PRESENT STATUS OF AQUACULTURE AND SOCIO-ECONOMIC CONDITION OF FISH FARMERS IN A RURAL SETTING IN BANGLADESH

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A B S T R A C T

The socio-economic condition of fish farmers was assessed in the Habiganj Sadar upazila, Habiganj, Bangladesh to determine the constraints and vulnerability of the community in term of aquaculture. Data from 30 fish farmers were collected during January to May 2019. Among surveyed farmers, most of the pond size (37.61%) ranged between 0.02 ha to 0.06 ha and 63.33% of ponds under single ownership. Most of the farmers were interested to stock rohu, catla, mrigal along with other species and average stocking density was found to be 16236 fry/ha. All farmers provided feeds for the cultured species and 73.33% farmers have taken measures against disease outbreak. The highest production was estimated as 6.19 MT/ha/year and lowest production was 0.54 MT/ha/year. Highest income of farmer was reported as 5,00,000 Tk/ha/year and the lowest as 74534 Tk/ha/year. Highest 34.38% farmers in the study area reported high cost of feed is the most important constraint. The study indicated that majority of fish farmers (33.33%) were in age structure of 31-40 years. Similar to the religious profile of the population, Muslims (93.33%) dominated the ownership. Among all the farmers, 40% received primary level education. The study revealed that 60% of farmers lived in joint families with tin shed house (43.33%). All farmers had electricity in their house and at least one mobile phone. Among the farmers 53.33% have good sanitary facility and 83.33% farmers had own tubewell for drinking water facility. 50% farmers received health service from village doctor and 33.33% farmers received technical training on fish farming.

INTRODUCTION

For sustainable rural development and poverty alleviation, different options were adopted and the "Sustainable Livelihood Approach" has been gradually expanded with its own interior and principles for poverty focused development activities (DFID, 1998). The execution of the developmental program often failed due to the lack of adequate necessary information and socio economic condition's data (Hassan *et al.* 2012).

Bangladesh is one of the world's leading fish producing country with a total production of 42.76 million MT in financial year 2017-18 (DoF, 2018). The country became self-sufficient in fish production providing 62.58 g of fish per person in daily dietary consumption (DoF, 2018). Now a days aquaculture is economically profitable and farmers in rural areas are interested into aquaculture ponds (Islam *et al.* 2017). The annual pond fish production of Habiganj was 3.55 MT/Ha in financial year 2017-18 (DoF, 2018). Although Habiganj is an area with aquaculture dominating as the farming activity, adequate information, data and literature was not reported on the socio-economic and livelihood status of fish farmers of Habiganj. In this context, the present study was conducted to assess the status of aquaculture at Habiganj Sadar Upazila with a view to estimate the socio-economic status of fish farmers in the study area.

MATERIALS AND METHODS

Study area and duration

The present study was carried out at Habiganj Sadar upazila under the district of Habiganj (Figure 1), Bangladesh during January to May 2019. Habiganj Sadar upazila was selected because pond based aquaculture is practiced in this area. The study was carried out in the five villages named Poil, Panch Paira, Eralia, Shihaldaria, Mahmudabad where 30 fish farmers were interviewed during the survey.
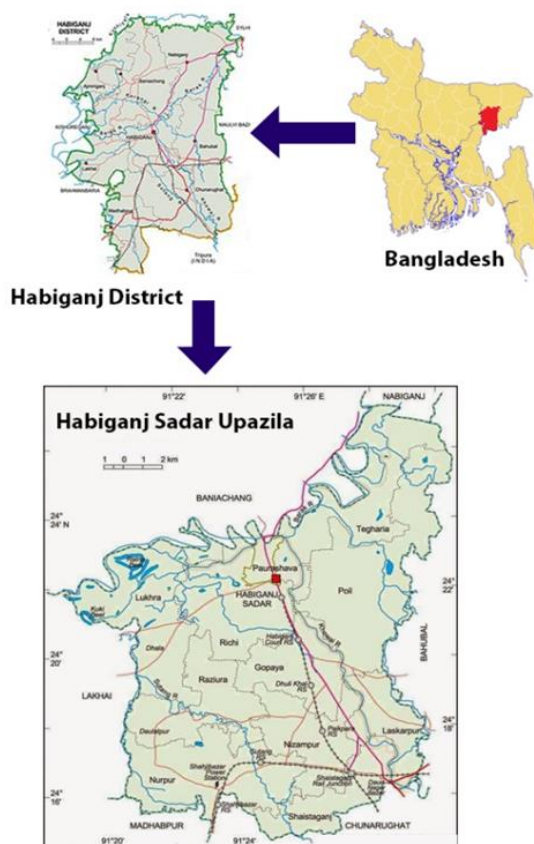

Figure 1. Map Showing study area (Sadar Upazila under Habiganj District, Bangladesh)

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METHODOLOGY

Data were collected from randomly selected 30 fish farmers by personal interview with a well-structured questionnaire. Participatory rural appraisal (PRA) tool such as Focus Group Discussion (FGD) was conducted to obtain more accurate data (Chambers, 1992). Five FGD were conducted with average group size of six farmers. Key Informant (KI) interviews were done with Upazila Fisheries Officer (UFO) to cross-check the collected data.

Data processing and analysis

All the collected data were tabulated, scrutinized, analyzed carefully and presented graphically by Microsoft Excel (version 2010).

RESULTS AND DISCUSSION

Ponds of fish farmers

The ponds (37.61%) were dominated by those with a water spread area of 0.02-0.06 ha. Next dominant group (30.28%) farmers had ponds with 0.07-0.13 ha of water spread area, 20.18% farmers had ponds with a size of 0.14-0.20 ha, 9.17% farmers had ponds with a size of 0.21-0.35 ha and 2.75% farmers had ponds which were larger than 0.35 ha, respectively (Table 1). Asif *et al.* (2017) found most of the farmers had ponds with size of 34-66 decimal in Jhikargachha upazila of Jessore district, Bangladesh.

Table 1. Pond size of fish farmers in Habiganj Sadar upazila, Habiganj

Pond Size (Ha)	No. of Ponds	Percentage
0.02-0.06	41	37.61%
0.07-0.13	33	30.28%
0.14-0.20	22	20.18%
0.21-0.35	10	9.17%
0.35-Above	3	2.75%
Total	109	100%

Farming experience of farmers

In the study area 26.67% farmers had farming experience for 1-3 years, 20% farmers had farming experience for 4-6 years, another 20% farmers had farming experience for 7-10 years, 13.33% farmers had farming experience for 11-15 years and 20% farmers had farming experience for 16 years or above. There was a significant positive relationship between the farming experience of the farmers and the production per ha per year, r=0.84, P<0.001. It was observed that farmers who had farming experience for more than 16 years got higher production.

Farm's land ownership

It was revealed that 63.33% farmer's farmlands were under single ownership while 26.67% farmer's farmlands and 10.00% farmer's farmlands were under multi ownership and leased, respectively (Figure 2). It was observed that, in case of multiple ownership farms, decision-making phases of pond management are often affected for a consensus among the owners and it also affect the production negatively. Ali *et al.* (2009) found that 70% of the ponds were under single ownership in Mymensingh district of Bangladesh, which is almost similar to the results of the present study.
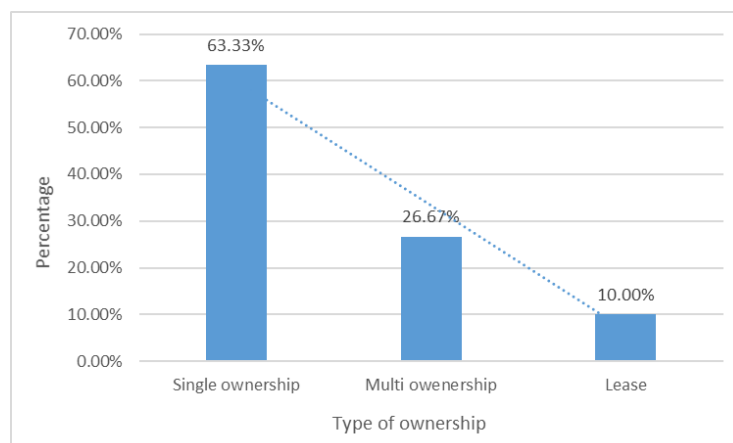
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Figure 2. Farm's land ownership

Culture system

All farmers (100%) carried out the polyculture system. Gosh *et al.* (2006) also found that 100% farmers carried out polyculture system in two unions of Rangpur district. Adhikary *et al.* (2018) stated that, most of the farmers (99%) carried out polyculture system both of which are similar to the present study.

Fish species preferred by farmers and stocking density

Most of the farmers (90%) stocked rui (*Labeo rohita*). Among thirty farmers, catla (*Catla catla*) was stocked by 60% and mrigal (*Cirrhinus cirrhosus*) was stocked by 70%. Other species such as tilapia (*Oreochromis niloticus*) was stocked by 26.67%, grass carp (*Ctenopharyngodon idella*) was stocked by 46.67%, ghonia (*Labeo gonius*) was stocked by 40.00%, common carp (*Cyprinus carpio*) was stocked by 36.67%, silver carp (*Hypophthalmicthyes molitrix*) was stocked by 33.33%, bighead carp (*Hypophthalmicthyes nobilis*) was stocked by 23.33%, punti (*Puntius sophore*) was stocked by 6.67%, bata (*Cirrhinus reba*) was stocked by 13.33%, sarpunti (*Puntius sarana*) was stocked by 20%, chitol (*Chitala chitala*) was stocked by 10.00%, shing (*Heteropneustes fossilis*) was stocked by 6.67%, pangus (*Pangasius pungasius*) was stocked by 10%, mirror carp (*Cyprinus carpio*) was stocked by 6.67%, and mono-sex tilapia was stocked by 6.67% farmers, respectively (Figure 3). Hatchery produced fingerlings were predominant in the fish culture of the study area. The average stocking density of fish was found to be 16236 fry/ha in the study area. The average stocking density of carp found to be 17262 fry/ha by Gosh *et al.* (2006) in Rangpur district and 16196 fry/ha by Hasanuzzaman (1997) in Rajshahi district of Bangladesh.
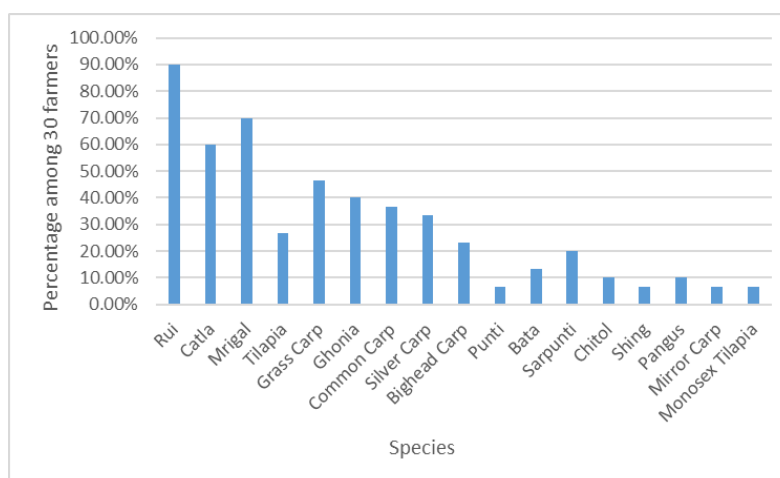

Figure 3. Fish species stocked and cultured in Habiganj Sadar upazila, Habiganj

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Feed types preferred by farmers

In the study area, all farmers provided feeds with the cultured species. Homemade feed was provided by 30% of the farmers and commercial feed was provided by 70% of the farmers. Most of the homemade feed providers used household waste, rice bran and mustard oil. Rahman *et al.* (2018) observed that artificial feed (63%), farm made feed (3%), and both artificial and homemade feed (34%) were supplied to the cultured species in Nilphamari district of Bangladesh. It was observed that, farmers who provided commercial feed got higher production than those are provided homemade feed.

Fertilizer used in fish farming

In the present study, organic fertilizer cow-dung was used by 50% farmers, inorganic fertilizer urea was used by 96.67% farmers, TSP (Triple super phosphate) was used by 26.67% farmers and MoP (Murate of Potash) was used by 6.67% farmers. Here, fertilizer is generally used in the fishpond to create favorable condition, which facilitate to produce good quality natural fish feed, as a result fish production increased. Asif *et al.* (2017) found in his study that cow-dung was used by all (100%) surveyed farmers in Jhikargachha upazila of Jessore district.

Farming duration

The aquaculture started usually in March and continued up to December in the study area. Other authors also observed that peak season of carp polyculture were from March to December (Rahman, 2003) and April to December (Ahmed, 2003).

Disease Outbreak

It was found that, gas bubble disease was experienced by 3 farmers, dropsy was experienced by 11 farmers, EUS (Epizootic Ulcerative Syndrome) was experienced by 10 farmers, bacterial gill disease was experienced by 1 farmer, fin and tail rot was experienced by 6 farmers was experienced by 1 farmer in their farm (Figure 4). The conscious farmers adopted preventive measures like pond drying, liming, weed control, maintaining water quality parameters etc. to keep away the infectious pathogens from the farms.
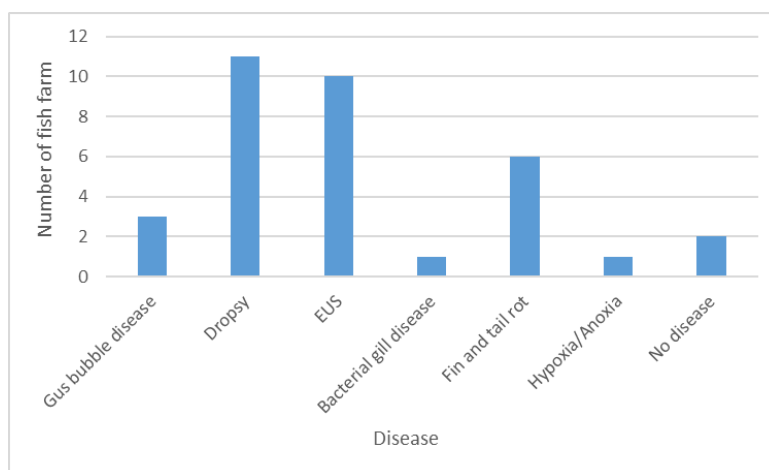

Figure 4. Disease outbreak experienced by fish farmers in Habiganj Sadar upazila, Habiganj

Disease outbreak and treatment

It was found that, 73.33% farmers had taken measures against disease outbreak with the advice from upazila fisheries officer/local drug seller shops and experienced farmers (26.67%) did not face any disease problem. Rahman *et al.* (2018) found 87% farmers were aware of control measures of diseases of cultured species and potentially adverse conditions in the farming systems.

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Harvesting and marketing of fish

Farmers' harvest fish by using cast net and seine net. The farmers sold around 80% fish to the traders/agents and rest of the fish time to time consumed by the households. Gosh *et al.* (2006) found that, the farmers sold around 75% fish to the traders and the households consumed the rest (25%). The findings almost similar to the present study.

Production of fish

The highest fish production was found 6.19 MT/ha/year while the lowest production was 0.54 MT/ha/year. Most of the farmers (60.00%) produced 0.50-2.50 MT/ha/year, 33.33% farmers produced 2.51-4.50 MT/ha/year and 6.67% farmers produced 4.51-6.50 MT/ha/year. The average production was found 2.13±1.39 MT/ha/year (Table 2). The average fish production from pond in Habiganj district was found 3.55 MT/ha in 2017-18 Financial Year (DoF, 2018). Asif *et al.* (2017) found the highest production was 27000 kg/year and the lowest production was 650 kg/year in Jhikargachha upazila of Jessore district.

Table 2. Average fish production in the study area

Production (MT/ha/year)	No. of fish farmer	Percentage	Min	Max	Mean±SD
0.50-2.50	18	60.00%			
2.51-4.50	10	33.33%	0.54	6.19	2.13±1.39
4.51-6.50	2	6.67%			

Annual Income

It was found that highest income of fish farmer was 5,00,000 Tk/ha/year and the lowest income was 74,534 Tk/ha/year. Most of the fish farmers (60%) got their annual income between the range of 1,50,001 Tk/ha/year to 3,00,000 Tk/ha/year, 16.67% farmers got their annual income between the range of 50,000 Tk/ha/year to 1,00,000 Tk/ha/year, 10% farmers got their annual income between the range of 1,00,001 Tk/ha/year to 1,50,000 Tk/ha/year and 13.33% farmers got their annual income between the range of 3,00,001 Tk/ha/year to 5,00,000 Tk/ha/year. The average annual income was found 2,31,385±1,25,365 Tk/ha/year (Table 3). Pravakar *et al.* (2013) stated that 34% fish farmers earned 75,000 to 1,00,000 Tk/ year.

Table 3. Annual income fish farmers in the study area

Annual Income (Tk/ha/year)	No. Fish Farmer	Percentage	Minimum	Maximum	Mean±SD
50000-100000	5	16.67%			
100001-150000	3	10.00%	74534	500000	231385±125365
150001-300000	18	60.00%			
300001-500000	4	13.33%			

Constraints of fish production

The fish farmers reported a number of constraints. Among 30 farmers, 34.38% reported high cost of feed as most important problem. The lack of insurance reported by 3.13% farmers, another 3.13% farmers reported lack of availability of loan, 6.25% reported lack of technical training, 9.38% farmers reported lack of security, 6.25% farmers reported lack of governmental help, another 6.25% farmers reported high cost of fertilizer, 15.63% farmers reported high labor cost and another 15.63% farmers reported disease outbreak as constraint of fish production in their farm (Figure 6). Adhikary *et al.* (2018) found that, 40% of the surveyed fish farmers identified fish disease as the single most important problem in Noakhali, Bangladesh.
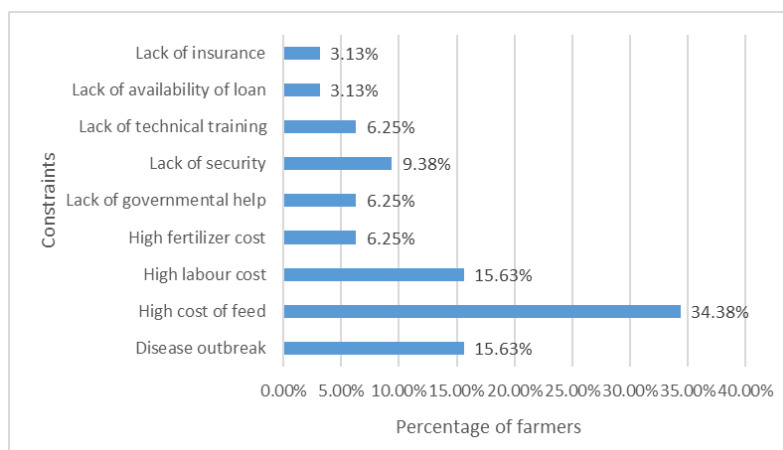
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Figure 6. Constraints of fish production

Age structure and sex composition of fish farmers in Habiganj Sadar Upazila

The present study observed that, majority of fish farmers (33.33%) were 31-40 years old. On the other hand, 3.33% respondents were less than 20 years old, 20.00% respondents were 21-30 years old, 30.00% respondents were 41-50 years old, 6.67% respondents were 51-60 years old and 6.67% respondents were 61-70 years old (Table- 3). Ali *et al* (2009) revealed that most of the fish farmers (50%) belonged to age group of 31-40 years in Mymensingh district. Present study implies that the majority of the sample farmers were in active age group of 31-40 years indicating that they provided more physical efforts for fish farming and it had effect on production. All the respondents were male.

Table 3. Age structure of the fish farmers in Habiganj Sadar Upazila

Age Group (years)	No. of respondents	Percentage
10-20	1	3.33%
21-30	6	20%
31-40	10	33.33%
41-50	9	30.00%
51-60	2	6.67%
61-70	2	6.67%
Total	**30**	**100%**

Religion status

Muslims were featuring as the absolute majority of the fish farmer in Habiganj Sadar upazila, Habiganj. It was recorded that 93.33% farmers were Muslims and 6.67% farmers were Hindus. Ali *et al* (2009) found 85% of fish farmers were Muslims and remaining 15% were Hindus in Mymensingh. It is more or less similar to the present study.

Educational qualification of fish farmers

Six educational categories were used to determine the level of education. Out of 30 fish farmers, 13.33% had no education (illiterate), 40% had primary level, 16.67% had secondary level (up to X), 16.67% had SSC level, and 6.67% had HSC level, 3.33% had bachelor level and 3.33% had MS level of education (Figure 7). It was observed that educated farmers were more conscious about farm management, thereby got higher production. Pravakar *et al* (2010) found in his study in Shahrasti upazila of Chandpur district that about 10% had no education while 16%, 48%, 16%, 10% had primary, secondary, higher secondary and bachelor level of education, respectively. This study has similarity with the present findings.
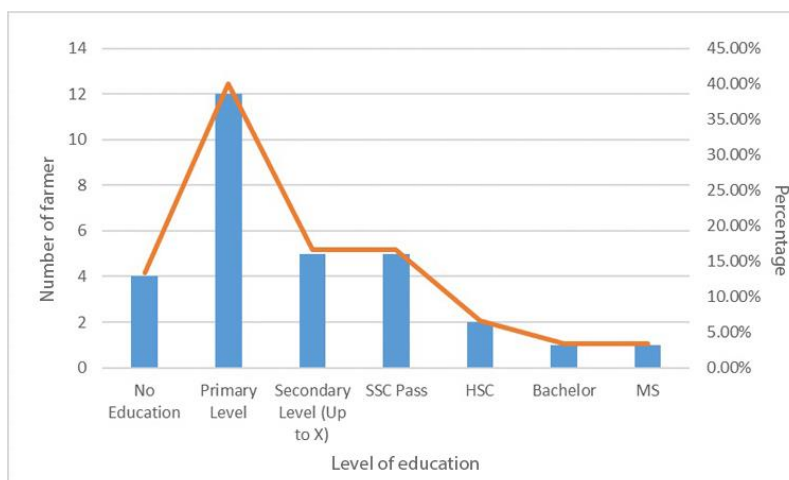
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Figure 7. Educational status of fish farmers in Habiganj Sadar upazila, Habiganj

Family Type

It was found that 60% fish farmers lived in joint families and 40% lived with separated families. Asif *et al* (2017) found that 66% fish farmers lived in joint families and 34% lived with separated or nuclear families in Jhikargachha upazila in Jessore district, Bangladesh. 20% families had up to four members, 23.33% families had five members, 6.67% had six members, 3.33% had seven members and 46.67% had eight or more members in their family. Touhidur *et al* (2017) observed that 57% fish farmer's family consisting 6 to 10 members in selected areas of Mymensingh.

Housing condition of fish farmers

Majority of respondents around 43.33% had tin shed house, 16.67% farmers had half building, 40.00% had brick constructed house. Ali *et al.* (2009) found that 50% households of the fish farmers were tinshed in Tarakanda upazila of Mymensingh district. Ali *et al.* (2008) also noticed that the majority (54%) of the respondents had tinshed house in some selected areas of Bagmara upazila under Rajshahi district.

Electricity facility of fish farmers

It was found that all of the respondents had electricity facility in their house and farm. In addition, all the 30 respondents had at least one mobile phone. Some farmers had more than one. They usually consulted with feed dealers, fertilizer dealers, NGO workers, technical service providers through mobile phone. 66.67% farmers had television and 33.33% farmers had no television set. 60% farmers had refrigerator and 40% had no refrigerator in their house (Figure 8). Ali *et al.* (2009) found that 95% farmers had electricity facilities in Myemensingh. Asif *et al.* (2017) observed every surveyed fish farmer had at least one mobile phone in Jhikargachha upazila in Jessore district.

Sanitation facilities

In the study area, it was found that 10.00% farmers used unconstructed toilet, 36.57% farmers used semi constructed and 16 53.33% farmers used constructed toilet. Pravakar *et al.* (2010) found that 76% and 24% of fish farmers used semi constructed and constructed toilet respectively in Shahrasti Upazila of Chandpur District.

Drinking water sources

All the respondents 30 (100%) farmers used tube well water for drinking and other household work. Asif *et al.* (2017) also found same percentage of drinking water sources of fish farmer in Jhikargachha upazila in Jessore district. In the present study, 83.33% farmers had own tubewell and 16.67% farmers used neighbor's tubewell.
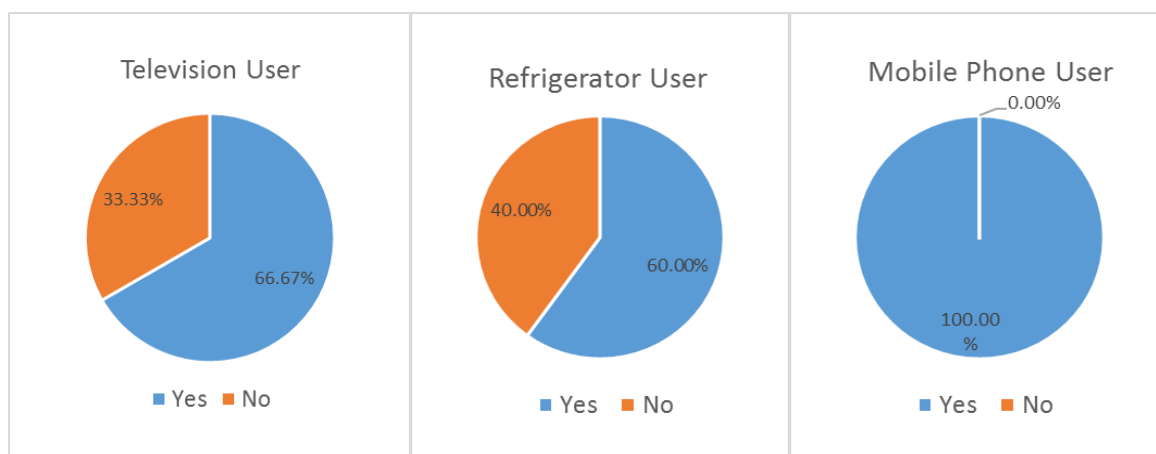
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Figure 8. Television, refrigerator and mobile phone using status of fish farmer

Health service facilities

The present study showed that 50.00% farmers received health service from village doctor while 3.33% farmers, 23.33% farmers and 23.33% farmers received health service from Upazila Health complex, MBBS doctor and Sadar hospital respectively (Figure 9). Ali *et al.* (2008) found that 46% of the farmers received health service from village doctors, 18% from upazila health complex, 14% from district hospital and 20% from MBBS doctors.
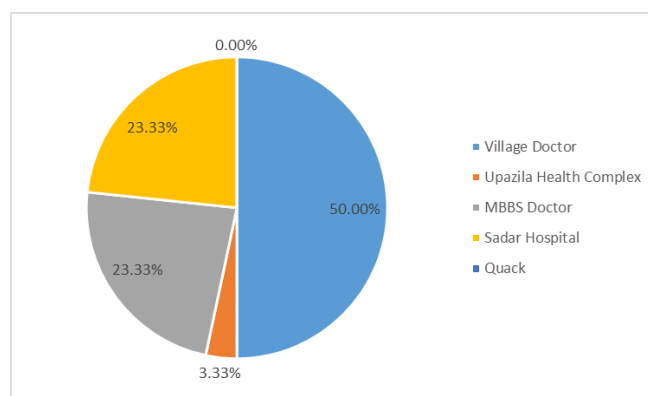

Figure 9. Health service facilities of fish farmers in the study area

Training of fish farmers

In the study area, it was found that 33.33% farmers had received technical training on fish farming from BRAC training center, Upazila fisheries office while 66.67% farmer had no training on fish farming. In addition, only 6.67% farmers had training from government organization (Figure 10). Sarwar *et al.* (2016) said that, 18% received formal training from Upazila fishery office with the help of Department of Fisheries (DoF). He also mentioned 82% farmers had not obtained training and 18% farmers obtained technical training in Subarnachar, Noakhali.
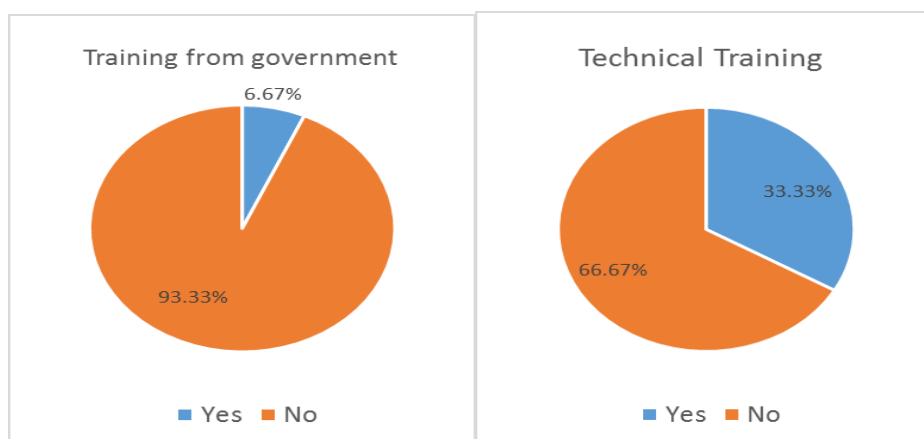
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Figure 10. Receiving of training of fish farmers in the study area

Bank account holding status of fish farmers

It was found that 73.33% farmers had bank account for savings and transaction while 26.67% farmers had no bank accounts. Some farmers had more than one account and mobile banking found much popular. Asif *et al.* (2017) also noticed mobile banking was much popular.

CONCLUSION

Fish farming played important role in the livelihood and socio-economic status of fish farmers'. From the present study, it is clearly indicated that fish farmers in Habiganj Sadar upazila, Habiganj are showing better condition in their life style through fish farming. The aquaculture management practices were not followed duly, even though they are benefited from the fish culture. The profit margin will be higher if the farmers were given technical training; economic support with low interest loan, feed and fertilizer in fair price, proper advice about treatments against disease outbreak, more prosperity would be outputted. It can be concluded that fish farming is a profitable business that could be of helpful in uplifting of fish farmer's livelihood.

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