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Non-Financial and Financial Factors Influencing the Mode of Life of the Gher Farmers from the Western Coastal Areas of Bangladesh

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ABSTRACT

Ponds for shrimp culture are also called shrimp gher, and gher farming is a common occupation for the people of the coastal regions. In this study, the researchers aimed to assess the socio-economic condition of the gher farmers at the Paikgachha sub-district under Khulna. Data based on questionnaires were randomly collected from 125 gher farmers from April to September 2018. Most of the respondents belonged to 26 to 40 year- old group, and 38.4% of households had 4 to 5 members. More than 30% gher farmers received no institutional education, but they can at least write their names. On the other hand, 76.8% of respondents sent their children to school. Ninety-two percent of farmers followed traditional culture systems, and most of them were involved in gher farming throughout the year. They practiced different additional income-generating activities besides shrimp farming, such as agricultural work, livestock rearing, business, day laboring and others. Around 44.8% of farmers took technical assistance from family and friends, while 22.4% received it from NGOs. The livelihood status of the respondents does not witness any improvement due to illiteracy, natural disasters and disease outbreaks. Their life should be facilitated with continuous disease control support and other technical support. The government and NGOs can play a significant role to improve their socio-economic status by implementing coastal zone developmental plans based on community so that they can sustain their livelihood in an effective way.

INTRODUCTION

The nature of coastal zone is diverse and special for the interaction among terrestrial and marine environment. The coastal zone of Bangladesh contains more than

30% of the country and is occupied with 29% of the population **(Ahmad, 2019)**. According to the geographical structure, the zone in Bangladesh is partitioned into the eastern zone, the central zone and the western zone. The coastal people are involved in different income generating activities, viz. agriculture, fishing, fish farming, honey collection from forest, salt production, and industrial works and others **(Hossain & Hasan, 2017; Roy *et al.*, 2020a)**. Remarkably, the livelihood of rural coastal people are different from the other part of the country since the coastal zone is highly vulnerable to climatic change effect and the people have to cope up with the uncertain natural calamities **(Parvin *et al.*, 2017)**. The coastal zone is ecologically important for containing mangrove forest as a shield against natural calamities; it is popular as a hotspot of diversified terrestrial and aquatic organisms **(Shamsuzzaman *et al.*, 2017a; Ahmad, 2019)**. Moreover, for Bangladesh, the coastal areas are financially important for the valuable living resources, specially capture and culture fisheries **(Shamsuzzaman *et al.*, 2017b)**.

Shrimp culture, mostly known as gher farming, is a popular and special occupation chosen by the coastal people **(Hossain & Hasan, 2017; Ali *et al.*, 2018; Ahmad, 2019)**. Gher is generally called a modified rice field building embankments to support water for shrimp and other crustaceans **(Rahman & Barmon, 2018)**. The sector of shrimp culture has a great role in meeting the animal protein requirement, foreign exchange earnings and socio-financial progress of the rural people by lessening poverty through generating employment opportunities **(Shamsuzzaman *et al.*, 2017b; Rasha *et al.*, 2018)**. After 1970s, the success in gher farming attracted the coastal people and currently, more than 2,750 km^2 land areas are utilized for gher farming in the coastal zone of Bangladesh **(Parvin *et al.*, 2017)**. The shrimp production in Bangladesh enhanced almost nine folds over the last three decades **(DoF, 2015; Shamsuzzaman *et al.*, 2017b)**. Five percent of the national GDP is contributed by the shrimp farming sector in the country **(Hossain & Hasan, 2017)**. In addition, more than two million people are connected with shrimp value chain, including culture, transportation, marketing, processing, exportation and other ancillary activities directly or indirectly **(Ahmed *et al.*, 2018; Ali *et al.*, 2018)**. Nevertheless, the gher farmers are one of the most vulnerable societies in Bangladesh and their economic conditions are further deteriorating in some region since the produced shrimp gains high demand both nationally and internationally **(Rasha *et al.*, 2018)**. Several studies reported that, condition of gher farmers is socially and financially unsustainable. The social condition indicates literacy, career status, and societal status, while the economic condition represents financial capital.

For minimizing the vulnerabilities and ensuring sustainable life, the social life and financial condition of a target community is a must **(Ahamed *et al.*, 2020; Etana *et al.*, 2020)**. However, several studies have been conducted on shrimp farming in Bangladesh, including, technical efficiency of shrimp farming and economic analysis of shrimp farming **(Karim *et al.*, 2019; Roy and Basu, 2020; Mamun *et al.*, 2020)**. Moreover, few

studies on socio-economic conditions of gher farmers were carried out in Bangladesh but all those efforts lack specific information on livelihood, viz. more specific social factors, culture related factors and livelihood constraints. Notably, livelihood generally varies in terms of area and community. Khulna is a well-known district among the 19 coastal districts of Bangladesh situated in the western coastal zone, and Paikgachha sub-district under the district is popular for gher farming in the area **(Wijayanti & Pratomo, 2016; Ali *et al.*, 2018; Roy & Basu, 2020)**. To the best of our knowledge, specific study on the non-financial and financial dimensions of livelihood of the gher farmers of Paikgachha has not yet been statistically described. The main objective of this study was to identify the influence of social, occupational and financial factors on the livelihood of the gher farmers in Paikgachha. It will be helpful for the administrators, institutions involving in coastal zone management, academicians and researchers to understand specific community which will be effective for designing policies and sustainable development plan for the coastal people of Bangladesh.

MATERIALS AND METHODS

The area of Paikgachha Sub-district under Khulna District is 411.19 km^2, where gher farming represents one of the main occupations of the inhabitants **(BBS, 2011)**, and it has been selected for sampling. A total of 125 gher farmers (n= 125) from Kapilmuni, Lata, Gadaipur, Sholadana and Chandkhali (Fig. 1) out of 10 unions of Paikgachha were selected using random sampling technique to avoid biasedness in case of small sample size. Prior to the initiation of the survey, consent of the Upazila Fisheries Officer (UFO), Paikgachha Sub-district was taken for ensuring the local authorization for the study. The data were collected through a questionnaire survey, focused group discussion (FGD), key informant interview (KII) and observation methods. Both open-ended and closed-ended questions were used to collect data from April to September 2018. Thus, FGD, KII and observation methods as qualitative data collection methods were employed to overcome the flashpoint of questionnaire **(Cheung, 2014)**. Ten FDG sessions were carried out, and each group consisted of 8-12 respondents and each session took an average of 1.5h. In addition, key informant interviews were conducted with knowledgeable person, including aqua farming entrepreneurs, shrimp traders and local government officials. Additionally, during each interview, the purpose of the study was explained to the participants, and a permission was taken for disclosing their information to others for research. Collected data were analyzed using SPSS (Statistical Package for Social Science, Version 20.00).

Priority Index (P.I.) was used in this study to figure out the nature of problems facing the respondents. The gher farmers were asked to prioritize the problems regarding diseases during culture, high input cost, low benefit, insufficient fund, natural calamities, lack of technical skill, shrimp stealing, applying poison in gher and inconsistency in value chain facing them in marketing their crop with five point range.

The Priority Index (P.I) is explained below according to **Mozahid *et al.* (2018)** and **Roy and Basu (2020)**.

$P.I.=\sum s_i f_i/n$, $(0 \leq P.I. \leq 1)$…….. (1)

Where,

P.I. = Priority Index;

S_i = Scale value of i^{th} priority;

F_i = Frequency of i^{th} priority, and

N = Total number of observations.

In Table (5), scale value used in constructing priority index is mentioned. It can be seen that the scale value ranges from 1 to 0 with priority 1^{st} to 5^{th}, correspondingly.

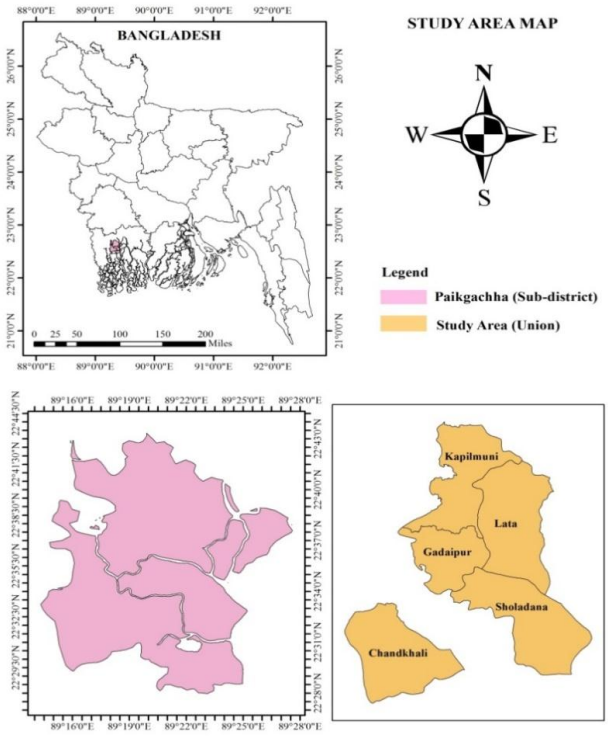

Fig. 1. Geographical location of the study area

RESULTS AND DISCUSSION

Age composition

For the assessment of the potentiality of human resources of a specific community, the study of age composition is needed. Four different age groups were found from the studied area. Most of the gher farmers (49.6%) belonged to the age group between 26 to 40 years, while lower age group (12.8%) was above 60 years of age (Table 1). Twenty percent respondents had age between 41 to 60. **Aziz *et al.* (2020)** opined that, older fishers preferred traditional harvest system than the younger counterparts. The finding is close to the result of a study on the gher farmers of Shyamnagar Sub-district,

where 53% respondents were 36-50 years old **(Roy & Basu, 2020)**. Whereas, more than 30% fishermen of Paikgachha were 31- 40 years of age, and those aged from 12-20 were 16.7% **(Roy *et al.*, 2020c)**.

Gender

The survey data revealed that, the majority of the gher farmers were males (97.6%), with a frequency of 122 out of 125 respondents, and the rest were female counterparts (2.4%) (Table 1). However, it was reported that the female members were indirectly engaged in gher farming activities, such as gher construction, feeding, netting and fencing around the gher. In this context, **Ahmed *et al.* (2021)** stated that, most of the female members in the fishers' community were indirectly involved in fisheries activities. Moreover, less than 20% female members were involved in fishing at Batiaghata Sub-district, Khulna **(Das *et al.*, 2015)**.

Religion

For the religious perspective, 56% farmers were Hindu and the remaining 44% were Muslim (Table 1). The finding of **Das *et al.* (2015)** was close to that of the present study, where most of the fishermen were Hindu at Batiaghata, Khulna. Whereas, more than 90% Muslim fishermen were found near the Meghna River Estuary at Chandpur District, which is dissimilar to the present study **(Ahmed *et al.*, 2021)**.

Household member

Family indicates a group of people including parents with their offspring living as a unit where a common kitchen is shared **(Roy *et al.*, 2016)**. Additionally, family size represents dependency ratio of the household and responsibilities on the earning head member **(Hossain *et al.*, 2020)**. Four different family sizes were identified in the present study, with members ranging between 2-3, 4-5, 6-7 and above 7 in each household. Larger percentage (38.4%) of family consisted of 4 to 5 members, while lower percentage (14.4%) comprised above 7 members (Table 1). The finding of **Roy and Basu (2020)** is a little bit different from the present finding, where more than 60% of gher farmers families had 4 to 6 members.

Education

The light of education develops human personality and brings economic development in the society **(Aliloo and Dashti, 2021)**. In the study area, the higher the educational level (primary to graduation), the less the participants were involved. Most of the respondents (33.6%) took education up to primary level, and only 4% completed to graduation (Table 1). On the other hand, only 30.4% of the farmers could sign only with no institutional education. Whereas, 53% of gher farmers of Shyamnagar completed their secondary education **(Roy & Basu, 2020)**. **Roy *et al.* (2020c)** found that, more than 20% fishermen at Paikgachha received no institutional education. They added that, fishermen used to involve in fishing at the early age due to poverty, with an attempt to help in the

family income. **Ahmed *et al.* (2021)** detected that, only 7% of Meghna River fishers completed secondary education, while more than 65 (10%) were illiterate.

In the present study it was evident that, children from 76.8% households of gher farmers went to school, and the rest 23.2% could not go to school, either for family pressure or lack of awareness regarding the importance of education. Moreover, **Roy and Basu (2020)** reported that, 75% shrimp farmers had 1- 3 members continuing education.

Housing pattern

Forty eight percent respondents had tin shaded houses, 31.2% had half cemented buildings (semi-permanent), and 20.8% had full cemented buildings (permanent) for living purpose (Table 1). Generally, roof and wall of tin shaded home are made of corrugated iron sheets with earthen floor. **Ahmed *et al.* (2021)** documented that, most of the fishermens (53%) of Chandpur had tin-shed housing patterns, and only 5% had fully cemented homes. Whereas, more than 25% of fishermen at Paikgachha, Khulna used to live in shack made of bamboo, wood, jute sticks and leaves **(Roy *et al.*, 2020c)**.

Status in society

Recognition of an individual in the society is indicated by his family history, education, family income, housing structure and type of occupation. In the current study, the societal status was classified into 3 groups: general, local leaders and respective persons. The majority of the farmers led an ordinary life (73.6%); some were local leaders (6.4%), while the rest were respective persons (20%) in their community (Table 1). Whereas, 81.6% of the ordinary fishermen and 4.4% of the local leaders were found in the fishing community of Shibsa River **(Roy *et al.*, 2020c)**.

Drinking water

Safe drinking water indicates the available water for the users to drink, prepare food and use for maintaining personal hygiene **(Dinku, 2018)**. The current study revealed that, 60.8% of the people used their own tube-well placed into their house premises as a source of drinking water, and 39.2% used neighbors tube-well (Table 1). In this essence, **Roy *et al.* (2020c)** reported that, more than 30% of the fishermen owned a shared tube-well. The result is in accordance with the findings of **Das *et al.* (2015)** where they found that, 89% of the fishermen used tube-well water for consumption at Batiaghata Sub-district, Khulna. Moreover, **Rahman *et al.* (2018)** reported that, the availability of safe drinking water is challenging for the coastal people due to salinity intrusion during flood and other natural calamities.

Sanitation

Three different sanitation facilities were observed in the study area; namely, *kacha* (unimproved toilet), *semi paka* (basic standard toilet), *paka* (improved toilet). It was evident that, most of the farmers (65.6%) used basic standard latrine and 22.4% used

improved latrine (Table 1). On the other hand, 12% of the respondents had pit latrine at their homes, which is not satisfactory since fecal pollution of groundwater from pit latrines is considered as a health hazardous for rural and peri-urban people **(Ravenscroft *et al.*, 2017)**. Whereas, more than 50% of the fishermen in Chandpur used to utilize unimproved toilet built in sand **(Ahmed *et al.*, 2021)**.

Diseases and treatments

It was found that, the gher farmers suffered from various types of diseases, including fever, gastrointestinal and respiratory diseases, aches and others. The majority of them (40.8%) suffered mainly from fever of various types. Most of the farmers (66.4%) accepted allopathic treatments; some received homeopathy (20.8%), and the others (12.8%) took herbal treatments (Fig. 2). **Roy *et al.* (2020c)** reported that, more than 45% of the fishermen near Shibsa River suffered from fever, and 16% were affected with different pulmonary diseases. In the study area, 45% of the respondents preferred allopathetic medicine, while 20% were dependent on herbal treatment. Whereas, 57% of the fishermen of Meghna River was treated by certified allopaths from government hospital **(Ahmed *et al.*, 2021)**.

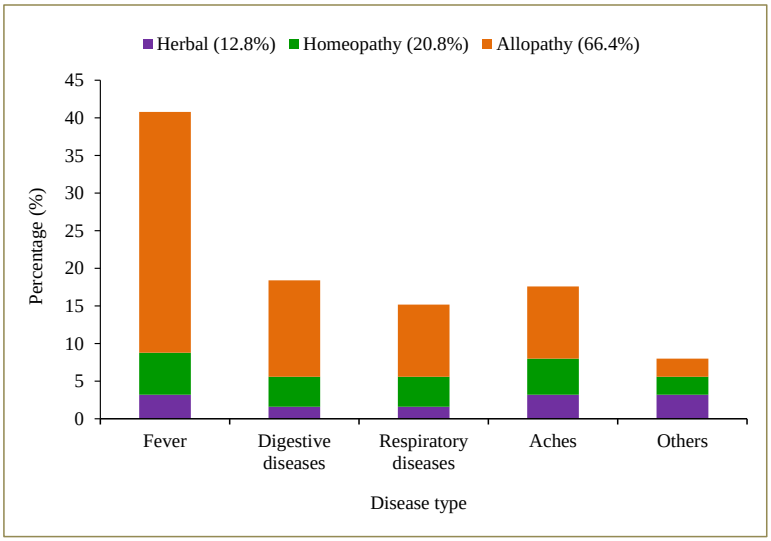

Fig. 2. Common diseases and treatment categories of the gher farmers

Fuel for cooking

In the current study area, more than 76.8% farmers used wood, cow dung, paddy straw and dry leaves (Table 1). On the other hand, 23.2% used gas for cooking purposes. **Billah *et al.* (2020)** opined that, most of the rural households of Bangladesh utilize fuel wood as their daily energy source. According to **Miah *et al.* (2021)**, the amount of annual fuel use depends on family type, household income, demands for food and burning hours.

Electricity connection and electronic mass media

Successful electricity connection in the households is one of the fundamental necessities for rural development. From the survey it was found that, 88% of the gher farmers got electricity facilities, while the other 12% was deprived of electricity amenities (Table 1). In comparison, **Ahmed *et al.* (2021)** reported that more than 90% fishers households had electricity in their home.

At present, mass media is regarded as means of social advancement, especially for the agrarian areas for it has potentiality to transmit technological developments. In the study area, more than 96.8% of the gher farmers used mobile phone for communication, specially for marketing the harvested shrimp and fishes (Table 1). Whereas, in case of recreational purpose, 52% of the farmers had television while the rest did not. In this context, **Roy *et al.* (2020c)** postulated that, 25% households in the fishermen community had either television or radio for entertainment.

Table 1. Social dimensions of the gher farmers of Paikgachha Sub-district

Variable	Category	Percentage (%)
Age	10-25 years	17.6
	26-40 years	49.6
	41-60 years	20
	Above 60 years	12.8
Gender	Male	97.6
	Female	2.4
Religion	Muslim	44
	Hindu	56
Household member	2 to 3 members	26.4
	4 to 5 members	38.4
	6 to 7 members	20.8
	Above 7 members	14.4
Educational status	Can sign only	30.4
	Primary (Class I to V)	33.6
	Secondary (Class VI to X)	18.4
	Higher secondary	13.6
	Graduation	4
School going children	Yes	76.8
	No	23.2
Status in society	General	73.6
	Local leaders	6.4
	Respective persons	20
Housing pattern	Tin shade	48

	Half cemented building (semi-permanent)	31.2
	Full cemented building (permanent)	20.8
Source of water	Own tube-well	60.8
	Neighbor's tube-well	39.2
Sanitation	Pit latrine (*kacha*)	12
	Basic standard latrine (*semi-paka*)	65.6
	Improved latrine (*paka*)	22.4
Diseases	Fever of all types	40.8
	Gastrointestinal diseases	18.4
	Respiratory diseases	15.2
	Aches	17.6
	Others	8
Treatments	Herbal	12.8
	Homeopathy	20.8
	Allopathy	66.4
Electricity conditions	Present	88
	Absent	12
Main fuel for cooking	Wood, dry leaf and cow dung	76.8
	Fuel gas	23.2
Mobile	Yes	96.8
	No	3.2
Television	Yes	52
	No	48

Experience and ownership

Experience in gher farming enhances skill in gher management. Experience of gher farmers was classified into three groups: 1-15 years, 16-30 years and above 30 years (Table 2). The majority (44.8%) of the farmers had an experience of 16-30 years in gher farming, 35.2% had experience of 1-15 years and the remaining had above 30 years. Whereas, half of the fishermen near the Shibsa River had 11-20 years' experience **(Roy *et al.*, 2020c)**.

The present study revealed that, 36% farmers had their own gher, 35.2% shared with others, and the rest 28.8% took ledge from others (Table 2). A study appeared that, 55% gher farmers practiced gher farming individually in the Khulna region **(Jahan *et al.*, 2015)**.

Gher number and size

The majority of the gher farmers (74.4%) had 1 to 5 ghers, and 21.6% had 6 to 10 ghers. On the other hand, only 4% of the farmers had above 10 ghers (Table 2). The size

of gher is correlated with the stocking density of the culture species. Most the gher size ranged between 1 to 10 bigha; whereas, only 7.2% farmers had gher with sizes above 20 bigha (Table 2). On the other hand, the average pond size in the fish farms of Rajbari Sub-district was 0.32-2.40 bigha **(Nadia *et al.*, 2021)**.

It was found that, 62.4% farmers prepared gher with depths ranging between 1 and 1.5ft; 17.6% of the farmers had gher between 1.6 and 2.5ft, 12% of the farmers recorded depths between 2.6 and 3.5ft and 8% farmers above 3.5ft (Table 2). **Mamun *et al.* (2020)** reported that, the depth of gher varies on the basis of season, but in the dry season, more than 70% of the gher depth ranged between 1&2ft in Shyamnagar Upazila. Moreover, **Ali *et al.* (2018)** found that, the depth of shrimp and prawn ghers were 2.66ft and 3.18 ft, respectively.

Culture system

From the survey it was found that, most of the farmers (56.8%) practiced monoculture of giant tiger prawn; whereas in case of poly-culture, it was practiced in combination of shrimps with fishes by 43.2% of the gher farmers (Table 2). In case of polyculture in the gher, most commonly stocked species are mud crabs, giant river prawn, Indian white shrimp, brown shrimp, Indian major carps, tengara, tilapia, mullet and coral. Similar result was found in a previous study where more than 25% gher farmers combinedly cultivating Horina (brown shrimp) and Bagda chingri (giant tiger shrimp) was reported **(Mamun *et al.*, 2020)**.

The different types of culture systems were identified as extensive and semi-extensive. The largest percentage (92%) of farmers performed extensive culture system, while only 8% of the farmers followed semi-extensive culture system (Table 2).

Seed and feed type

In the study area, more than 10% of the respondents used to stock seed collected from river; 60% collected from hatchery and the others (29.6%) collected from both hatchery and river (Table 2). On the other hand, more than 70% of the tilapia farmers brought fry from nearby commercial hatchery at Mymensingh **(Faruk *et al.*, 2017)**. **Nadia *et al.* (2021)** reported that, 46 and 54% of fish farmers of Rajbari district collected fish fingerlings from private and government hatcheries, respectively.

Quality feed is the prerequisite of higher production in aquaculture. Around 68.8% farmers were using commercial diet for feeding the cultured species, while the rest (31.2%) used homemade feed for their cultured species in the studied area (Table 2). The homemade feed ingredients were muscle of snail, molasses, rice polish, boiled rice, rice bran, wheat bran, soybean oil cake, mustard oil cake, boiled wheat, boiled lentil and boiled corn. Moreover, those who did not use commercial feed, partially relied on the natural source of feed for shrimp, such as phytoplankton, zooplankton and other aquatic vegetation. Consequently, they used to apply urea, phosphate, MOP and other fertilizers

for plankton production. Whereas, most of the gher farms preferred natural feed than commercial feed in shrimp farming at Satkhira region **(Mamun *et al.*, 2020)**.

Selling process

In the study area, the gher farmers used to utilize mainly Charu named trap made of bamboo stick for shrimp harvest. Moreover, other traps, cast net, seine net, push net, lift net, gill net, hook and line were also used for shrimp and other species. However, it was recorded that most of the farmers (61.6%) sold their production to store house or arot, lower percentage (10.4%) directly took in the market and some (28%) contacted with middlemen for selling purposes (Table 2). A similar result is detected in the study of **Das *et al.* (2015)** at Batiaghata Sub-district. Whereas, more than 30% of the fishermen used to sell fish to the store house and 45% deals with the middlemen at Paikgachha **(Roy *et al.*, 2020c)**.

Additional occupation

For uncertainties in agricultural crop (agriculture, livestock and fisheries) production, the rural households had to involve in both agricultural and non-agricultural occupations to maintain their livelihood **(Martin & Lorenzen, 2016)**. Along with gher farming, the farmers were involved with different occupations such as agriculture, livestock rearing, business, day labor and others job. Moreover, poor farmers used to work as day labor and the others usually managed agricultural crop production, livestock rearing and various types of business when their income was not sufficient to support the household expenses in case of having less physical capital. Similarly, **Roy and Basu (2020)** recorded those observations at Shyamnagar Sub-district. Whereas, fish was the main source of income for 79% of the fishermen at Chandpur District at the bank of the Meghna River **(Ahmed *et al.*, 2020)**.

Source of training

Higher percentage (44.8%) of farmer used to receive suggestions from family and neighbors regarding farming, 32.8% from the training offered by Govt. organizations and remaining 22.4% was trained by different NGO's such as WorldFish, Winrock International, CP Bangladesh, ACI and TMSS (Table 2). **Roy *et al.* (2020c)** found that, more than half of the fishermen near the Shibsa River received technical guidance from neighbors and relatives. On the other hand, more than 80% of the farmers were trained by NGO's for fish farming. A study showed that, less than 35% of fish farmers received improved farming guidance from Upazila Fisheries Office **(Salim *et al.*, 2013)**.

Table 2. Occupational factors of gher farmers of Paikgachha Sub-district.

Variable	Category	Percentage (%)
Experience	1-15 years	35.2
	16-30 years	44.8
	Above 30 years	20
Gher ownership	Own	36
	Share with others	35.2
	Ledge	28.8
Gher number	1-5	74.4
	6-10	21.6
	Above 10	4
Gher area	1-10 bigha	79.2
	11-20 bigha	13.6
	Above 20 bigha	7.2
Depth	1-1.5 ft	62.4
	1.6-2.5 ft	17.6
	2.6-3.5 ft	12
	>3.5 ft	8
Seed type	River	10.4
	Hatchery	60
	Both	29.6
Culture species	Only shrimp	56.8
	Shrimp with other species	43.2
Culture system	Extensive	92
	Semi-intensive	8
Feed type	Homemade and natural feed	31.2
	Commercial feed	68.8
Selling process	Store house or arot	61.6
	Direct market	10.4
	Middleman	28
Source of training	Govt. organizations	32.8
	NGO's	22.4
	Family and neighbor	44.8

Income, expenditure and savings

In the current study, on the basis of yearly income, the gher farmers were categorized into 4 groups (Table 3). Higher percentage of farmers (38.4%) earned between 60,000-80,000 BDT, while 24.8% earned 81,000-100,000 BDT; 18.4% earned 101,000-120,000 BDT and the rest 18.4% earned above 120,000 BDT annually. Similar result was found

in the fishers communities of Shibsa River **(Roy *et al.*, 2020c).** On the other hand, **Ahmed *et al.* (2021)** reported that more than 45% of the fishermen of Meghna River earn 5,000-10,000 BDT monthly from fishing.

Household savings accelerate sustainable economic growth, which mostly depends on income and expenditure. Respondent farmers spent 58% from the total income on culture and gher management and rest (42%) of the income was spent on family expenditure (Fig. 3). Family expenditure includes food (30%), health (7%), education (3%) and clothing (2%). While, culture expenditure includes gher repairing (7%), PL and fish seed (11%), feed (25%), aqua-drug (10%) and transportation (5%). It was noted that the fisher folk of Hilsa near the Ganga River spent 40% of the income on occupation **(Roy *et al.*, 2016)**.

Most of the farmers (70.4%) used to save money, while the remaining (29.6%) failed to do so (Table 3), which is close to the finding of previous studies among which that of **Roy *et al.* (2020c)** can be considered.

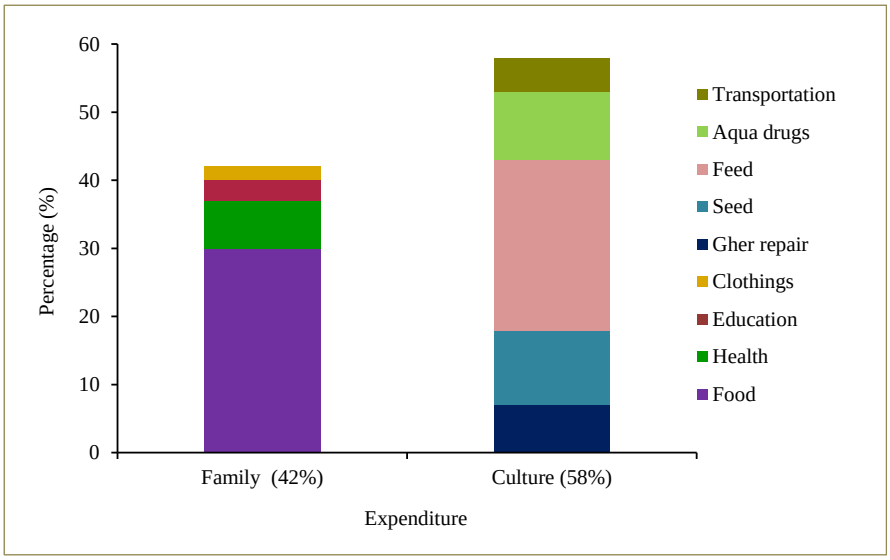

Fig. 3. Expenditure categories of the gher farmers

Source and purpose of loan

In the present study it was found that, most of the farmers (53.6%) could bear the farming cost without loans from banks or any other organization (Table 3). However, 38.4% of the farmers took loans from banks and NGO's, and the rest 8% got loans from Mahajans. **Roy *et al.* (2020c)** observed that, more than 30% of the fishermen borrow money from banks whereas less than 15% got it from friend and neighbors.

The farmers basically took loans for different reasons, including farming, housing, marriage, health and education. Larger percentage (36.8%) made loans for farming purpose, 20.8% for housing, 12% for marriage, 17.6% for health and 12.8% for education (Table 3). This finding coincides with that of **Salim *et al.* (2013)** who found that more than 35% fishermen lend money for their occupation.

Table 3. Financial factors of gher farmers of Paikgachha Sub-district

Variably	Category	Percentage (%)
Income/year (BDT.)	60,000-80,000	38.4
	81,000-100,000	24.8
	101,000-120,000	18.4
	Above 120,000	18.4
Savings	Cannot	29.6
	Save	70.4
Source of credit	Self	53.6
	Bank and NGO's	38.4
	Mahajan	8.0
Purpose of taking loans	Culture	36.8
	Housing	20.8
	Marriage	12.0
	Health	17.6
	Education	12.8

Correlation among different financial and non-financial factors

Table (4) describes the correlation coefficient between different variables of the sampled gher farmers. It was found that the experience of gher farmers increased with the increase of age, and there was a strong correlation (r= 0.711, $P < 0.01$) between age and experience as shown in Fig. (4). The present result concurs with that of **Roy *et al.* (2020c)**. The social status was high in the older age group and was strongly correlated (r= 0.636, $P < 0.01$) with one another. Age was positively correlated with housing pattern; however, it had negative correlation with culture system, feed type, income and savings. In this respect, **Roy *et al.* (2016)** found weak positive correlation among the two variables. On the contrary, experience was negatively correlated with culture system, feed type and savings. Moreover, it was found that, education had weak negative correlation (r= -0.188, $P < 0.05$) with social status, while it was positively correlated with housing pattern (r= 0.029, $P > 0.05$), culture system (r= 0.367, $P < 0.01$), feed type (r= 0.280, $P < 0.01$), income (r= 0.078, $P > 0.05$) and savings (r= 0.276, $P < 0.01$). **Roy *et al.* (2020c)** detected weak positive correlation between the education and the social status of the fishermen. This indicates that there was a great impact of education on those particular variables studied with respect to gher farmers. A very strong correlation (r= 0.792, $p < 0.01$) was identified between housing pattern and income since higher income improve housing facility (Fig. 5), which is close to the result of **Roy *et al.* (2020c)**. From the study it was found that, culture system had positive correlation with feed type, income and savings. Improved culture system is related to quality feed. Higher income and savings helped farmer develop culture system.

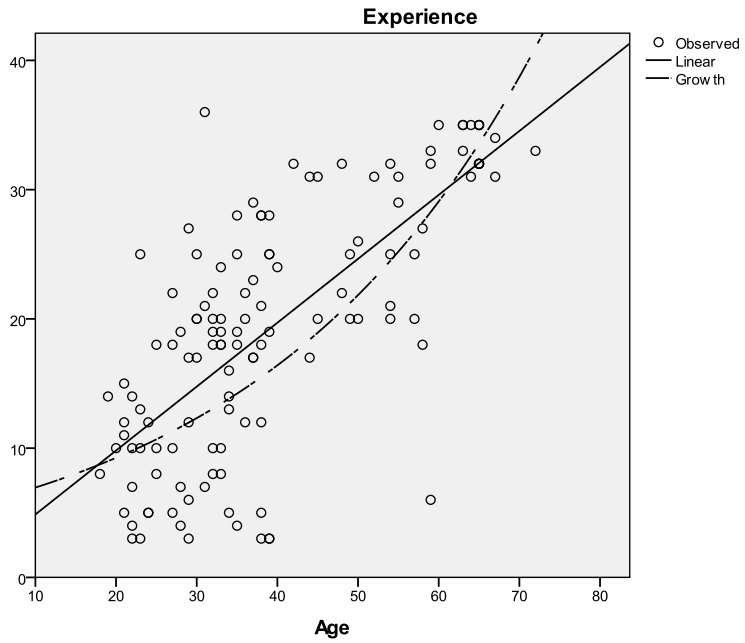

Fig. 4. Correlation between age and experience of the gher farmers

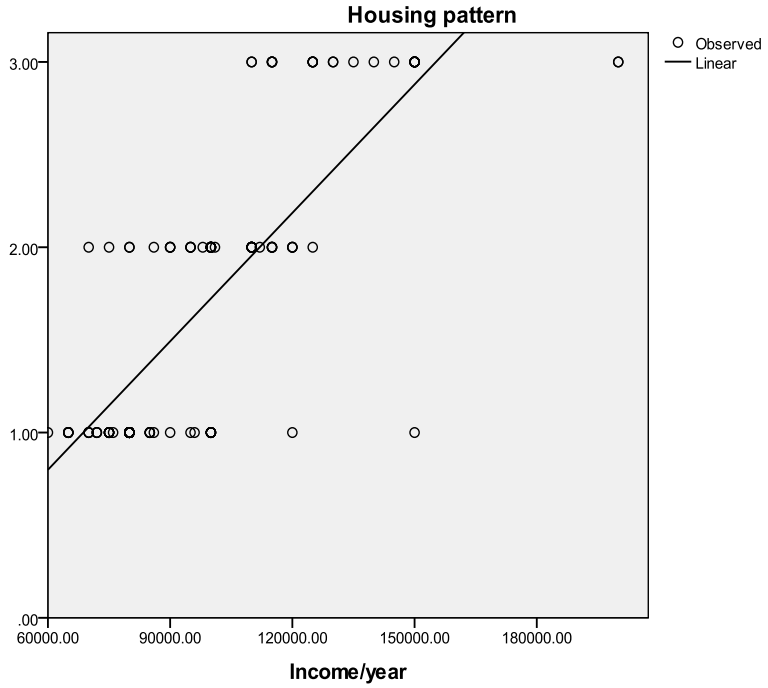

Fig. 5. Correlation between annual income and housing pattern of the gher farmers

Table 4. Correlation coefficient among different factors of gher farmers of Paikgachha Sub-district

	Age	**Experience**	**Education**	**Social status**	**Housing pattern**	**Culture system**	**Feed type**	**Income/Year**	**Savings**
Age	1								
Experience	0.711**	1							
Education	-0.485**	-0.353**	1						
Social status	0.636**	0.546**	-0.188*	1					
Housing pattern	0.022	0.172	0.029	-0.014	1				
Culture system	-0.054	-0.058	0.367**	-0.031	0.065	1			
Feed type	-0.425**	-0.334**	0.280**	-0.366**	0.075	0.135	1		
Income/Year	-0.013	0.146	0.078	-0.017	0.792**	0.154	0.108	1	
Savings	-0.462**	-0.398**	0.276**	-0.375**	-0.024	0.127	0.320**	0.024	1

** means correlation is significant at the 0.01 level (2-tailed) and * indicates significance at the 0.05 level (2-tailed).

Constrains faced by the farmers

The observed problems of the gher farmers in the present study were similar to those of the aqua farmers of other regions **(Rahman *et al.*, 2018; Roy & Basu, 2020)**. Although shrimp cultivation is a profitable sector, the respondents pointed several major constraints. **Roy and Basu (2020)** categorized constraints in financial, technical and social problems. The respondents in the present study ranked sudden disease of the culture species as 1st problem (Table 5), which might be emerged due to infectious pathogens or unfavorable environmental factors. Whereas, high input cost, lower benefit, insufficient fund, natural calamities, the lack of technical expertization, shrimp stealing, poison applying in gher and inconsistency in value chain were ranked as 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th major problem, respectively. Coastal zones are disaster prone areas, and as a result, gher farming remained vulnerable to sudden calamities. The gher farmers suffered from huge loss due to poison application and poaching as a result of social and political conflicts.

Table 5. Major problems faced by the gher farmers of Paikgachha Sub-district

Problem	**1st (S= 1)**	**2nd (S= 0.75)**	**3rd (S= 0.50)**	**4th (S= 0.25)**	**5th (S= 0)**	**∑F**	**P.I.**	**Rank**
Diseases during culture	66	36	21	2	0	125	0.84	1
High input cost	65	31	17	12	0	125	0.80	2
Lower benefit	54	34	27	10	0	125	0.77	3
Insufficient fund	52	33	22	15	3	125	0.74	4
Natural calamities	48	37	19	17	4	125	0.72	5
Lack of technical expertization	38	23	31	21	12	125	0.62	6
Stealing	31	30	35	15	14	125	0.61	7
Applying poison in gher	29	27	35	19	15	125	0.59	8
Inconsistency in value chain	18	31	31	27	18	125	0.52	9

* S: Scale; F: Frequency; P.I: Priority Index

CONCLUSION

Shrimp represents one of the potential food producing sectors in Bangladesh, which have already demonstrated continuous production over recent years. Sustainability of this

potential sector is directly related to the gher farmers. Livelihood of the gher farmers is the combination of various socio-economic factors. However, all the gher farmers cannot improve their life mode due to various social, financial and technical constraints. The farmers should be encouraged to practice more improved ways of farming, including gher construction, seed stocking, feeding, regular monitoring, harvesting and others. Hence, the implementation of modern technologies is assumed to enable the gher farmers increase their income and improve their livelihood standard. It is high time to make more effective plans and augment them for solving their problems.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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