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ORIGINAL RESEARCH ARTICLE

Livelihood assets and food consumption status of riverbank erosion hazard people in a selected area of Bangladesh

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ABSTRACT

Riverbank erosion is a major threat to Bangladesh refers to an endemic and recurrent natural hazard of our country. The study was conducted to identify the socioeconomic characteristics, find out the root causes of riverbank erosion, determine the livelihood assets and measure the calorie intake level of the riverine people. Primary data were collected from Jamalpur district in Bangladesh. The DFID approaches of livelihood and the consumption data of riverine households of seven days was measured by per person per day calorie intake level. The findings revealed that 72% of the respondents belonged to the age up to 60 years, 33.33% respondents' education level was primary, 36% of the respondents' primary occupation was agriculture, and 40% respondents had annual household income more than Tk. 100000 (US$ 1556.60). Most of the households identified flood, heavy rainfall, and stream of current as the main cause of riverbank erosion. Overall, human assets were in good position. About 54% respondents used leased land for their cultivation and 37.33% respondents had cash in hand. About 80% of the respondents belonged to the poor and their calorie intake level was < 2122 K. Cal. The Water Development Board of Bangladesh needs more attention to riverine people for improvement of their livelihood and food security status.

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INTRODUCTION

Bangladesh is a heavily-populated, mainly riverine country located in South Asia with a landfall of 580 km on the northern in-shore of the Bay of Bengal (Wikipedia, 2011). Rivers always vary their path, changing shape and depth, trying to make a balance between the sediment transport capacity of the water and the sediment supply. This process is called riverbank erosion. Riverbank erosion is often induced by failing of a riverbank causing high sediment loads or heavy rainfall (Islam and Rashid, 2011). Riverbank erosion is one of the very serious disasters of Bangladesh. This is not for only for the natural causes, but also human activities like unplanned dressing of the river. It causes uncertain adversity to thousands of people every year living along the banks of rivers in Bangladesh. Every year, millions of people of our country are affected by erosion that demolishes many kinds of resources such as standing crops, farmland and homestead land etc. (Samsuzzaman, 2018). Only riverbank erosion has executed millions of people shelter less and has become a major social jeopardy. People, who live near riverbanks, become victim of erosion, which forces them to change their livelihood and food security (Islam *et al.*, 2017).

A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living. A livelihood is sustainable which can cope with and recovers from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits

to other livelihoods at the local and global levels and in the short and long term (Chambers and Conway, 1992). Livelihood assets are something from which people derive a flow of income or consumption. They are also something people invest in so as to increase future flows of income/consumption. Better access to assets is a desirable outcome of any livelihood strategy. Livelihood strategies may enter upon increasing the range of assets to which a person or household has access, or on increasing access to particular types of capital. The ultimate motive of these investment strategies is to develop long-term livelihood security and the quality of life of more generally.

The livelihood of the majority riverine people depends on agriculture which is most affected by river erosion. Therefore, their socio economic condition is vulnerable. Riverbank erosion causes trouble for village agriculture. Along with homestead adjustments, it erodes farmland, infrastructure and the communication system. It affects the crop income of vulnerable groups. The farmers are the worst affected. The affected people lose their assets and are forced to draw on savings and often fall into further liability. Displacement is the quick impact of riverbank erosion. The displaced people usually move to nearby areas but displacement to distant places are not uncommon. In erosion-prone areas, most families have witnessed a migration in their lifetime. The female-headed households uprooted by riverbank erosion and residing on embankments are the most divested group.

Food security gives top most priority in Bangladesh. Food security achievement is the key development priority for all developing countries such as Bangladesh (Parvin and Ahsan, 2013). The hidden type of hunger that is caused by deficiencies in micronutrients such as iron, Vitamin A, and Zinc affects two billion people worldwide (FAO, 2014). In Bangladesh food insecurity situation is more severe; overpopulation along with the decrease of the land-to-human ratio (Shaheen and Islam, 2012) has made the need for food security of utmost necessity. Food security embraces four key dimensions of food availability, access, utilization, and stability. Bangladesh is an agrarian country where more than half of the population is engaged directly in agriculture for survival (Jolliffe *et al*., 2013). About 14.17% of GDP share of the national economy comes from the agriculture sector (BBS, 2017). Bangladesh has nearly achieved self-sufficiency in food production (Mannaf and Uddin, 2012), especially in the case of rice. The production of rice (staple food of Bangladesh) was assumed to be tripled over the last 30 years. The staple food of most people in Bangladesh is rice and more than 70% of their daily calories come from rice (Magnani *et al*., 2015). Hence, food security is considered synonymous with self-sufficiency in rice production (Hossain, 2013).

Malak *et al.* (2021) found that a significant portion of migrants changed their livelihood occupation in Bhola district in Bangladesh. The displaced people shifted their shelter to live in road-come-embankment, annually leased land, and "housing without rent for humanity" provided by the local government. People also migrated to large cities such as Dhaka and nearby towns to seek employment. Islam *et al.* (2020) carried out a study in Bhola district of Bangladesh and found that the river erosion wreaked havoc on the communities' physical resources and increased their psychosocial vulnerabilities such as forced displacement, social insecurity, food insecurity, breakdown of socio-cultural bondage and networks, and decreased social esteem. Rahman and Gain (2020) identified that river bank erosion negatively affects people and their livelihood with their economic, social and psychological distress increasing over the time. It was observed as a risk that river bank erosion is causal factors of migration, vulnerability and hindrances of rural socio-economic, cultural, psychological and environmental development. Aditi (2020) found that river banks are made of stratified layers with cohesive and cohesion less materials. Alam *et al.* (2019) suggested that interventions such as access to institutions and credit facilities, human capital development and a package of technologies through agro-ecological based research for emerging char land (sandbars) were required to build the resilience of the riverine households as well as improve their food security and livelihoods. Barua *et al.* (2019) found that riverbank erosion is addressing displacement, hidden hunger and poverty, loss of land and identity of coastal people. Besides, displaced persons faced social, economic, cultural stigma in their community. Sarker *et al.* (2019) observed that riverbank erosion, frequent flood inundation, and lack of employment and access to basic public services are the major social and natural drivers of livelihood vulnerability. *Char*-based policy, focusing on short- and long-term strategy is required to reduce livelihood vulnerability and enhance char-dweller resilience.

It is clear that the livelihood asset loss is not trivial, extent of riverbank erosion is high in the disaster-prone country and displacement of people is needed to give maximum attention. To protect the lives and livelihood assets and ensure the food security of riverine people from riverbank erosion, there should be appropriate and effective policy and programmes of the government as well as non-governmental organizations. This research work was trying to answer the following research questions: what are the socioeconomic conditions of the river erosion hazard people? What are the root causes of riverbank erosion in the study area? What are the livelihoods assets hold by the river erosion hazard people? What are the food consumption levels of the river erosion hazard people? The objectives of the study were to analyze the socioeconomic characteristics, find out the root causes of riverbank erosion, measure the livelihood assets, and determine the calorie intake level of the riverbank erosion hazard households in the study area.

MATERIALS AND METHODS

A sample of 75 households was randomly selected from Dewanganj upazila of Jamalpur district in Bangladesh. The study area was selected because of the intensity of riverbank erosion hazard and familiarity of the area. Data were collected through field survey using a semi-structured interview schedule. The time period of the data collection was January to July, 2020. Several Focus Group Discussions (FGDs) were also made. Data

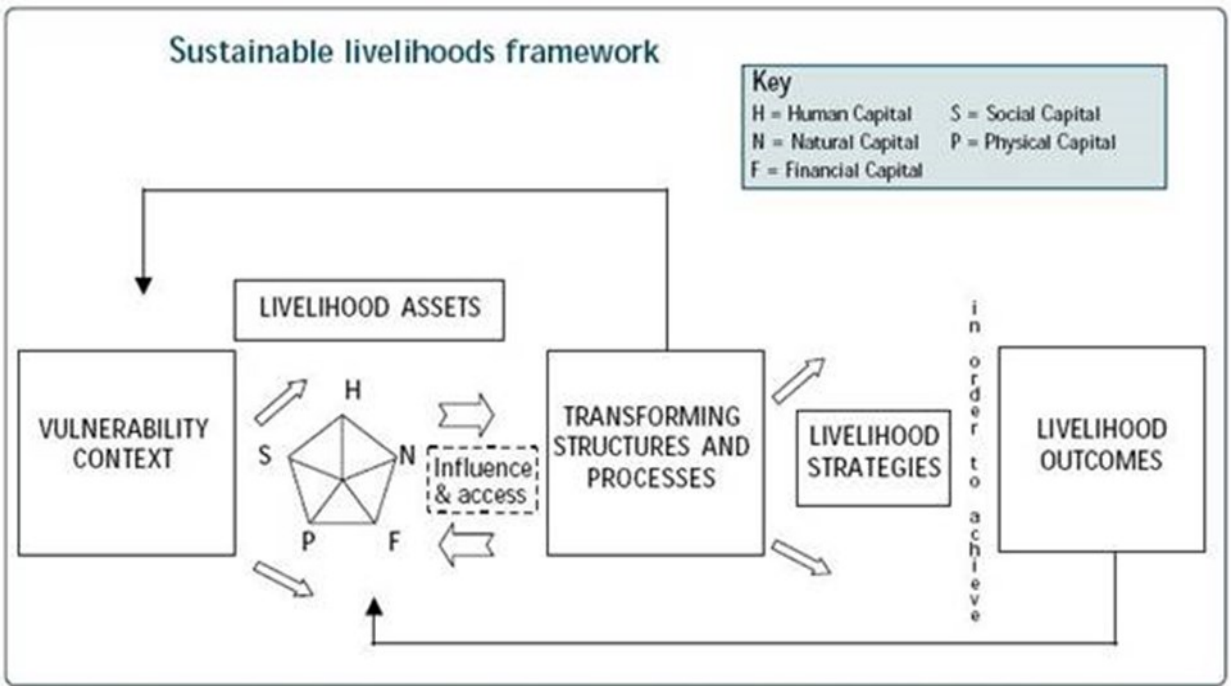

Figure 1. *DFID Sustainable Livelihoods Framework (Source: DFID, 2000).*

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, the DFID sustainable livelihoods framework was used (Figure 1).

To determine the calorie intake level of the sample households, the food consumption data of tribal 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. For the calculation, the OECD modified equivalence scale was used. This scale, first proposed by Hagenaars *et al.* (1994), assigns a value of 1 to the household head, of 0.5 for each additional adult member and of 0.3 for each child.

RESULTS AND DISCUSSION

Age

A family was considered as a group of individuals living together, taking meals together and living under the control of one head. It included husband, wife, son, daughter, father, mother, brother, sister etc. The respondents were classified into three categories: 1) below 35 years old 2) between 35-60 years old and 3) above 60 years old. Table 1 shows that, 37.33% respondents were under 35 years old, 34.67% respondents were between 35 -60 years old and 28 % respondents were above 60 years old in the study area. Young respondents were a little bit more compared to old age respondents.

Education

Education helps the unvarying development of a country by fighting the inequalities of society. Education improves the thinking of the social order and helps to rip up social evils. The respondents were classified into five categories (Table 2). Table 3 reveals that among the total respondents the number of illiterates was above 9%, 10% respondents can sign only, above 33% received primary education, 36% received secondary education and above 10% respondents received above secondary education.

Occupational status of earning members

Occupation means "a specific continued activity affianced in especially in earning one's living," occupation implies work in which one engages recurrently. The occupation of where major family income has been acquired during the study year is defined as the occupation of the family. It was noticed that most of the members of the respondent's family were engaged in various types of occupation, such as agriculture, fishing, day labor, garment labor, business, an auto rickshaw driver, NGO worker, parlor worker, grocery shop etc. Most of them were mainly engaged in agriculture. In this study, occupational status of earning members of the respondents was observed on the basis of six categories which were presented in Table 4. Table 4 shows that most of the respondents were occupied with agriculture that was 36%. A large number of respondents were engaged as day laborers which was 22.67%. 16% respondents were engaged in fishing. 10.67% respondents were garment labors. 6.66% respondents worked in an NGO and 8% respondents were involved in another occupation.

Family size

Family means the total number of people related by blood, marriage or adoption tat live together (Bell, 2014). Family size of the respondents ranged from 3 to 11 members. Distribution of households according to their family size is shown in Table 5. Family size of the respondents was classified into three categories: 1) Small (up to 3 members), 2) Medium (4-6 members) and

Table 1. Distribution of respondents according to their age.

Categories according to age	Bahadurabaad (25)		Futangi Bazar (25)		Kulkandi (25)		Total (75)	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Below 35 years	8	32	10	40	10	40	28	37.33
Between 35-60 years	9	36	8	32	9	36	26	34.67
Above 60 years	8	32	7	28	6	24	21	28.00

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 respondents.

Village	Illiterate		Can sign only		Primary education		Secondary education		Above secondary education		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Bahadurabaad	3	12	3	12	9	36	9	36	3	12	25	100
Futangi Bazar	2	8	2	8	6	24	7	28	2	8	25	100
Kulkandi	2	8	3	12	10	40	11	44	3	12	25	100
Total	7	9.33	8	10.67	25	33.33	27	36	8	10.67	75	100

(Figure within parentheses indicate percentages of total); Source: Field Survey, 2020.

Table 4. Occupational status of respondents.

Village	Categories according to occupation						
	Agriculture	Day labor	Fishing	NGO worker	Garment Labor	Others	All
Bahadurabaad	9 (36%)	6 (24%)	4 (16%)	1 (4%)	2 (8%)	3 (12%)	25 (100)
Futangi Bazar	8 (32%)	6 (24%)	4 (16%)	2 (8%)	3 (12%)	2 (8%)	25 (100)
Kulkandi	10 (40%)	5 (20%)	4 (16%)	2 (8%)	3 (12%)	1 (4%)	25 (100)
Total	27 (36%)	17 (22.67%)	12 (16%)	5 (6.66%)	8 (10.67%)	6 (8%)	75 (100)

Source: Field Survey, 2020.

3) Large (7 and above). Table 5 shows that the average family size of Bahadurabaad, Futangi Bazar and Kulkandi village was 5.84, 6.28 and 6.56, respectively. The table also shows that most of the respondents belonged to a large family and the average of a large family of Bahadurabaad, Futangi Bazar and Kulkandi village is and 7.9, 8.18 and 9.3 respectively.

Average annual income of the sample households

Annual household income is the sum of the net income of all members of a particular household within a year. The annual household income indicates the financial condition of the household. Average total family income has been calculated by adding up farm and non-farm sources of income during the study period. Income earned from agricultural sectors like crop, livestock, fisheries, homestead gardening, forest and others were considered to be farm income in monetary value of the above mentioned agricultural activities. Business, job, labor sale, etc. was also found as important earning activities of the respondents. According to the respondent's response, annual income was categories into three categories such as: Low income up to Tk. 60000 (US$ 693.96), medium income Tk. (60001-100000) (US$ 693.96- US$ 1156. 60) and higher income more than Tk.

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

Family Size	Bahadurabaad			Futangi Bazar			Kulkandi		
	No.	Total	Average	No.	Total	Average	No.	Total	Average
Small family (up to 3)	4	12	3	3	9	3	3	9	3
Medium family (4-6)	11	55	5	11	58	5.27	12	62	5.17
Large family (7 and above)	10	79	7.9	11	90	8.18	10	93	9.3
Total	25	147	5.84	25	111	6.28	25	121	6.56

Source: Field Survey, 2020

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

Village	Categories according to income (TK.)							
	Low income (up to Tk. 60000) (US$ 693.96)		Medium income Tk. (60001 100000) (US$ 693.96- US$ 1156. 60)		High income Tk. (>100000) (US$ 1156.60)		Total N = 75	
	No.	%	No.	%	No.	%	No.	%
Bahadurabaad	6	24	11	44	8	32	25	100
Futangi Bazar	6	24	10	40	9	36	25	100
Kulkandi	4	16	8	32	13	52	25	100
Total	16	21.33	29	38.67	30	40	75	100

Source: Field Survey, 2020; (US$ 1= Tk.86.46).

Table 7. Causes of riverbank erosion.

Causes	Number of times				
	First	Second	Third	Fourth	Total (n = 75)
Flood	50 (66.67%)	5 (6.67%)	3 (4%)	2 (2.67%)	60 (80%)
Strong current	35 (46.67%)	10 (13.33)	8 (10.67)	7 (9.33%)	60 (80%)
Heavy rainfall	45 (60%)	10 (13.33)	3 (4%)	2 (2.67%)	60 (80%)
Deforestation	15 (20%)	12 (16%)	14 (18.67)	9 (12%)	50 (66.67%)
Sedimentation	20 (26.67%)	15 (20%)	8 (10.67)	5 (6.67%)	48 (64%)
Soil extraction	20 (26.67%)	15 (20%)	7 (9.33%)	3 (4%)	45 (60%)
Redirection of flow within the channel	0 (%)	8 (10.67)	7 (9.33%)	5 (6.67%)	20 (26.67%)

Source: Field Survey, 2020.

100000 (US$ 1156.60). Table 6 reveals that in Bahadurabaad village low, medium and high-income respondents are 24%, 44% and 32%, respectively. In Futangi Bazar low, medium and high income respondents are 24%, 40% and 36%, respectively, and in Kulkandi village low, medium and high income respondents were 16%, 32% and 52%, respectively. The average of low, medium and high income respondents were 21.33%, 38.67% and 40%, respectively.

Causes of riverbank erosion

Riverbank erosion is one of the major natural disasters of Bangladesh and an issue of major concern. It causes undefined miseries to thousands of people every year living along the banks of rivers in Bangladesh. Only erosion has rendered millions of people homeless and has become a major social hazard. People, who live near riverbanks, become victim of erosion, which forces them to change their livelihood and community. Most of the victims of riverbank erosion become slum dwellers in large urban and metropolitan cities and (Hutton and Haque, 2004). Since 1973 major rivers like the Jamuna, the Ganges and the Padma have covered around 1,590 km2 of floodplains making 1.6 million people became homeless (Islam *et al*., 2017). Riverbank erosion has disastrous socioeconomic effects. Riverbank erosion affects people, irrespective of farm sizes.

Table 7 shows that 60 (80%) of the respondents indicate flood as a major cause of riverbank erosion in the study area. Among them, 66.67% respondents said that the flood is the first cause of bank erosion. About 6.67%, 4%, 2.67% respondents ranked flood as the second, third and fourth cause respectively. 60 (80%) respondents of sample households also indicate strong current of the river as a major cause of riverbank erosion in the study area. 46.67%, 13.33%, 10.67%, 9.33% respondents ranked the strong current of the river as the first, second, third and fourth major cause of bank erosion respectively. Heavy rainfall is another major cause of bank erosion in this area. 60%, 13.33%, 4%, 2.67%, respondents said that heavy rainfall is the first, second; third and fourth number cause respectively.

Table 8. Distribution of households according to human assets.

Items	Villages And Ranking							
	Bahadurabaad (25)	Rank	Futangi Bazar (25)	Rank	Kulkandi (25)	Rank	Total (n=75)	Rank
Education	8 (32%)	Poor	14 (56%)	Good	15 (60%)	Good	37 (49.33%)	Good
Health Service	13 (52%)	Good	11 (44%)	Good	7 (28%)	Poor	31 (41.33%)	Good
Skills And Knowledge	6 (24%)	Poor	12 (48%)	Good	20 (80%)	Very good	38 (50.67%)	Good

Source: Field Survey, 2020.

Table 9. Percentage of social assets

Items	Area and Ranking							
	Bahadurabaad (25)	Rank	Futangi Bazar (25)	Rank	Kulkandi (25)	Rank	Total (n=75)	Rank
Common rules and sanction	8 (32%)	Poor	12 (48%)	Good	20 (80%)	Very good	40 (53.33%)	Good
Women empowerment	21 (84%)	Very good	16 (64%)	Good	14 (56%)	Good	51 (61%)	Good
Leadership	11 (44%)	Good	7 (28%)	Poor	15 (60%)	Good	33 (44%)	Good
Network and connection	6 (24%)	Poor	12 (48%)	Good	8 (32%)	Poor	26 (34.67%)	Poor

Source: Field Survey, 2020.

Table 10. Percentage of natural assets.

Items	Area and Percentage							
	Bahadurabaad 25		Futangi Bazar 25		Kulkandi 25		Total Respondents n=75	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Land (own)	16	64	11	44	8	32	75	46.67
Land (leased)	9	36	14	56	17	68	75	53.33

Source: Field Survey, 2020

Deforestation also causes riverbank erosion, said by respondents. About 20%, 16%, 18.67%, 9% respondents between 50 (66.67%) sample household ranked deforestation as the first, second, third, fourth main cause of river bank erosion respectively. They also said, sedimentation, soil extraction, redirection of flow within the channel is the causes of riverbank erosion. About 48%, 45% and 20% sample household ranked sedimentation, soil extraction and redirection of the flow within the channel as the cause of riverbank erosion in Bahadurabaad, Futangi Bazar and Kulkandi areas of dewanganj upazila.

Livelihood assets

Sustainable livelihoods (SL) thinking gained ground, in the Department for International Development (DFID) poverty reduction efforts in the 1990s. The guiding assumption of the DFID approach is that people pursue a range of livelihood outcomes by which they hope to improve or increase their livelihood assets and to reduce their vulnerability. The five types of assets that form the core of livelihood resources in the DFID SL framework range such as: Human assets, social assets, natural assets, physical assets and financial assets.

Human assets

Human asset helps to develop humankind with them. After acquiring human assets like education, health status, training facilities people can develop them and also help to improve their living standard. Human assets are perceived to have an association with economic growth, productivity, and profitability. According to Table 8; 32% of the total respondents in Bahadurabaad area had an education which was ranked poor, 56% of the respondents of the Futangi Bazar area had an education which was ranked good and 60% of the respondents of the Kulkandi area had education ranked good. The overall percentage of sample households was 49.33%, which was ranked good. In case of health service, Bahadurabaad was in good condition which was 52%, Futangi Bazar was in good condition which is

Table 11. Condition of household furniture's /modern amenities.

Items	No. of respondents	Percentage (%)	Average (Tk.)
Chauki/ Khat	75	100	Tk. 873.33 (US$ 10.10)
Chair	44	58.67	Tk. 268.18 (US$ 3.10)
Table	31	41.33	Tk. 516.13 (US$ 5.97)
Almirah	13	17.33	Tk. 6846.15 (US$ 79.18)
Showcase	11	14.67	Tk. 4653.63 (US$ 53.82)
Television	17	22.67	Tk. 6764.71 (US$ 78.03)
Bicycle	36	48	Tk. 6888.89 (US$ 79.68)
Motorcycle	7	9.33	Tk. 85714.29 (US$ 991.38)

Source: Field Survey, 2020.

Table 12. Financial assets.

Items	No. of respondents	Percentage (%)	Average value (Tk.)
Cash in hand	28	37.33	Tk.11142.86 (US$ 128.88)
Poultry birds	49	65.33	Tk.2602.04 (US$ 30.10)
Dairy cows	32	42.67	Tk.118812.5 (US$ 1374.19)
Goats	30	40.00	Tk. 12766.67 (US$ 147.66)

Source: Field Survey, 2020.

44%, Kulkandi was in poor condition which is 28% and overall condition of the sample household was good. In the field of skills and knowledge, Bahadurabaad was in poor condition which was 24%, Futangi Bazar was in good condition which was 48%, Kulkandi was in very good condition which was 80%.

Social assets

Social asset involves with network and connection (kinship and patronage), formal and informal social relationship, common rules and sanction, women empowerment, leadership etc. According to these assets people work together and help them each other which help them to improve all the communities. Social assets, which is a strong, self-organizing civil society deeply occupied with the daily life of its communities. From Table 9, it is observed that overall common rules and sanction of the sample household was ranked good that was 53.33%. individually, the condition of common rules and sanction were 32%, 48%, 80% in Bahadurabaad, Futangi Bazar, Kulkandi areas respectively, and ranked poor, good, very good respectively in case. Table 9 reflects that women's empowerment condition was good (61%). Individually it was ranked very good, good, well in Bahadurabaad, Futangi Bazar, Kulkandi areas respectively. The leadership condition of the sample households was ranked good. 44%, 28%, 60% are the individual percentage of leadership condition of Bahadurabaad, Futangi Bazar, Kulkandi areas respectively. Overall network and connection condition of the sample household was 34.67% which were ranked poor. 24%, 48%, 32% were the percentages of Bahadurabaad, Futangi Bazar, Kulkandi areas respectively in case of network and connection.

Natural assets

Natural assets consist of natural resources, including their own land, lease/mortgage lands etc. Table 10 shows that 46. 67% respondents had their own land while 53.33% respondents reported had their leased land. Due to the riverbank erosion, their lands were being eroded. As a consequence, they were taking a lease from other landowners for agricultural production. So, the percentage of own land was lower than that of leased land. Most of the own lands belonged to the Futangi Bazar area and most of the leased lands belonged to Kulkandi area.

Physical assets

Physical assets are tangible assets that can be seen, touched and held, with a very identifiable physical reality. Physical assets consist of the physical infrastructure, household elements, tools, equipment, agricultural inputs, etc. Table 11 shows that chauki or khat was possessed by every sample household. All of the (100%) respondents had chauki and average price of the chauki was Tk. 873.33 (US$ 10.10), 58.67% respondents had chair and average price of the chair was Tk. 268.18 (US$ 3.10), 41.33% respondents had table and average price of the table was Tk. 516.13 (US$ 5.97), 17.33% respondents had almirah and an average price was Tk. 6846.15 (US$ 79.18). 14.67% of the respondents had showcase and average price of the showcase was Tk. 4653.63 (US$ 53.82). About 22.67% of the respondents had television and an average price was Tk. 6764.71(US$ 78.03). About 48% of the respondents had a bicycle and an average price was Tk. 6888.89(US$ 79.68). Only 9.33% respondents had motorcycles and an average price was Tk. 85714.29 (US$ 991.38). If these sample households did not face river bank erosion hazard, they would have more number of household furniture.

Financial assets

A financial asset is a non-physical asset whose value s derived from a contractual claim, such as bank deposits, bonds, and participations in companies share capital (Chen, 2003). The condition of financial assets is given in the Table 12 which shows

Table 13. Food intake per person per day.

Major food items	Food intake (gm/person/day)	National Average food intake (gm/person/day)	Difference (gm/person/day)
Rice	390.8	515.16	-124.36
Potato	59.55	96.45	-36.90
Vegetables	167.7	109.58	58.12
Pulses	11.03	9.86	1.17
Oil	17.50	5.75	11.75
Meat	42.23	23.24	18.99
Egg	5.09	8.03	-2.94
Milk	54.87	21.64	33.23
Fish	52.6	44.65	7.95

Source: Authors Estimation

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	>2122

Source: Bangladesh Economic Review, 2020.

Table 15. Percentage of calorie intake.

Categories	No. of respondents	Per person per day average calorie intake (k. cal)
Ultra poor < 1600 k.cal	14 (18.67%)	1451.548
Hardcore poor 1600-1804 k.cal	24 (32%)	1722.387
Absolute poor 1805-2122 k.cal	22 (29.33%)	1986.595
Non-poor> 2122 k.cal	15 (20%)	2455.320

Source: Authors Estimation.

that only a few numbers of respondents had cash in hand. Only 37.33% respondents had cash in hand and the average value was Tk.11142.86 (US$ 128.88). Poultry farming of sample households was 65.33% and the average value was Tk.2602.04 (US$ 30.10). Dairy cattle were 42.67% and the average value was Tk.118812.5 (US$ 1374.19). Goat farming was 40% and the average value was Tk. 12766.67 (US$ 147.66). So, the financial assets in the riverine area were so frustrating due to the riverbank erosion.

Individual food intake

Per person per day food intake is presented in Table 13. In the table it is seen that there is a column of national average food intake and food intake from the respondents. The table exposes that the lacking of the calorie intake of the respondent from the national average. Per person rice consumption level was 390.8 gm. at household level which was lower than the national level. It was constantly observed that farmers had to cut down their consumption expenditure for using it in production purposes. Therefore, average food intake was decreased due to covering production expenditure. So, necessary policies are required to increase their consumption expenditure.

Calorie intake

Calorie intake is defined as the amount of energy consumed via food and beverage. A calorie is a unit of energy that is defined as the amount of heat energy required to raise 1 gm of water by 1 degree centigrade. Calories are units that measure the energy in food as well as the energy produced, stored and utilized by living organisms. An ideal daily intake of calories varies depending on age, metabolism and levels of physical activity, among other things. Generally, the recommended daily calorie intake is 2000 calories a day for women and 2500 for men. On the basis of the amount of food consumed by the respondents and their family member per capita calorie intake was measured. It was classified into the following four categories in Table 14. Table 15 shows the percentage of calorie intake with respect to per person per day average calorie intake by the sample households. About 18.67% of the respondents belonged to the ultra-poor whose per person per day calorie intake was 1451.548 k.cal. The percentage of respondents who belonged to hard core poor was 32% and per person per day calorie intake was 1722.387 k.cal. The percentage of respondents who belonged to absolute poor was 29.33% and per person per day calorie intake was 1986.595 k.cal. 20% respondents had an average per person per day calorie intake 2455.320 k.cal and they belonged to non-poor class. Therefore, it can be concluded that most of the respondents belonged to hardcore poor. Some of them have the sufficient income to access food, but they have less knowledge about the nutritional value of the food items and the utilization of the food adequately. That is why most of the respondents are hardcore poor.

Conclusion

Riverbank erosion is not a recent phenomenon, the people of the study area has been experiencing high river bank erosion since last few decades. Many families in the area who were totally dependent on agriculture had lost homesteads and agricultural productions which made them socio-economically vulnerable. Due to facing great economic problem the expenditure on food, health and education had been lowered of the affected people in the area. The study comprehensively examined challenging issues facing rural households in Bangladesh in the form of rising water levels, land erosion near the riverbank and the subsequent loss of arable land. This in turn will push these households into food insecurity; together these factors were major obstacles to economic and social progress of the nation of Bangladesh. The infrastructural loss in this area was high, as the riverbank erosion is one of the most hazardous processes in the study area. According to the observation, riverbank erosion occurred by dually, facts physical and human. The main reasons were streambed lowering or in full, flooding of bank soils followed by rapid drops in followed, saturation of banks from off-stream source, redirection and acceleration of flow within the channel, poor soil drainage, wave action, excessive Sand/Gravel Extraction, intense water from rainfall, effects of the Tsunami, dam and bridge construction etc. The condition was observed in case of the livelihood standard of the respondents. All of the assets (human assets, social assets, physical assets, natural assets and financial assets) were in moderate situations. The highest number of respondents belonged to hardcore poor. Most of them do not have knowledge about nutritious food. It is time to formulate policies to address prevention of riverbank erosion as well as to rehabilitate the river-erosion refugees. Natural vegetation has a massive impact on riverbank. The deep-rooted plants can help to plants to hold soil in place and protect it from being washed away. Plants can also absorb the shock of heavy rainfall. So, the government and concerned authority need more attention to implement the plantation policy in the riverbank other initiatives to should reduce riverbank erosion and improve food security of riverine household.

Conflict of interest

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

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