characteristics, identify the assets possession, determine the calorie intake level and analyze the perception of the households' livelihood improvement. An interview schedule was used in field survey for primary data collection. The DFID approaches of livelihood and the consumption data of *haor* households of seven days were used in the study. The findings revealed that about 24.61% of the respondents were illiterate, 32.31% respondents were can sign only and 30.77% respondents had primary education, average family size was 9.66, about 51% respondents' annual income was below Tk.60,000 (US$ 690) and, most of the respondent's (84.62%) occupation was agriculture and fishing. The human, social, natural, physical and financial capital of the *haor* respondents was in a vulnerable position. The findings also revealed that about 44.61% of the respondents belonged to the ultra-poor whose per day per person calorie intake was 1350.56k.cal. All of the respondents demanded the improved road and communication facilities which are essential for their livelihood and food security improvement. The *haor* is being tarnished fast due to mishandling and damaging activities. The government should take necessary steps to improve the road and communication facilities in the *haor* area which will foster the socioeconomic development of *haor* people in Bangladesh.

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INTRODUCTION

Bangladesh is one of small South Asian country with an area of some 1, 47, 570 sq. km, where nearly 16.7 million people struggle for survival. Bangladesh has a population density of 1115.62 persons per square kilometer (2889.45/square mile), which ranks 10th in the world (BBS, 2020). Bangladesh has to cope with poverty, population pressure, natural calamities, resources and food scarcity mostly. *Haors* with their unique hydro-ecological characteristics are large, bowl-shaped floodplain depressions located in the north-eastern region of Bangladesh covering about 1.99 million ha (19,998 sq km) of the area and accommodating about 19.37 million people. *Haor* is a low lying, bowl-shaped flood plain shaped by tectonic forces crisscrossed by numerous rivers descending from the hills of India carrying a huge volume of runoff water which frequently causes flash floods and extensive flooding during the monsoon season. The *haor* ecology is found primarily in northeastern Bangladesh and

comprises 25% of the entire region embracing 5 districts, namely, Moulovibazaar, Habigonj, Sunamgonj, Kishoregonj and Netrokona. There are 373 *Haors*/wetlands located in the districts of Sunamganj, Sylhet, Habiganj, Moulovibazar, Netrokona, Kishoreganj and Brahmanbaria (MoWR, 2012). These 373 *Haors* cover an area of about 859,000 ha which is around 43% of the total area of the *haor* districts. It is surrounded by the mountain ranges of India- Meghalaya to the north, Tripura and Mizoram to the south and Manipur and Assam in the east. A large area in the *haor* region is seasonally flooded cultivated and it is the It is the mixer of marshland habitats.

The region has distinctive hydrological characteristics. Annual rainfall ranges from 2200 mm along the western boundary to 5800 mm in its northeast corner and is as high as 12000 mm in the headwaters of some catchments extending to India (Rahman *et al*., 2014). Across the India borders, the *haor* areas in Bangladesh receive water from the Shillong plateau and the Tripura Hills catchments slopes. Flash flood is the main catastrophe in the *haor* area which destroys the primary production like boro rice and emerges threatens the lives and livelihoods of the households. Massive rainfall in the upstream hilly areas s main reasons flash floods. The *haor*/wetlands are among the most complex ecosystems in the world. This region is an ecological area that provides resources to sustain the people living in that ecosystem. The area suffers from occasional flash floods coming from the Himalayan foothills in the month of March, April and May. Because of their unfavorable topographical location, *haor* inhabitants are identified one of the most vulnerable people in Bangladesh. They are vulnerable to frequent natural disasters, poor or inadequate infrastructure, food insecurity, remoteness, landlessness, ecological degradation, unsafe drinking water and sanitation, deforestation, inadequate livelihood opportunities, and overall poor service provision. The main sources of income in the *haor* area are producing boro rice and catching fishes. Most of the villagers switch occupations between seasons because of the long monsoonal wet season. Fisheries and agriculture are the two major livelihoods for local people living in and around the *haor*. People living in these inaccessible pockets face numerous problems concerning livelihoods and survival and cannot take full advantage of the services provided by the government and other civil society organizations.

Siddique (2020) found that the situation of food availability, access and utilization remain challenged, considering Bangladesh's unique context and the emergence of issues such as climate change, food price crises, and food safety and nutrition concerns. Nurullah and Sarkar (2020) found that status and pattern of community livelihood of the *Chalan Beel* area and its dependence on natural resources. Roy *et al.* (2019) argued that regardless of the progress in many aspects of food security in Bangladesh, people are still deficiency of nutritional divergence, which leads to dietary disparities. Uddin *et al.* (2019) found that the business environment in the *haor* areas has a high potential to be exposed with the integration of available local agricultural resources. Government price support and improved market management are recommended for accessibility and appropriate use of agricultural inputs, and for managing local productive resources in the use of business prospects in the study areas. Kazal *et al.* (2018) found that 45%, 29% and 19% of the households suffered from 'normal', 'moderate' and 'severe' food insecurity, respectively in the *haor* area in Bangladesh. Yeasmin *et al.* (2018) revealed that in order to maintain their livelihoods, the majority of the respondents had insufficient human resources and had low to medium physical facilities and women in the *haor* area face a severe lack of financial capital, as well as a lack of natural capital and a weak social network. Uddin *et al.* (2018) recommended that input subsidy and output price support programs should be properly implemented and sufficient work opportunities should be created by government and non-government organizations to support the *haor* dwellers in the crisis period and for moving away from a single cropping pattern to a double or triple cropping pattern. Being geographically remote, ecologically vulnerable and environmentally isolated, poverty is severe and livelihood is onerous in the northeastern *haor* area in Bangladesh. Livelihood in the *haor* area is sensitive to seasonal occupational mobility. In view of all these, the present study was designed to make an empirical analysis on assets possession and food consumption level of *haor* households in Bangladesh.

MATERIALS AND METHODS

A sample of 65 households was randomly selected from three villages namely; Palgaon, Banuhary and Vatia under the Mohonganj upazila of Netrokona district in Bangladesh. The study area was selected because easy access to the *haor* people and familiarity of the area. Primary data were collected through field survey and focus group discussion. A semi-structured interview schedule was used in the field survey. The time period of the data collection was September to November, 2020. Data were presented mostly in tabular form, because it is simple in the calculation, widely used and easy to understand. Tabular analysis mainly based on some statistical measures like averages, percentages, etc. To measure the livelihood assets possession, the DFID sustainable livelihoods framework was used (Figure 1). To determine the calorie intake level of the sample households, the food consumption data of *haor* households of seven days were measured by the per person per day calorie intake level, each food item which was consumed by the family members of the sample households was converted through standard value of 100 gm of each food item. The OECD modified equivalence scale was used calculating the calorie intake level. This scale, first proposed by Hagenaars *et al*. (1994), assigns a value of 1 to the household head, 0.5 for each additional adult member and 0.3 for each child.

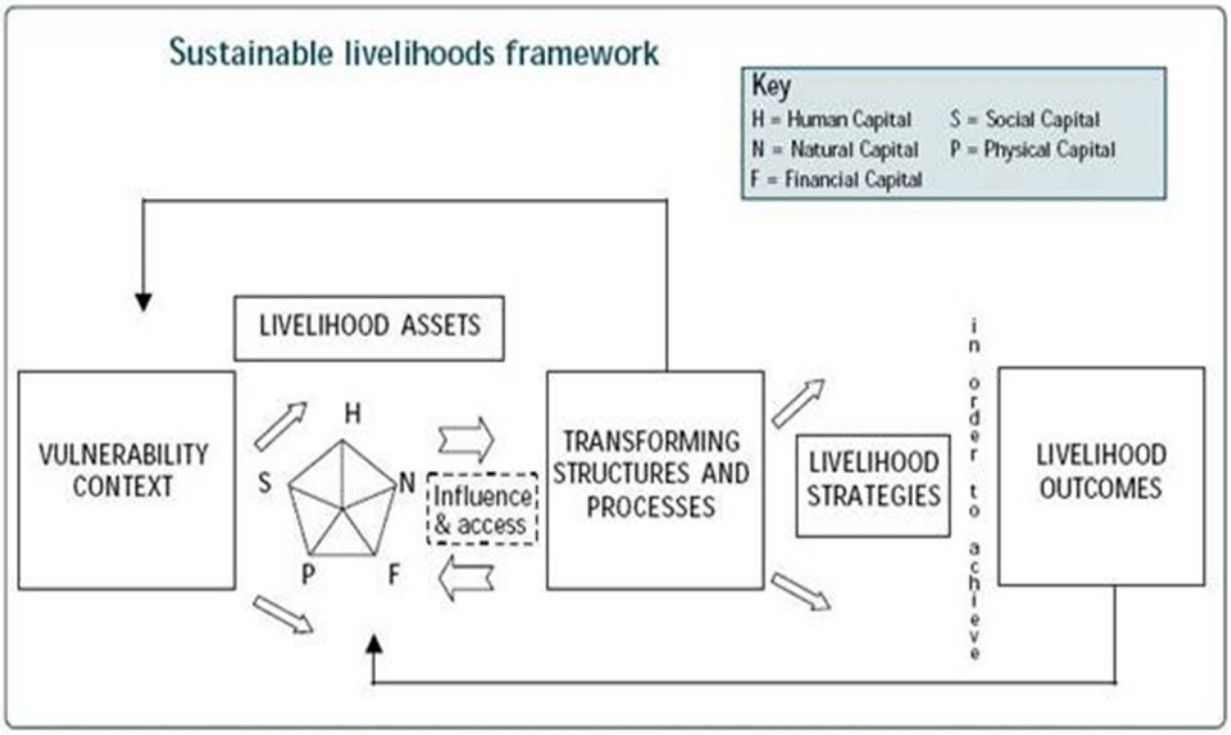

Figure 1. *DFID Sustainable Livelihoods Framework; Source: DFID, 2000.*

RESULTS AND DISCUSSION

Age

In this study, the age groups of the selected sample respondents are classified into three categories according to the working age classification of Bangladesh Bureau of Statistics (BBS, 2020). The categories are:

Below 30 years,

Age between 30-50 years and

Above 50 years.

In the following Table 1, it can be seen that, about 20% and 13.33% respondents were below 30 years in Banuhary and Vatia village respectively. There were no respondents in the Palgaon village under 30 years. The percentages of respondents who were between 30-50 years old were 83.33%, 30% and 66.67% in Palgaon, Banuhary and Vatia villages, respectively. Above 50 years old, the respondents were 32%, 50%, 20% in Palgaon, Banuhary and Vatia villages respectively. So, it can be said that most of the respondent's age was between 30 to 50 years.

Education

Education plays an important role to make a nation develop. Education is the most victimized sector in *haor* area. In terms of mainstream socioeconomic development initiatives, *haor* areas people are becoming increasingly marginalized. There are a small number of schools in *haor* area, thus in most cases, children have to attend school outside their settlement. The respondents were classified into the following five categories (Table 2). Table 3 reveals that there were a few illiterate members in Palgaon and Vatia villages. It can be seen that there were no members above the secondary education in Palgaon and Vatia villages. There was one respondent in Banuhary village whose educational level was above secondary education. The 50% respondents could sign only in Palgaon village. In Banuhary, 60% respondents'education was primary level. In total, 32.31% respondents could sign only, 30.77%, respondents' education was primary, 10.77% respondents' education was secondary level and only 1.5% was above secondary. So, it could also be concluded that the education level of the *haor* respondents of the selected 3 villages was not so satisfactory level.

Occupational status of earning members of the sample households

The word 'occupation' is understood as paid work. The occupation of where major family income has been derived during the study year is defined as the occupation of the family. Occupational status is a fundamental measure of social standing which is a key measure of socioeconomic status. Farmers in Haor areas have very diverse crop production practices, economic activities, and overall livelihoods than those in other parts of the country (Kashem *et al.*, 2013). It was found that the earning members of respondents' family were engaged in mainly 3 types of occupation but there was hardly engaged in garments labor, carpenter etc. A number of respondents' occupation was agriculture. In this study, the occupational status of earning members of the respondents was observed on the basis of 3 categories which are presented in Table 4.

Family size

The family size of the respondent's household ranged from two to twelve members. The family size of the respondents was classified into three categories:

Small (up to 3 members)

Medium (4-6 members) and Large (7 and above)

Table 1. Distribution of the respondents according to their age.

Categories according to age	Palgaon (30)		Banuhary (20)		Vatia (15)	
	Number	Percentage	Number	Percentage	Number	Percentage
Below 30 years	-	-	4	20	2	13.33
30-50 years	25	83.33	6	30	10	66.67
Above 50 years	5	16.67	10	50	3	20

Source: Field Survey, 2020.

Table 2. Categories of educational level.

Category	Years of schooling
Illiterate	No schooling
Literate	Can sign only
Primary education	1-5 years schooling
Secondary education	6-10 years schooling
Above secondary education	Above 10 years schooling

Source: Mustaree, 2010.

Table 3. Educational level of the respondents.

Village	Illiterate		Can sign only		Primary education		Secondary education		Above secondary education		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Palgaon	10	33.33	15	50	3	10	2	6.67	-	-	30	100
Banuhary	-	-	2	10	12	60	5	25	1	5	20	100
Vatia	6	40	4	26.67	5	33.33	-	-	-	-	15	100
Total	16	24.61	21	32.31	20	30.77	7	10.77	1	1.54	65	100

Source: Field Survey, 2020.

Table 4. Primary occupational status of the sample households.

Village	Categories according to occupation				
	Agriculture	Fisherman	Day laborer	Others	All
Palgaon	25 (83.33%)	3 (10%)	2 (6.67%)	-	30
Banuhary	9 (45%)	4 (20%)	7 (35%)	-	20
Vatia	5 (33.33%)	9 (60%)	-	1 (6.67%)	15
Total	39 (60%)	16 (24.62%)	9 (13.85%)	1(1.54%)	65

Source: Field Survey, 2020.

Table 5. Distribution of respondents according to their family size.

Categories according to family size	Palgaon (30)			Banuhary (20)			Vatia (15)		
	No.	Total	Average	No.	Total	Average	No.	Total	Average
Small family (Up to 3)	3	9	3	1	3	3	-	-	-
Medium family (4-6)	17	89	5.24	13	67	5.15	2	10	5
Large family (7 and above)	10	125	2.5	6	75	12.5	13	135	10.38
Total/ Average	30	223	7.43	20	145	7.25	15	145	9.66

Source: Field Survey, 2020.

Table 5 depicts that the average family size in Palgaon, Banuhary and Vatia was about 7.43, 7.25 and 9.66, respectively. It is observed that in the Palgaon village most of the families belong to the medium family (4-6). And overall, most of the respondents belong to the large family in both the 3 villages and their averages are 12.5, 12.5 and 10.38 respectively.

Annual income of the households

Household income in the *haor* area is subject to a diversity of uncontrolled, semi- controlled and controlled factors. Floods, remoteness, and inadequate infrastructure facilities affect rural household incomes. The primary income of the *haor* households is derived from paddy mono- cropping cultivation subject to the ecological, geographical and environmental attributes of the *haor* ecosystem. The ecological attributes constrain income sources, forcing the inhabitants to maximize their incomes from the dry season agricultural activities which can be damaged by flash floods, hail storms and dry weather causing crop damage and affecting the household and community economic sustenance. This study is consistent with the findings of Nurullah and Sarkar (2020) who found that the income of the households fluctuates due to seasonal variations in occupation and the biological parameters of the wetland area have a strong influence on household income. The annual income of a family has been

Table 6. Distribution of sample households on the basis annual average income.

Village	Categories according to income (Tk.)							
	Low income (Up to Tk. 60,000) (US$ 689.58)		Medium income Tk. (60,001- 100,000) (US$ 689.5- US$ 1149.29))		High income Tk. (>100,000) (>US$ 1149.29)		Total	
	No.	%	No.	%	No.	%	No	%
Palgaon	17	56.67	10	33.33	3	10	30	100
Banuhary	10	50	9	45	1	5	20	100
Vatia	6	40	7	46.67	2	13.33	15	100
Total	33	50.76	26	40	6	9.23	65	100

Source: Field Survey, 2020 (US$ 1= Tk.87.01).

Table 7. Human capital of the respondents.

Items	Degree of ranking			
	Low	Moderate	high	Total
Education	40 (61.54%)	23 (35.38%)	2 (3.08%)	65 (100)
Health status	47 (72.30%)	10 (15.38%)	8 (12.31%)	65 (100)
Skills and knowledge	45 (69.23%)	12 (18.46%)	8 (12.31%)	65 (100)

Source: Field Survey, 2020; (Figures in parentheses indicate percentages).

Table 8. Social capital of the respondents.

Items	Degree of ranking			
	Low	Moderate	High	Total
Formal and informal groups	36 (55.38%)	20 (30.77%)	9 (13.85%)	65
Women empowerment	58 (89.23%)	7 (10.77%)	-	65
Leadership	60 (92.31%)	5 (7.69%)	-	65
Network and connection	50 (76.92%)	10 (15.38%)	5 (7.69%)	65

Source: Field Survey, 2020; (Figures in parentheses indicate percentages).

estimated based on yearly earnings from all sorts of Income Generating Activities (IGAs) by the active male and female members of the family. Average total family income has been calculated by adding up farm and nonfarm sources of income during the study period. Table 6 reflects that the 56.67% respondents' incomes were low in Palgaon village. The highest percentage of the respondents was within the middle-income range in Vatia village which was about 46.67%. Under the low-income category in Vatia village was 40%. The total percentages of three selected villages under the range of low, medium, high income were about 50.76%, 40% and 9.23% respectively. So, it can be said that the most of the respondents' income is low. As a result, they have to face many problems and they are often failing to lead a proper, healthy and secured life. According to the respondents' socioeconomic profiles, Islam *et al.* (2019) found that *haor* farmers come from a poor socioeconomic background and have limited access to education, income, and agricultural training opportunities because they live in a rural area with few of these resources. Furthermore, they are members of an extended family with a small farm.

Livelihood assets

Livelihoods assets are valued things which people can derive a flow of income or consumption and invest in so as to increase future flows of income or consumption. Sustainable livelihoods (SL) thinking gained ground, in the Department for International Development (DFID) poverty reduction efforts in the 1990s.

The DFID SL framework divides the livelihood assets into 5 capitals. They are:

Human capital (e.g., education, health);

Social capital (e.g., community networks);

Natural capital (e.g., land); Physical capital (e.g., infrastructures like markets and roads); and Financial capital (e.g., access to credit).

Human capital

Human capital is the personal qualities and characteristics that enhance the individual health, happiness and well- being of each family member. Human capital consists of education, health status, skills and knowledge, and training facilities of the people which is also known as human capital. It can improve the standard of living of the households.

From the Table 7, it can be revealed that, the percentage of education was the lowest of the 61.54% respondents. Similarly, the health status and skills and knowledge were also low ranked of the 72.30% and 69.23% of the respondents respectively. So, their educational status, health status, skills and knowledge have to be increased to improve livelihoods. It is clearly observed the human capital of the respondents is not good.

Social capital

Social capital is the networks, organizations and institutions, including norms of reciprocity and the mutual trust that exist among and within groups and communities. Social capital in-

Table 9. Natural assets in the respondents.

Items	No. of Respondents	Percentage
Land (owned)	35	53.84
Land (lease/mortgage)	30	46.16
Total	65	100

Source: Field Survey, 2020.

Table 10. Physical capital (agricultural equipment).

Items	No. of Respondents	Percentage
Weeder	14	21.54
Harvester	2	3.08
Fishing net	21	32.31
Shallow tube well	0	0
Deep tube well	10	15.38
Ladder/rake	52	80

Source: Field Survey, 2020.

Table 11. Average amount of household furniture/ modern amenities.

Items	No. of Respondents	Percentage	No. of per items	Amount (Tk.)	Average amount (Tk.)
Chair	65	100	142	78100 (US$ 897.60)	550 (US$ 6.32)
Chauki	65	100	117	480000 (US$ 5516.61)	4102.56(US$47.15)
Table	65	100	71	50000 (US$ 574.65)	704.23(US$8.09)
Alna	51	78.46	51	80000 (US$ 919.43)	1568.62(US$18.03)
Television	24	36.92	24	530000 (US$ 6091.25)	22083.33(US$253.80)
Showcase	32	49.23	32	195000 (US$ 2241.12)	6093.75(US$70.04)

Source: Field Survey, 2020 (US$ 1= Tk.87.01).

volves with network and connection (kinship and patronage), formal and informal social relationships, common rules and sanctions, women empowerment, leadership etc. According to these assets people work together and help each other which help them to improve the communities. From the Table 8, it reflects that most of the respondents of *haor* area were very poor in leadership and women empowerment and the percentages were 92.31% and 89.23% respectively. Similarly, 76.92% respondents' network and connection facilities were low ranked. So, the social capital of the respondents is vulnerable.

Natural capital

Natural capital is the capital of the natural environment. These include land (owned) and land (lease/mortgage). In the Table 9, it represents that out of 65 respondents, 35 respondents had owned land. The percentage of owned land is higher (53.84%) than the land leased. The percentage of land (lease/mortgage) was 46.16 %. Out of 65, 30 respondents lease the land.

Physical capital

Physical capital also known as the tangible asset is an object which has value. A physical asset is an item of economic, commercial or exchange value that has a material existence. Table 10 shows the values of agricultural equipment.

Agricultural equipment

Agricultural equipment or machinery relates to the mechanical structures and devices used in farming or other agriculture. Agricultural equipment means a device, part of a device or an attachment to a device designed to be principally used for an agricultural purpose. Actually, agriculture equipment includes the deep tube well, shallow tube well, dram seeder, harvester, plough, fishing net, ladder /rake, axe and others. Table 10 reveals that out of 65 respondents only 14 respondents have a weeder machine and the percentage is 21.54%. Only 3.08% respondents have the harvester machine. The number of ladder or rake is sufficient due to their fewer prices, but the other equipment is insufficient because of their higher price. Most of the respondents have to depend on rented agricultural equipment. There is no shallow tube-well of their owned that's why the respondents of the *haor* area have to face some problems The percentage of fishing net is 32.31% and the deep tube well is 15.38%.

Household furniture

Household furniture means all movable compactible articles or apparatus such as chair, tables, sofas, almirah, alna and others. Table 11 represents that 65 respondents had a total of 142 chairs and the average amount was Tk. 1201.54 (US$13.81).The average amount of chauki was Tk. 4102.56 (US$47.15). Among the 65 respondents, 51 respondents had 51 alnas and the average amount was Tk. 1568.62 (US$18.03). The average value of television and showcase was Tk. 22083.33 (US$253.80) and Tk. 6093.75(US$70.04), respectively.

Table 12. Average amount of financial assets of the samplehouseholds.

Items	No. Respondents	Percentage	Average Amount (Tk.)
Cash in hand	16	24.62	687.50 (US$ 7.90)
Poultry birds	65	100	1330 (US$15.29)
Dairy cows	65	100	68185 (US$ 783.65)
Goats	65	100	2092 (US$ 24.04)
Ducks	65	100	222 (US$ 2.55)

Source: Field Survey, 2020 (US$ 1= Tk.87.01).

Table 13. Food intake per person per day.

Major food items	Per person per day food intake (g/person/day)	National Average per person per day food intake (g/person/day)	Difference from national average (g/person/day)
Rice	313.88	515.16	-201.28
Potato	78.47	96.45	-17.98
Vegetables	190.35	109.58	80.77
Pulses	15.26	9.86	5.4
Oil	19.05	5.75	13.33
Meat	25.76	23.24	2.54
Egg	5.03	8.03	-3
Milk	38.09	21.64	16.45
Fish	37.69	44.65	-6.96

Source: Authors Estimation.

Financial capital

Financial capital or asset is a non-physical asset whose value is derived from a contractual claim such as, bank deposits, bonds and participation in companies' share capital. These assets are typically more liquid than other touchable assets. Access to financial capital provides insurance to manage risks and cope with vulnerability. In the case of *haor* people, they have less scope and determination to save and thus cannot depend on the formal financial system. In the *haor* areas, the poor are forced to borrow money from informal and exploitative moneylenders as they have little collateral; microfinance institutions can play a crucial role in this regard. Table 12 represents that out of 65 respondents only 16 respondents had cash in hand and the percentage and average amount were 24.62% and Tk. 687.50 (US$ 7.90) per month respectively. All the respondents had poultry birds, dairy cows, goats and ducks. The average amount of poultry, dairy cows, goats and ducks were Tk. 1330 (US$ 15.29), Tk. 68185 (US$ 783.65), Tk. 2092 (US$ 24.04) and Tk. 222 (US$ 2.55), respectively. So, the financial capital of the *haor* respondents is not in sound condition.

Food consumption status sample households

Table 13 shows that there is a column of the national average per person per day food intake and per person per day food intake from the respondents. From the Table 13, it reveals that there was a lacking of the calorie intake of the respondents from the national average and per person per day rice consumption level was 313.88 g at the household level whereas the national average per person rice consumption was 515.16 g. There had 201.28 gm deficiency from the national average food intake. Similarly, the potato consumption per person per day food intake was 78.47 g whereas the national average per person per day was 96.45 g. There had a deficiency of 17.98 g. The respondents consumed vegetables 80.77 g more than the national average food intake. It is clearly observed that the respondents' food consumption status is not so good. Because the people in *haor* area are mainly depend on low- cost food consumption or reduced the amount of food either by amount or by the number of meals. Another cause due to flash floods their cultivated crops is damaged, as a result, they are failing to meet their proper food consumption. So, the government should undertake special programs for promoting appropriate agricultural technologies for the *haor* vulnerable people.

Calorie intake

Calorie intake is defined as the amount of energy consumed via food and beverage. The amount of food consumed by a household from that per capita calorie intake was measured. It was classified into the following four categories in Table 14. Table 15 reflects the percentage of calorie intake with respect to per person per day average calorie intake by the sample household. About 44.61% of the respondents belonged to the ultra-poor whose per day per person calorie intake was 1350.56k.cal. The persons belonged to the hard-core poor whose average per person per day calorie intake was 1700.81 k.cal. About 24.62% of the respondents had an average per person per day calorie intake 1990.32 k. cal. and they belonged to absolute poor. The rest 7.69% of the respondents took above 2122 kilo cal. Therefore, it can be summarized that, most of the respondents are ultra-poor. They do not have sufficient knowledge to utilize the food adequately and for this reason, the present study, most of the respondents are ultra-poor among the respondents.

Perception of respondents for their livelihood improvement

Livelihoods in *haor* area of Bangladesh directly or indirectly depend primarily on agriculture and fishing. Developments in

Table 14. Categories of people according to calorie intake.

Category	Calorie (k.cal)
Ultra-poor	<1600
Hardcore poor	1600-1804
Absolute poor	1805-2122
Non-Poor	Above 2122

Source: Bangladesh Economic Review (2020).

Table 15. Calorie intake by the household's members.

Categories	No. of respondents	Per person per day average calorie intake (k. cal)
Ultra-poor<1600 k.cal.	29 44.61%)	1350.56
Hardcore poor 1600-1804 k.cal.	15 (23.07%)	1700.81
Absolute poor 1805-2122 k.cal.	16 (24.62%)	1990.32
Non-poor above 2122 k .cal.	5 (7.69%)	2143.91

Source: Authors Estimation; (Figures within parentheses indicate percentages of total).

Table 16. Perception of households for livelihood improvement.

Suggested initiatives	Number of times priority was ranked				
	First	Second	Third	Fourth	Total (n = 65)
Improved road and transport system	58 (89.2%)	4 (6.15%)	2 (3.07%)	1 (1.52%)	65 (100%)
Pure drinking water	48 (80%)	8 (13.33%)	1 (1.52%)	3 (5%)	60 (92.3%)
Proper education	37 (61.6%)	14 (23.3%)	8 (13.33%)	1 (1.52%)	60 (92.3%)
Proper health facilities	30 (50%)	20 (33.33%)	6 (10%)	4 (6.66%)	60 (92.3%)
Job opportunity	42 (70%)	10 (16.67%)	5 (8.33%)	3 (5%)	60 (92.3%)
Rehabilitation of flood management facilities	20 (36.36%)	22 (40%)	10 (18.18%)	8 (14.55%)	55 (84.62%)
Marketing facilities	26 (52%)	10 (20%)	20 (40%)	4 (8%)	50 (76.9%)
Government incentives	15 (33.33%)	35 (77.77%)	6 (13.33%)	4 (8.89%)	45 (69.23%)

Source: Field Survey, 2020; (Figures within parentheses indicate percentage of total).

the agriculture sector through the mechanized way can boost the rice production, rural employment, and poverty alleviation in these haor regions (Alam *et al*., 2021). In the *haor* region, the vulnerabilities of the ecosystem can create additional pressures on livelihoods governed by agricultural crop cycles. The study area is poverty-stricken; highly flood-prone provides fewer opportunities for livelihood diversification and forces its vulnerable population to migrate elsewhere in search of supplementary income sources. This research is an attempt to study the food security and livelihood patterns of the *haor* area's people. The *haor* dwellers mainly rely on Boro crops and fishing while a minority section depends on livestock rearing and day laborers. They face various problems; the road and transport system is one of them. They think that some initiatives can improve their socioeconomic conditions. These are:

Improved road, transport and communication systems,
Proper education,
Proper health facilities,
Job opportunity,
Rehabilitation and construction of flood management facilities,
Marketing facilities,
Government incentives,
More extension services, etc.

The Table 16 reflects the perception of households for improving livelihood patterns of the respondents in *haor* area. Table 16 reveals that out of 100% respondents, 89.2% opined the improved road and transport system as the first priority for their livelihood improvement, among them 6.15% as a second, 3.07% as a third and 1.52% as a fourth priority respectively. The lacking of pure drinking water was another fatal problem in the *haor* area. Out of 65 respondents, 60 respondents had opined on their lacking of pure drinking water. Out of 92.3% people, 80% respondents told pure drinking water as a first, 13.33% as a second and 1.52% as a third and 5% as a fourth demand. Out of 92.3 %, 61.6% thought that the proper education was not got available to improve their standard of living and ranked as a first. They had demanded that if they were properly educated then it would be helpful to improve their livelihood status and ensure food security. Among 92.3 % respondents, 50% respondents demanded the deficiencies of health facilities as a first problem, 33.33 % as a second, 10% as a third and 6.66 % as a fourth respectively. About 70 % respondents thought that if they got the job opportunity from various sectors, it would be better for their livelihood improvement. According to Rahaman *et al.* (2021), poverty, lack of basic infrastructure and utilities, lack of awareness, and a lack of external help have already placed people in *haor* regions in a vulnerable position, while repeating natural calamities and changing climatic patterns

have made the constraints practically unbearable.

The improvement of the livelihood pattern of *haor* people is very important for the overall development of the country. Besides this, for the improvement of *haor* people; Firstly, need to ensure the security of the crops cultivated in the area. Early flash flood is a matter of prime concern for the *haor* area. Flash flood damages the Boro crop which is the only means of livelihood for most of them. Secondly, the roads transport networks and other communication means need to be improved taking the ecological aspect of the area into account. Thirdly, by rehabilitating and constructing the flood management facilities, agriculture and fishery productivity have to be increased. Fourthly, the government should encourage private sector investment and small-scale entrepreneurship in *haor* areas. In addition to government efforts and NGOs should also come forward with some skills development programs. National policies and development initiatives should give special focus on the *haor* region. Proper execution of Delta Plan 2100 and a special allocation for the *haor* in our budget is also essential.

Conclusion

Bangladesh has achieved significant socioeconomic progress in recent decades. A review of progress made by the United Nations and Planning Commission, the Government of Bangladesh reveals that Bangladesh has made great strides in achieving the Millennium Development Goals (MDGs) of reduction of poverty and under nutrition, universal access to primary education; gender equality in schooling and maternal mortality, but the progress has not been uniform throughout the country. The *haor* area is one of them. The majority of the households in the *haor* areas are usually vulnerable to different types of seasonal shocks and disasters, mainly due to the special geographical condition of *haor* region. They are vulnerable to various natural disasters, poor or inadequate infrastructure, remoteness, landlessness, unsafe drinking water etc. Without the improvement of *haor* people livelihoods and food security, the overall development of the country will not be possible. For poverty alleviation and improvement of livelihoods in the *haor* region, the government should consider policies and interventions oriented to the modernization and intensification of the agricultural sector, blending education with new technology and agricultural research. Since the area is highly vulnerable to flash floods, high priority should be accorded to the construction, renovation and maintenance of the *haor* dike and the embankment network to protect the dry season crop from its depredations.

Conflict of interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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