

## Understanding the access to livelihood assets and fishers' perceptions towards local practice for wetland fisheries sustainability

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### ABSTRACT

This study was conducted to explore the livelihood status and fishers' perceptions of local fisheries management practice in the Ashura floodplain of Dinajpur, Bangladesh. Data were collected from July to December 2020 through a semi-structured questionnaire. Five different forms of livelihood capitals (assets) were studied. From the human capital view, most of the fishers belonged to the 36-55 years age group. About 8% of fishers were illiterate and 56% could only sign their names. 10% of the fishers had no formal training. 67% of the fishers had annual incomes ranging from 20000 to 36000 BDT,- while 27% of fishers were in the medium income group (36001-72000 BDT) and 6% were in the high-income group (72001-108000 BDT per year). On the social capital aspect, 48% of the fishers had no organizational participation. Physical capital showed had the highest index value of 2.31, which indicates a relatively good availability of physical resources, while financial capital recorded had the lowest index value of 1.39, suggesting a very poor economic condition. Several problems were reported, including malnutrition, lack of other employment opportunities, insufficient releasing and stocking of fish seed and brood fish, insufficient educational institutions, lack of community-based fisheries management etc. Among them, malnutrition (PCI, 243) was the major problem in this area. It can be concluded that the fishers' community needs more institutional, organizational, financial, and social support to improve their livelihood status in the Ashura wetland area of Dinajpur, Bangladesh.

### INTRODUCTION

Livelihood assets are fundamental resources affecting the livelihoods of fishers and other primary producers. They have a significant influence on the nation's ability to alleviate and eradicate poverty. A livelihood is considered sustainable when a person can cope with and recover from stresses and shocks and maintain or enhance his/her

potentials and assets, now and in the future, without undermining the natural resource base (DFID, 1999). It seeks to gain an accurate and realistic understanding of people's strengths (assets or capital endowments) and how they endeavor to convert those strengths into positive livelihood outcomes (Dercon, 2001).

Considering various assets, strategies, activities and other factors commonly required for living (Chambers & Conway, 1992), the Institute of Development Studies (IDS) and the International Institute for Sustainable Development (IISD) have developed the sustainable livelihoods analysis (SLA) approach since the mid-1980s (DFID, 1999). SLA is defined based on the ability of a social unit to improve its assets, regardless of the external impacts (Castaneda, 2000; Stephen *et al.*, 2009). SLA first seeks to identify the important assets (physical, natural, human, financial and social capital) related to livelihood. Based on SLA, many scholars have studied different topics, such as livelihood diversity in rural development (Ellis, 2000), natural resource management (William, 2003) and poverty alleviation (Barrett & Swallow, 2004; Erenstein, 2009) .

About 17 million of the population in Bangladesh are dependents on fisheries sector for their livelihood through fishing, farming, fish handling and processing (DoF, 2019). All water bodies in Bangladesh harbor a great variety of fish and other aquatic plants and animals due to the increasing practice of agriculture and the adverse climatic conditions. Nevertheless, a large number of them are losing their original characteristics as a basin. Literally, the local fishers are also losing their original professions and facing several problems in their livelihood. The majority of the available literature on this topic has mainly focused on qualitative or qualitative analyses of water properties, fisheries biodiversity and some aspects of socio-economic status of local fishers (Flowra *et al.*, 2009; Ferdoushi *et al.*, 2017; Halim *et al.*, 2017). However, very few studies have attempted to measure or analyze their livelihood assets. Though, it is well-accepted that any wetland should be used in a sustainable way so that the resource base would not be damaged or destroyed. Therefore, a well-planned and systematic study is required to assess the livelihood assets of the fishers. Such a study would assist in the arrangement of an appropriate scheme to save local fisheries, besides conserving and managing the aquatic fauna of this valuable wetland in Bangladesh.

Consequently, the current study considered the following objectives:

- a. To analyze the distribution of livelihood assets among the fishers, with their access to different forms of capital through capital index analysis,
- b. and address the perceptions and attitudes of fishers, with respect to their local knowledge and practice through identifying their problems.

## MATERIALS AND METHODS

### Site selection

The study was carried out in a floodplain area named *Ashura beel* of Dinajpur, Bangladesh (Fig. 1), which is fed by the Karotoa River of Bangladesh. This floodplain is surrounded by fourteen villages inhabited by 971 households. It is located in the northwest side of Bangladesh, and the total area of this wetland is about 251.78 hectares. The survey was conducted in five villages: Bastek, Bostapara, Adarshapara, Goribpara, Burimondob, adjacent to the *Ashura wetland* of Dinajpur, Bangladesh.

### Data collection

Data were collected through random sampling. A number of 100 fishers were selected from 300 fishers (30% of the total population) to undergo a survey from July 2020 to December 2020. To understand the livelihood status of fishers from their viewpoints, face-to-face personal interviews were performed, using a structured questionnaire.

Primary data were collected through a field survey in the selected villages, using a semi-structured questionnaire. In addition, the physical behavior of the investigated fishers was recorded during the interview at their homes, in their fields or where they fish. The initial draft questionnaire was used in the field as a pre-test that was furtherly modified on basis of the respondents' feedback in the field. Additionally, secondary data were collected from the Fisheries Office, Dinajpur. An extensive literature review was performed to collect additional relevant information on fishers' livelihoods, using books, theses, newspapers and journals.

### Analysis of livelihood capital index value

The capital index values were calculated for the majority of the indicators using a weighed rating scale of 0, 1, 2, and 3, which could be interpreted as none (0), low or poor (1), medium or good (2) and high or excellent (3), respectively (**Muangkaew & Shivakoti, 2005; Chena et al., 2013; Chen et al., 2018; Dutta & Guchhait, 2018; Muthelo et al., 2019**). The capital index value was measured following the procedures of **Chen et al. (2018)** and **Dutta and Guchhait (2018)** as follows:

Three answer choices were considered, including:

$$I = (\text{low\% or poor\%} \times 1) + (\text{medium\% or good\%} \times 2) + (\text{high\% or excellent\%} \times 3)$$

For including four answer choices:

$$I = (\text{no\%} \times 0 + \text{low\% or poor\%} \times 1) + (\text{medium\% or good\%} \times 2) + (\text{high\% or excellent\%} \times 3)$$

The value of each type of capital (C) was calculated using the following weighed formula. The integrated measurement equation was developed as follows:

$$C = \sum_{n=0}^n \left( \frac{I_n}{T_n} \right)$$

Where, C = Criteria score for each asset or capital ( $0 \leq C \leq 3$ );  $n = n^{\text{th}}$  indicator criterion ( $n = 1, 2, 3 \dots n$ ); I = Indicator; and T = Total number of indicators (**Dutta & Guchhait, 2018**).

### **Determination of fishers' perceptions and attitudes towards local knowledge and practice**

Fishers' perceptions and attitudes were measured on a Likert scale (**Likert, 1932**). Each fisher responded to the 20 statements (10 positive and 10 negative) on a five-point Likert scale, ranging from "strongly agree" to "strongly disagree". Simple weightages (1 to 5) were assigned to the response categories, based on the favorableness and unfavorableness of the items. For favorable (positive) statements, the 'strongly agree' response was given a weight of 5; whereas, agree, undecided, disagree and strongly disagree were given values of 4, 3, 2 and 1, respectively. In the case of unfavorable (negative) statements, the reverse scoring was done. Afterwards, the responses of the farmers were arranged and the 30 statements were revised (**Semie *et al.*, 2009; Wang *et al.*, 2019; Walling & Jha, 2020**).

### **Assess the problem confrontation index (PCI)**

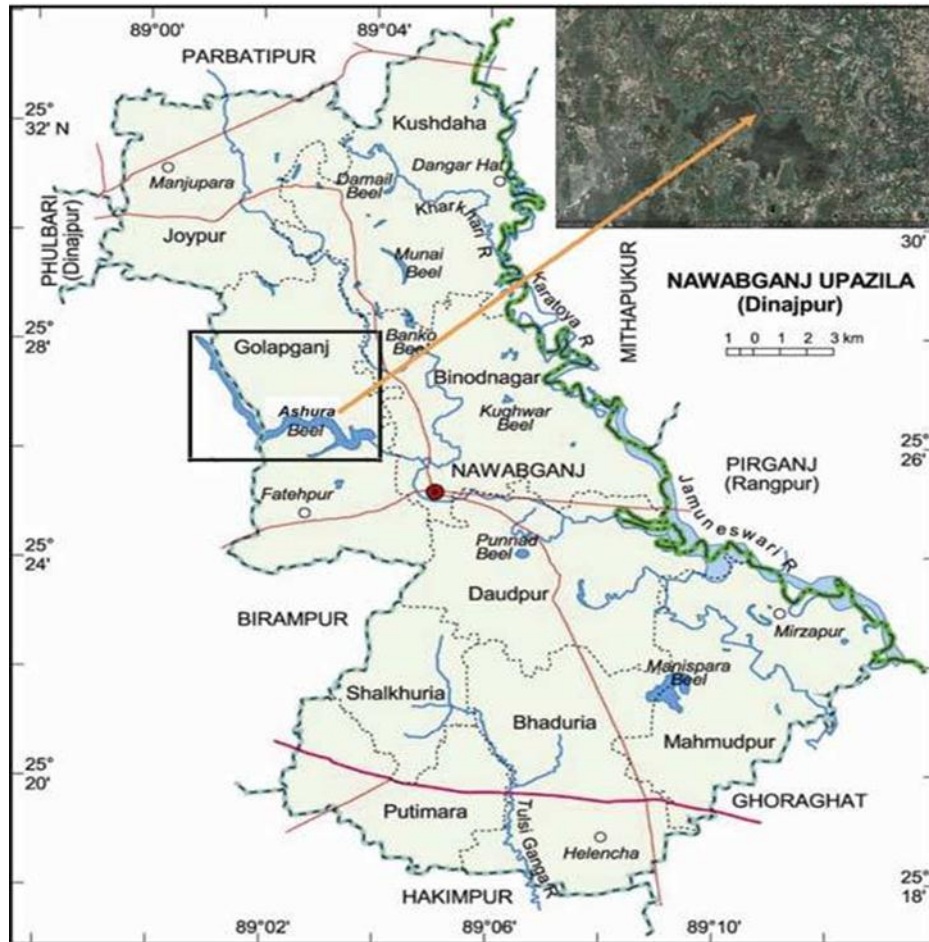
A list of twelve (12) possible problems was chosen to determine the problem confrontation index (PCI). A scale was prepared to indicate the extent to which each of the twelve problems was applicable to a given fisher. Each respondent was asked to express their opinion regarding the severity of the problems they face during their work in fisheries. For every problem, scores were assigned as 3, 2, 1, 0 for high, medium, low and not at all, respectively. For ranking the problems, a problem confrontation index (PCI) was computed according to the equation of **Roy *et al.* (2013)**.

$$\text{PCI} = P_n \times 0 + P_l \times 1 + P_m \times 2 + P_h \times 3$$

Where,  $P_n$  = Frequency of respondents ranking the problem as 'not at all';  $P_l$  = Frequency of respondents considering the problem as 'low';  $P_m$  = Frequency of respondents mentioning the problem as 'medium' and  $P_h$  = Frequency of respondents assessing the problem as 'high'.

### **Data analysis**

Data were compiled, tabulated, coded and then analyzed using SPSS (Statistical Package for Social Sciences) version-22. Descriptive statistics (frequency, percentage, mean and standard deviation) were obtained to categorize and describe the variables.



**Fig. 1.** Geographical position and satellite view of *Ashura wetland*

## RESULTS

### Distribution of livelihood assets

The five selected livelihood assets of fishers, such as human, physical, financial, social and natural assets were calculated. The categorization of fishers according to their livelihood assets are shown in Table (1). Most of them were under middle aged groups followed by poor educational level (56% can only sign their name). Yet, their level of knowledge on fisheries and their training status were quite worthy. On the other hand, their social and physical facilities were determined.

**Table 1.** Main Features and categorization of Fisheries

Characteristics	Scoring method	Range		Categories	Respondents %	Mean	SD
		Possible	Observes				
Age	No. of years	Unknown	20-70	Young (up to35)	40	41.68	11.57
				Mid aged (36-55)	50		
				Old aged (above 55)	10		
Education	Year of schooling	Unknown	0-8	Can't read and write	8	2.21	2.47
				Can sign name only	56		
				Primary (1-5)	25		
				Secondary (6-10)	11		
Fisheries knowledge	Score	0-24	4-24	Poor (up to 8)	16	13.40	3.99
				Good (9-16)	72		
				Excellent (above16)	12		
Training experience	Day	Unknown	0-7	No (0)	10	4.39	2.33
				Low (up to 3)	25		
				Medium (4-5)	33		
				High (above 5)	32		
Source of drinking water	score	1-3	3	Government tube-	0	3.0	.00
				Neighbor tube-well	0		
				Own tube-well (3)	100		
Sanitation facilities	score	1-3	1-3	Kacha	47	1.72	.76
				Semi-standard toilet	34		
				Paka (Standard) toilet	19		
Housing characteristics	Score	1-3	1-3	Earthen house (1)	32	1.83	.66
				Tin-shed house (2)	53		
				Concrete house (3)	15		
Cooking fuel	Score	1-3	2-3	Coal (1)	0	2.01	.10
				Wood and dry leaf	99		
				Electricity (3)	1		
Electricity facilities	Score	1-3	3	No electricity (1)	0	3.00	.00
				Solar (2)	0		
				Power house (3)	100		
Annual income	Thousand BDT	Unknown	20000-108000	Low (up to 36000)	67	42005.5	17275.5
				Medium (36001-72000)	27		
				High (above 72000)	6		
Organizational participation	Score	Unknown	0-8	No (0)	48	1.89	2.19
				Low (up to3)	28		
				Medium (3-5)	20		
				High (above5)	4		
Extension media contact	Score	0-45	6-44	Low (up to 15)	11	22.90	7.71
				Medium (16-30)	72		
				High (above 30)	17		
Natural resource	Score	0-24	5-24	Low (up to 8)	12	15.15	4.28
				Medium (9-16)	56		
				High (above 16)	32		

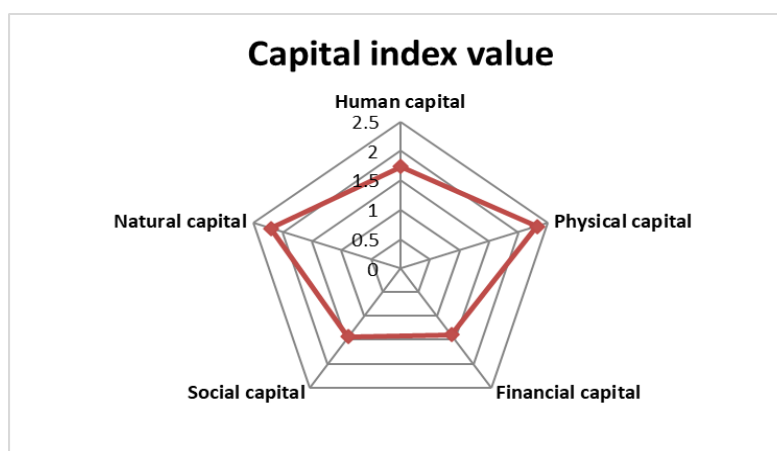
Fishers' perception and attitude	Score	0-100	22-90	Unfavorable (up to	15	54.94	15.25
				Neutral (34-66)	68		
				Favorable (above 66)	17		
Fishers' problem	Score	0-36	8-32	Low (up to12)	8	22.94	4.67
				Medium (13-24)	50		
				High (above 24)	42		

### Livelihood capital index (LCI)

The five core fisher's livelihood capitals (human, physical, financial, social and natural capital) were calculated by livelihood capital index (LCI) (Table 2 & Fig. 2). Results showed that the value of human capital, natural capital and physical capital were 1.73, 2.20 and 2.31, respectively, indicating that fishers were in medium to good condition in terms of human capital, natural capital and physical capital. However, the financial and social capital value was relatively low, recording values of 1.39 and 1.43, respectively (<2), which suggested a weak economic condition and weak social linkages in the community.

**Table 2.** Value of livelihood capital index (LCI)

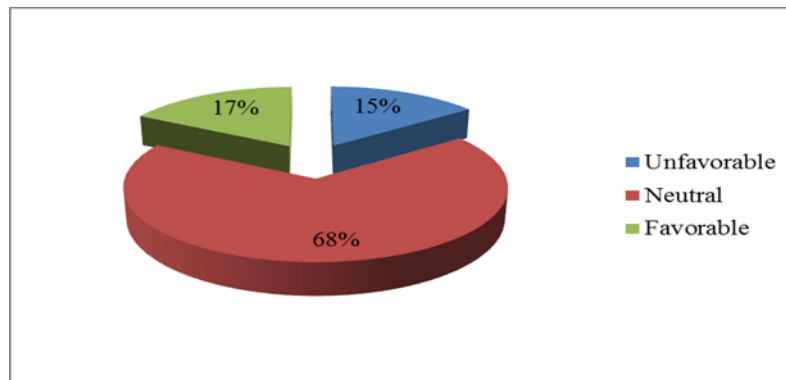
Capital	Capital index value
Human capital	1.73
Physical capital	2.31
Financial capital	1.39
Social capital	1.43
Natural capital	2.20



**Fig. 2.** Spider diagram of livelihood capitals of fishers in the study area

### Fishers' perceptions and attitudes towards local knowledge and local practice

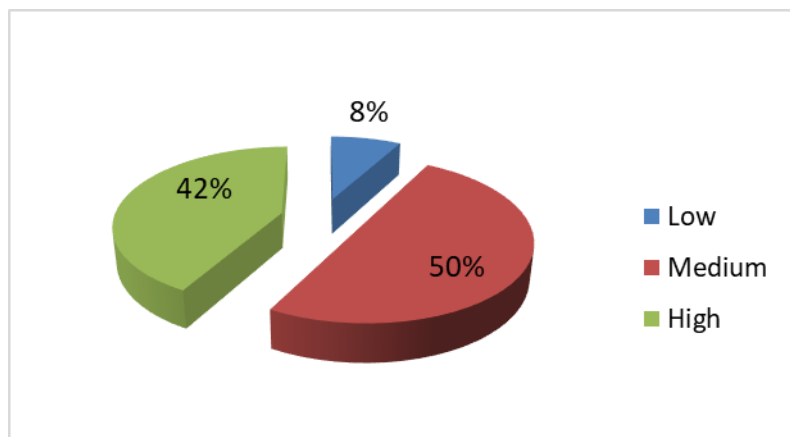
Data were analyzed to address fishers' beliefs, feelings and actions towards local knowledge and practice of fisheries management in the studied area. Results revealed that the highest proportion of the fishers (68%) had neutral, 17% had favorable and 15% had unfavorable perceptions and attitudes towards local knowledge and practice of fisheries management (Fig. 3).



**Fig. 3.** A histogram showing the percentages of fishers' perceptions and attitudes towards local knowledge and practice

### Problem confrontation of fishers in the study area

From the problem confrontation analysis, the highest proportion (50%) of the fishers confronted a medium degree of problems, 42% of them confronted a high degree of problems, while only 8% of fishers confronted a low degree of problems (Fig. 4). Notably, the vast majority of fishers faced significant problems in carrying on their trade in the Ashura *wetland* area.



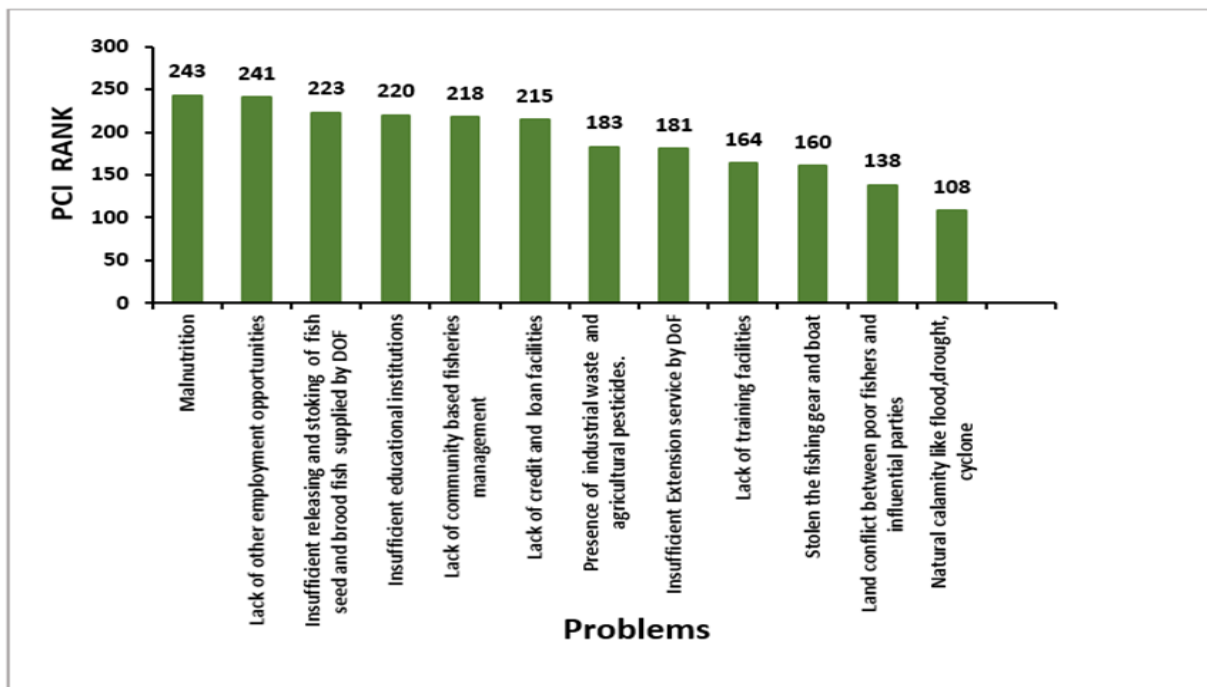
**Fig. 4.** A histogram showing the problem context of fishers in the study area



### Problem confrontation index (PCI)

The fishers were asked to mention the extent of specific problems they were facing. The problems are ranked and listed in Fig (5) according to the number of respondents mentioning them.

Based on PCI rank, the major problem was malnutrition (PCI 243). This problem was followed by the lack of employment opportunities (PCI 241), insufficient stock and unavailability of fish seed and brood fish supply (PCI 223), insufficient educational opportunities (PCI 220), lack of community-based fisheries management (PCI 218) and a lack of credit and loan facilities (PCI 215) (Fig. 5). The least mentioned problem was that of natural calamity, including flood, drought and cyclones (PCI 108) (Fig. 5).



**Fig. 5.** A histogram showing PCI rank of fishers in the study area

## DISCUSSION

Data displayed that some of the fishers (50%) were middle-aged (36-55). Similarly, 40% to 50% of the fishermen belonged to the middle age groups (31-40 years) in Bhagyakul, Padma River, Munshiganj and in Eshulia *wetland*, Mymensingh, Bangladesh (Rahman *et al.*, 2016; Shill *et al.*, 2016). On the other hand, the education status of the area under estimation lacked proper educational opportunity, forming one of the major problems. In addition, fishers in the wetland showed good to medium (72%)

knowledge about overall fisheries operation and management. In accordance with our results, **Alam (2006)** detected a percentage of 66 of the farmers, with medium aquaculture knowledge.

For analyzing the physical assets, such as drinking, sanitation and house facility they seem to be underprivileged compared to the other parts of Bangladesh. Furthermore, almost all fishers' households (99%) used wood and dry leaves to light fire for the purpose of cooking since gas and electric ovens were not available. In contrast, a good number of fishers enjoyed electricity for light in the surveyed area. Moreover, **Mahmud *et al.* (2015)** reported that 82% of the fishermen had electrical facilities in the Paira River Valley, southern Bangladesh.

Moreover, financial capital is a key aspect of livelihood assets that can directly reflect livelihood development and changes. The majority of fishers had low annual income below the poverty line. In another survey, **Kabir *et al.* (2012)** found that about 60% of the fishermen had annual incomes between BDT 24,000 and 35,000, and 30% of the respondents had income in the ranges of BDT 35,001 to 45,000, considering fishermen of the old Brahmaputra River, Bangladesh. Interestingly, income tax is only payable on incomes of 300,000 BDT or above, and the statutory minimum wage provides an income of about 26,500 BDT per year. Some fishers could improve their living standard by leaving their boats and working as a day labour. Astonishingly, the investigated fishers listed the lack of employment opportunities in the nearby as a major problem facing them. Thus, it can be deduced that the socio-economic condition of the fishers in the Ashura area is very poor.

Social capital is very important to fishers in their livelihood status. They can raise fish alone but, like any trade, networking helps them to sell fish and find the best prices for the quality of resources. However, the Ashura fishers are relatively isolated. The majority of the fishers (48%) had no organizational participation, and most of the fishers (72%) had only medium contact with social media and institutions. In comparison, **Hoque (2011)** recorded that the fishers had low organizational participation and communication exposure to the improvement of socio-economic status of the commercial fish farmers since they converted their work from crop farming to aquaculture. **Hossain (2010)** reported that communication exposure was significantly positively correlated with their living status in a coastal area. The present findings reveal that the organizational participation and extension media contact of the fishers in the study area is not satisfactory. In addition, most fishers (56%) had a medium opinion about their natural capital. The present results indicate that the Ashura is full of natural resources, and fishers have access to these resources, but they lack the proper way to use them.

From the five-capital index, it was revealed that fishers' physical assets are one of the key strengths that can be utilized for their socio-economic welfare. However, their

financial capital is so poor, disabling them to cope with vulnerabilities and shocks which they regularly encounter. Additionally, **Dutta and Guchhait (2018)** detected similar condition in their study. In this context, **Muthelo *et al.* (2019)** reported that the financial/economic capital recorded the lowest index value of 2.58, while the human capital assessed the highest index value of 3.13, compared to other capitals. The findings of the present study, however, reveal that strong physical capital did not play a significant role in shaping overall livelihood status, but weak financial capital is a vital influencing factor in the livelihood status of fishers in the Ashura *wetland*.

On the basis of PCI rank, malnutrition represents the most intense problem in the Ashura area (PCI 243). In the past, the ancestors of today's fishers used the Ashura area as an agricultural land for harvesting 'Boro' paddy for rice. Every year, they harvested a minimum of 1400 -1600 kg of rice. In 2019, they lost their agricultural lowland as the Ashura submerged after the erection of the 'Cross Dam'. Thus, they became fishers as it was the only substitute for farming the submerged land. In addition, the creation of fish sanctuaries in different places in the Ashura limited their ability to catch fish. Sometimes they fish in the wrong place and their boats and gear are confiscated. For this reason, they cannot fulfill their daily nutritional requirements. In this respect, **Rahman and Haque (2008)** reported nutritional deficiency of living around the Rajdhala of Bangladesh due to catch restriction.

The lack of employment opportunities indicates that there was no adequate alternative source of income for the fishers in this area. Most of the fishers who depend only on the Ashura fishery for their livelihood are hungry for the lack of enough fish, and most of the potential fishers are unemployed and have no regular income. Similarly, **Rahman and Haque (2008)** found that there was no easy source of income for the fishers during the restricted fishing period (June to October), and added that almost half of the fishers had no jobs except fishing in the Rajdhala area of Bangladesh. Ashura area is also suffering from insufficient releasing and stocking of fish seed and brood fish supplied by DoF. The fry, fingerling and brood fish, supplied by the State fisheries officers are not sufficient for the fishers' community. **Rahman and Haque (2008)**, in this regard, found that fingerlings (mainly major carps) for stocking were not always easily available in the Rajdhala *wetland* of Bangladesh.

The lack of sufficient educational institutions, such as schools, colleges and NGOs create a very poor educational status in this area. **Islam *et al.* (2019)** identically found that, the major problem of fish farmers is the lack of educational institutions, including schools, colleges, etc. of the *Testa* barrage in Bangladesh. Similarly, the lack of community-based fisheries management hindered the local community to manage their resources efficiently. Before 2014, the fisher's community in Ashura worked with some non-governmental organizations to provide sufficient help for the fishers. Hence, all the fishers were engaged in a community-based fisheries management practice. However

nowadays, no community-based fisheries management are available in this area due to lack of NGO facilities. Furthermore, neither formal credits nor loan facilities are introduced from either governmental or non-governmental organizations in this area for the improvement of fishers' socio-economic conditions. Thus, it is necessary to provide the fishers with credit and loans initiated from different governmental and non-governmental organizations. This finding coincides with that of **Sultana and Islam (2016)** who found that, fish farmers experience a lack of credit facilities in the Chalan wetland area, Bangladesh.

Likewise, the presence of industrial waste and agricultural pesticides, insufficient extension service by **DoF**, lack of training facilities, poaching of fishing gear and boats, land conflict between the poor fishers and influential parties and natural calamities, including flood, drought, cyclone are other recorded problems facing the fishers throughout the year.

## CONCLUSION

The fishers' community around the study sites faces various problems throughout the year. Moreover, most of the fishers of this area are classified under the poverty line. Government should take more initiatives to resolve fishers' problems and support their livelihood. At the same time, more efforts are required from various NGOs to ensure the improvement of the livelihood status of fishers in different floodplain areas of Bangladesh.

## REFERENCES

- Alam, M. M.** (2006). Aquaculture knowledge of the fish farmers of Gomosthapur upazila under Chapainawabganj District. MS thesis, department of agricultural extension education, Bangladesh Agricultural university, Mymensingh, Bangladesh. pp. 22-45.
- Barrett, C. B. and Swallow, B. M.** (2004). Dynamic poverty traps and rural livelihoods. In: Ellis F, Freeman A. Rural Livelihoods and Poverty Reduction Policies. Routledge, London. pp. 103-165.
- Castaneda, F.** (2000). Criteria and indicators for sustainable forest management: International processes, current status and the way ahead. *Unasylva*, 203: 34-40.
- Chambers, R. and Conway, G. R.** (1992). Sustainable Rural Livelihoods: Practical Concepts for the 21<sup>st</sup> Century. 296: 5-21.
- Chen, B.; Qiu, Z.; Usio, N. and Nakamura, K.** (2018). Tourism's impacts on rural livelihood in the sustainability of an aging community in japan. *Sustainability*, 10(8): 2896. <https://doi.org/10.3390/su10082896>
- Chena, H.; Zhua, T.; Krott, M.; Calvo, J. F.; Ganesh, S. P. and Makoto, I.** (2013). Measurement and evaluation of livelihood assets in sustainable forest commons

- governance. *The International Journal Covering All Aspects of Land Use, Land Use Policy*, 30: 908 -914.
- Dercon, S.** (2001). *Assessing Vulnerability to Poverty*. Mimeo, Centre for the Study of African Economies, University of Oxford. pp. 6-79.
- DFID.** (1999). *Sustainable Livelihoods Guidance Sheets*. Department for International Development, London, UK. pp. 1-8.
- DoF** (2019). *National Fish Week 2019 Compendium (In Bengali)*. Department of Fisheries, Ministry of Fisheries and Livestock, Bangladesh. p.45.
- Dutta, S. and Guchhait, S. K.** (2018). Measurement of Livelihood Assets in Sustainable Forest Governance: A Study in Burdwan Forest Division, West Bengal. Article in *Transactions of the Institute of Indian Geographer*, 40(2): 203-213.
- Ellis, F.** (2000). *Rural Livelihoods and Diversity in Developing Countries*. Oxford University Press, Oxford. pp. 135-176.
- Erenstein, O.** (2009). Livelihood assets as a multidimensional inverse proxy for poverty: a district level analysis of the Indian Indo-Gangetic Plains. Working Paper. New Delhi, **12**(2): 283-302.
- Ferdoushi, Z.; Ara, Y.; Khatun, T. and Ahmed, K. K. U.** (2017). *Ashura beel in Dinajpur district: limnological aspect*. *Journal of Bangladesh Agriculture University*, 15(1): 103-112.
- Flowra, F. A.; Alam, M. B.; Hossain, M. A.; Samad, M. A. and Galib, M. S.** (2009). Livelihood aspects of fishermen community of the Dahia *Beel* under Natore district, Bangladesh. *Bangladesh Journal of Progressive Science and Technology*, 7(2): 283-284.
- Halim, M. A.; Haque, S. A.; Islam, M. S.; Rayhan, A. and Sku, S.** (2017). Socio-economic aspects of fisher communities in Kafrikhal *Beel* under Mithapukur Upazila, Rangpur, Bangladesh. *International Journal of Fauna and Biological Studies*, 4(1): 119-124.
- Hoque, M. Z.** (2011). Improvement of socio-economic status of the commercial fish farmers due to transformation from crop farming to aquaculture. M.S. Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh. pp. 35-40.
- Hossain, M. S.** (2010). Living status and income generating activities of the farmers in Bagherhat district. M.S. Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh. pp. 45-50.
- Islam, M. S.; Moniruzzaman, M.; Hossen, M. N.; Islam, M. S. Rayhan, A. and Sku, S.** (2019). Fish diversity and livelihood status of fish farmers of Teesta barradge in Bangladesh. *Journal of fisheries and life sciences*, 4(1): 29-32.
- Kabir, K. M. R.; Adhikary, R. K.; Hossain, M. B. and Minar, M. H.** (2012). Livelihood status of fishermen of the old Brahmaputra River, Bangladesh. *World Applied Sciences Journal*, 16(6): 869-873.

- Likert, R.** (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 22: 5-55.
- Mahmud, S.; Ali, M. L. and Ali, M. M.** (2015). Present scenario on livelihood status of the fishermen in the Paira River, Southern Bangladesh: Constraints and recommendation. *International Journal of Fisheries and Aquatic Studies*, 2(4): 23-30.
- Muangkaew, T. and Shivakoti, G. P.** (2005). Effect of livelihood assets on rice productivity: case study of rice-based farming in Southern Thailand. *Journal of International Society for Southeast Asian Agricultural Science*, 11: 63–83.
- Muthelo, D.; Owusu-Sekyere, E. and Ogundeji, A. A.** (2019). Smallholder Farmers' Adaptation to Drought: Identifying Effective Adaptive Strategies and Measures. Department of Agricultural Economics, University of the Free State, Posbus, Bloemfontein South Africa. pp. 2-17.
- Rahman, M. A. and Haque, M. M.** (2008). *Beel* fishery and livelihood of the local community in Rajdhala, Netrakona, Bangladesh. *Bangladesh Journal of Fisheries Resource*, 12(1): 95-108.
- Rahman, M. M.; Chowdhury, P. and Islam, M. S.** (2016). Livelihood status of fishers' community of Eshulia *beel* at Gouripur upazila under Mymensingh district. *International Journal of Fisheries and Aquatic Studies*, 4(3): 543-547.
- Roy, D.; Farouque, M. and Rahman, M.** (2014). Problem confrontation of the FFS farmers in participating farmer field school training session. *Progressive Agriculture*. 24(1–2): 273–280.
- Semie, N.; Belay, K.; Karippai, R. S. and Bogale, A.** (2009). Measurement of farmers' attitude towards complete ownership of farmland in Eastern Ethiopia. *Journal of Rural Development*, 32(2): 111-131.
- Shill, S.; Sarker, A.; Asaduzzaman, M.; Latifa, G. A.; Podder, S. C. and Obaida, M. A.** (2016). Livelihood status of fishers of the Padma River, Sreenagar, Munshiganj, Bangladesh *Journal of Zoology*, 44(1): 41-50.
- Stephen, M. Nora, M. and Moses, A.** (2009). Sustainable livelihood approach: A critical analysis of theory and practice. Department of Geography, University of Reading, UK. 189: 4-23.
- Sultana, N. and Islam, M. N.** (2016). Fish production and livelihood of fish farmers of Chalan *beel* area, Bangladesh. *Journal of Agriculture and Veterinary Science*, 9(2): 51-56.
- Walling, K. and Jha, K. K.** (2020). Scale for measuring attitude of farmers towards improved large cardamom cultivation. *Plant Archives*, 20(2): 4515-4520.
- Wang, H.; Li, C.; Liu, J. and Zhang, S.** (2019). Research on farmers' willingness of land transfer behavior based on food security. *Sustainability*, 11(8): 1-17.
- William, S.** (2003). Sustainable Livelihoods: A case study of the evolution of DFID policy. Overseas Development Institute, London, pp. 7–16.