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# Study of the present status and the constraints of commercially important small fish species culture at farm levels in Jessore region

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**Abstract**
The study was carried out during January to March, 2016 to understand the present status of the commercially important small fish species cultured in Jessore regions. Thirty five small fish farmers of four *upazilas* were interviewed. The education level of the respondents were, 31.43% passed primary, 37.14% secondary, 17.14% graduate and 14.28% post-graduate in the study areas. The average pond size was 0.24 ha within a range of 0.07-0.94 ha. In the study areas, 45.7% farmers usually stocked during December-February, 40.0% in March-May, 5.7% in June-August and 8.6% were in September-November as crop cycle. It was found that among small fish, no other species but, 55% farmers cultured koi (*Anabas spp)*of Vietamanamise strain, 32% of indigenous shing (*Heteropneustes fossilis)* and 13% were practiced magur (*Clarias batrachus*) species only. About 82.86% farmers collected seed from different hatcheries, 14.29% of fry traders and 2.86% from local market. Average stocking density of all three species in the study areas were found 4,71,214 fries /ha per crop cycle. The cultural cycle per crop was assessed 126 days for koi, 237 days for shing and 174 days for magur. The average feed application by the farmers was 6.79% of the estimated crop per day. The farmers often used potassium per magnate (0.575 kg/ha) as precaution measures of diseases in their ponds. The average dosages of inorganic fertilizer such as urea and TSP were 94.35 kg/ha, 127.75 kg/ha respectively. About 65.71% farmers exchanged water regularly in their ponds, but 34.29% never exchanged water while 68.57% of the farmers reported fish disease as the single most problem for fish farming while 8.57%, 11.14%, 14.28%, 2.85% identified the non availability of fish seed during stocking period, non availability of qualitative feed, natural disasters flood, drought respectively. The average small fish production was estimated 3,956.32 kg/ha. Farmers remained in unsafe and sometimes with the traditional culture system. They concerned about standard value of water quality parameters for fish culture, but they did not care about the measure. There is a scope of producing valuable some other indigenous high valued small fish species like gulsa (*Mystus cavasius*) and pabda (*Ompok pabda*) in alternate mono or mixed culture system.

**Keywords:** Survey, small fish species, stocking density, management, problems.

## 1. Introduction
Small fish species traditionally play an important role in the diet of the people of Bangladesh. There are about 143 small out of 260 indigenous fish species are reported in the country (DoF 2009) [5]. The accessibility of Small indigenous fish species (SIS) from capture fisheries is declining day by day (Roos *et al.* 2002) [13] due to destruction of natural habitat. In Jessore region, major cultured species are indigenous and exotic carps practiced by the farmers. Beside carps, some non carps indigenous as well as exotic small species culture growing up rapidly in recent times. The small fish species *viz.*, tilapia (*Oreochromis* sp.), Thai and Vietnamese strains climbing perch locally known as Thai or Vietnamise koi (*Anabas* spp.), the indigenous stinging catfish sing (*Heteropneustes fossilis)* and catfish magur (*Clarias batrachus*) has got greater attention among the farmers in Jessore region due to their demand and high market prices. In 2014, there were 57,809 major carps' farms in Jessore consisting 20,324 ha of area and the production was 82,016 metric tons (mt). On the other hand, small fishes like Vietnamese koi, sing, magur and tilapia production was reported 23,107mt, 129mt, 130mt and 18,207mt species respectively (DoF, 2015) [8].
In Bangladesh, sporadic studies have been undertaken to evolve or adopt the appropriate culture technologies by educational and research institutions.

Culture technologies of non-carp species (tilapia, koi, shing, magur, pangus etc.) have been practiced, but region base culture technologies have not yet been optimized and evaluated specially in Jessore region. The cultural practice have been indiscriminately intensified with high stocking density and feeding that results frequent disease outbreak as well as financial loses faced by the farmers. Some other valuable small fish species *viz.*, gulsa (*Mystus cavasius*) and pabda (*Ompok pabda*) an indigenous small fish species could be cultured to increase production. A very few or no data were available in this regard. However present study was envisioned to understand the status and constraints of small fish species culture practices in the Jessore region.

## Materials and Methods

The study was carried out during January to March 2016, to understand the present status and the cultural constraints of the commercially valuable small fish species in the Jessore region.

### Selection of the study areas

There were four *upazila* (administrational unit) of Jessore district, namely Jessore *sadar*, Jhikorgasha, Avaynagar and Monirampur selected for the present study. Data were collected from 35 small fish farmers randomly covering the selected study areas considering the following aspects, fish species, feeding management, water management, type of disease occurrence and management practice in fish farm conditions.

### Target farmers

In the study areas respondents of farmer livelihood were depended on small fish farming and its associated activities.

### Questionnaire of interview and data collection

A questionnaire was developed and pre tested among the small fish farmers in the village Vaduria and Bormonpara of *sadar upazila* in the Jessore district. The information about framers, type of cultural practices, cultural species, source of fingerlings, culture duration, management practices, water quality parameters, disease outbreak etc. The interviews were conducted at the pond sites or in the house of the farmers. At the beginning of the interview a brief introduction about the objectives of the study was given to each of the farmers and assured them that all information would be kept confidential. Each question was explained clearly and asked systematically for their sound understanding. At the time of interview the physical conditions of the small fish ponds, culture species, culture duration, application of feed and fertilizers, liming and harvesting were asked and responses were recorded. It was difficult to collect data since farmers did not keep then written records on cultural activities and data which they provided were mostly from their memories.

### Data processing and analysis

The collected data were scrutinized and summarized carefully before the tabulation. Some of the data were collected into local units and those data were converted into standard units. The processed data were transferred to a master sheet from which classified tables were prepared to reveal the findings of the study. Then the data were tabulated into a preliminary data sheet of a computer and compared with computer spreadsheets to ensure the accuracy of the data entered. After data entry, the data were analyzed with the help of computer software package Microsoft Excel.

## Result & Discussion

### Education and experiences of farmers

An educated person can easily adopt the techniques and help with qualitative production. The initially farmers' educational level of the study area was assessed. Fish farmers as well responds were classified into four categories on the basis of their education level. In the study areas, 31.43% farmers had a primary level of education, 37.14% secondary, 17.14% graduate and 14.24% had post-graduate level of education (Fig 1). The literacy rate found about 100% among small fish farmers while the reported national adult literacy level of 65% (BBS 2002) [4]. Zaman *et al.* (2006) [19] found that 23.3% farmers were illiterate whereas 14.4%, 8.9% and 6.7% were educated up to primary, secondary and higher secondary or above level respectively. Khan (1986) [10] stated that the level of education is a factor affecting utilization of pond for fish farming.

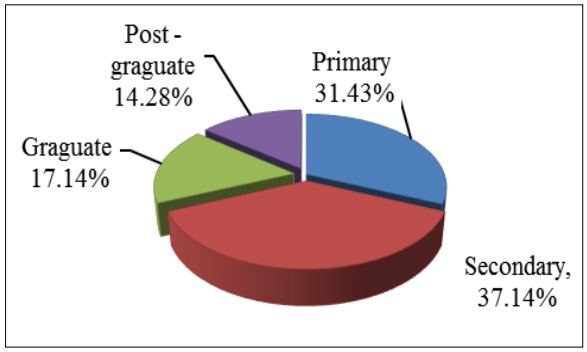


**Fig 1:** Education level of small fish farmers in the study area

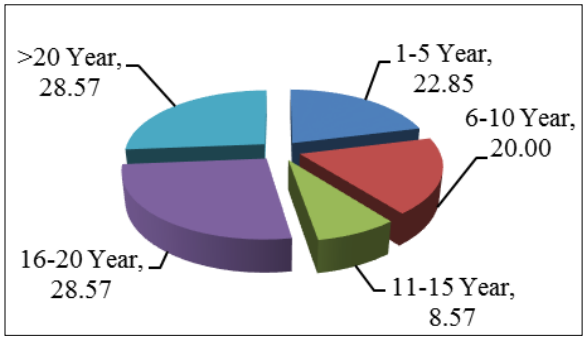


**Fig 2:** The experiences of small fish farmers in the study area

The process of getting knowledge, or skill from doing, seeing or feeling things terms as experience (Cambrigde dictionary). In the survey, it was found that 22.85% farmers had 1-5 years, 22.00% had 6-10 years, 8.57% had 11-15 years, 28.57% had 16-20 years and 22.85 had >20 years of farming experience (Fig 2). The cultural practices were generally monoculture, but there were also poly-culture practiced by the farmers.

### Pond size and depth

Pond size is an important factor because all management measures are planned considering the size of the ponds. In the present study, it was found that the average pond size was 0.33±.595 ha within a range from 0.07 ha to 3.608 ha (Table 1). Akter (2001) [1] also found that pond farmers had an average land area of 1.63 h. Khan (1986) [10] stated that fish culture efficiency varied with the size of the ponds. According to DoF (2010) [6] the average depth of ponds in Bangladesh is between 2 and 5 meters which correspond well with the present study.

**Table 1:** Detail survey location, number of respondents, average water area and average pond size

| Survey locations | Avarage No. of ponds possessed by farmers | Average water area (ha) | Average ponds size (ha) |
|---|---|---|---|
| Jessore Sadar (N=15) | 4.93±3.77 | 1.32±2.02 | 0.20±0.14 |
| Jhikargacha (N=8) | 3.75±1.75 | 1.53±1.83 | 0.40±0.25 |
| Avaynagar (N=8) | 2.88±2.85 | 0.66±1.07 | 0.17±0.09 |
| Monirampur (N=4) | 1.25±0.50 | 0.23±0.09 | 0.20±0.11 |
| Overall study area (N=35) | 3.77±3.12 | 1.09±1.59 | 0.24±0.18 |

**Water sources**

Water is a very important factor in fish culture. In the study areas, the water was mainly supplied from underground sources. About 68.58% farmers were used diesel machine pumps, 28.57% farmers were using the electric motor pumps and only 2.85% farmers were using rain fed and surface natural water for their ponds in the study areas (Table 2).

**Table 2:** Farmers source of water supply in the ponds

| S. No. | Water sources | (%) |
|---|---|---|
| 1 | Shallow and deep well water using diesel machine pumps | 68.58 |
| 2 | Shallow and deep well water using Electric motor pumps | 28.57 |
| 3 | Rain and surface natural water | 2.85 |

**Application of inputs and water management**

Farmers used inorganic fertilizers like urea and TSP for maintaining water quality. The average dosages of inorganic fertilizer such as urea and TSP were 94.35 kg/ha, 127.75 kg/ha respectively. In the Jessore *sadar* farmers often used potassium per manganate (0.575 kg/ha) as precaution measures of disease in their ponds. Saha (2004) [17] reported that, an average dose of organic fertilizer in fish farms were 8330 kg/ha/yr while inorganic fertilizer urea and TSP were used 387 and 176 kg/ha/yr respectively (Table 3).

**Table 3:** Water quality management with application of lime, fertilizers and chemicals in the survey areas

| Survey locations | Use of lime (kg/ha) | Use of chemical fertilizers (kg/ha) | | Use of other chemicals (kg/ha) | Exchange of water | |
|---|---|---|---|---|---|---|
| | | Urea | TSP | | % Yes | % No |
| Jessore *sadar*(N=15) | 116.25 | 43.85 | 70.25 | 2.30* | 86.67 | 13.33 |
| Jhikargacha (N=8) | 92.80 | 20.00 | 32.50 | - | 87.50 | 12.50 |
| Avaynagar (N=8) | 50.00 | 30.50 | 25.00 | - | 62.50 | 37.50 |
| Monirampur (N=4) | - | - | - | - | 25.00 | 75.00 |
| In the study area (N=35) | 64.76 | 23.58 | 31.93 | 0.57 | 88.56 | 11.44 |

*Potassium permanganate ($KmnO_4$)

**Use of lime and its application rate**

Liming helps to raise the total alkalinity level and consequently upheld the natural productivity of the water bodies. All the farmers were used lime irregularly in variable doses. The average rate of liming was found to be 64.76 kg/ha in the study areas (Table 3).

**Fish specie cultured by the farmers**

The choice of fish species is very important in maximizing production, both in terms of quantity and quality. In the study area farmers were exclusively cultured smaller fish species, 55% only about koi, 32% shing, 13% magur (Fig. 3). However, some other valuable indigenous species like golsha (*Mystus cavasius*) and pabda (*Ompok pabda*) could be cultured alternately as because seed and cultural technologies were available in the country.

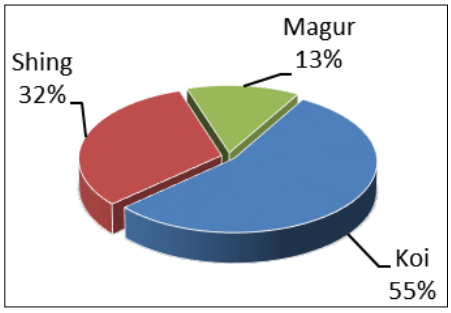


**Fig 3:** The small fish species cultured by farmers in the surveyed areas

**Fish fingerling sources**

The majority of the 82.86% farmers collected seed through the different hatcheries, 14.29% of fry traders and 2.86% from the local fish seed market (Fig 4).

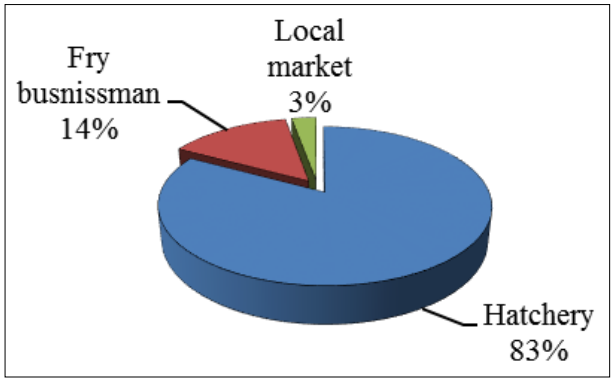


**Fig 4:** Fish seed collection sources of farmers

**Culture duration**

Farmers usually cultured small fish koi for the period of 126 days, 237 days for shing and magur for 174 days (Fig 5). On the basis of cultural duration, farmers can plan to stock twice or more cycles in a single year.

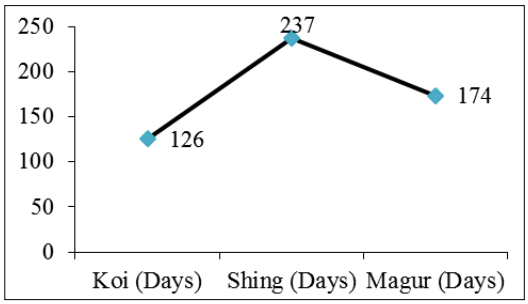


**Fig 5:** Cultural duration of different species followed by the respective farmers

**Small fish culture season**

The small fish culture season was determined from December-February (45.71%), March-May (40.00%), June-August (5.71%) and September-November (8.57%). Rahman (2003) [14] reported that the season of carp farming were from March to December. Saha (2003) [16] stated that there were two culture season in Dinajpur region the northern part of Bangladesh from June to December in the monsoon season in perennial ponds and another was from February to June in seasonal ponds. In the present study, it was understood that, in the area pond could be used round the year as the farmers could use ground water to keep the desirable depth of water.

**Stocking density**

Average stocking density (koi, shing, magur) in the study areas were found 471,214/ha. The location wise stocking density was found Jessore Sadar 570,570.0/ha, Jhikorgasha 236749.5/ha, Abhaynagar 321,100/ha, Monirampur 756,437.5/ha (Fig 6). Khatune-jannat *et al.* (2012) [11] recommended stocking of 1,35,850/ha koi for profitable culture while Karim (2006) [9] mentioned 74100/ha. Rahman *et al.* (2014) [15] mentioned their stocking density for shing of 1,85,000/ha in the Northen Bangladesh. In the study area, it was found that stocking density were higher than that recommended number. Some other indigenous high valued small fish species like gulsa (*Mystus cavasius*) and pabda (*Ompok pabda*) in alternate mono or mixed culture system. However, these small fish seed were available in the country and cultural technologies were developed.

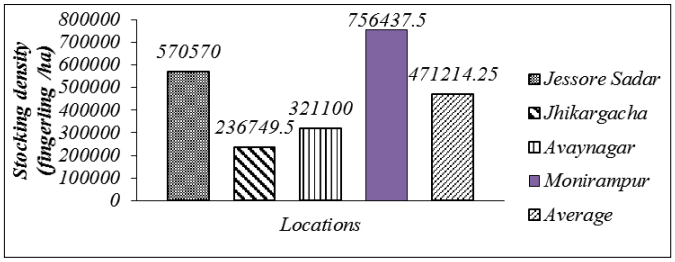


**Fig 6:** The stocking density of small fish species in the surveyed areas

**Feed application**

Supply of supplementary feeds, which can complement nutritional deficiency, is important to increase fish production. The average feed application was 6.79% estimated crop per day was reported by the respondents in the study areas (Fig 7). From this survey, it was found that most of the farmers applied in the ponds home made supplemental feed as well as commercial ready feed. Alam (2006) [3] found that 80% of the farmers applied supplementary feed such as rice bran and mustard oil cake.

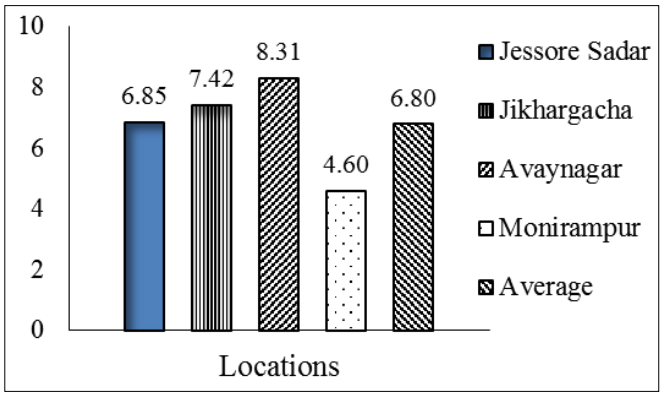


**Fig 7:** Feed applications

**Water exchange capacity**

Water exchange is a key issue for safe fish production. In the study areas 65.71% farmers exchanged water regularly in their ponds, but 34.29% farmers never exchanged water in their ponds during culture periods (Table 3).

**Problems faced by the fish farmers**

About 68.57% of the farmers were reported that fish disease as the single most problem for fish farming while 8.57%, 11.14%, 14.28%, 2.85% respondents identified the non-availability of fish seed during stocking period, feed problems, natural disasters like flood, drought and others respectively (Table 4). Fish diseases were a burning issue for fish culture in the study areas. About 74.28% farmers mentioned that disease out-break occurred in their fish ponds and rest of them were free from diseases (Fig. 7). However, in the present study it was evident that, the high stocking density as well as poor water management might be the cause of disease outbreaks. reported that lack of scientific knowledge, multiple ownership of ponds, attack of fish disease and non-availability of good quality fish fry were the major problems in pond fish culture in Bangladesh.

**Table 4:** The problems faced by the fish farmers in the surveyed areas

| SL No. | Problems faced by fish farmers | (%) |
|---|---|---|
| 01 | Fish disease | 68.57 |
| 02 | Non availability of fish seed | 8.57 |
| 03 | Feed problems | 11.14 |
| 04 | Natural disaster | 14.28 |
| 05 | Flood, drought and others | 2.85 |
| Total | | 100.00 |

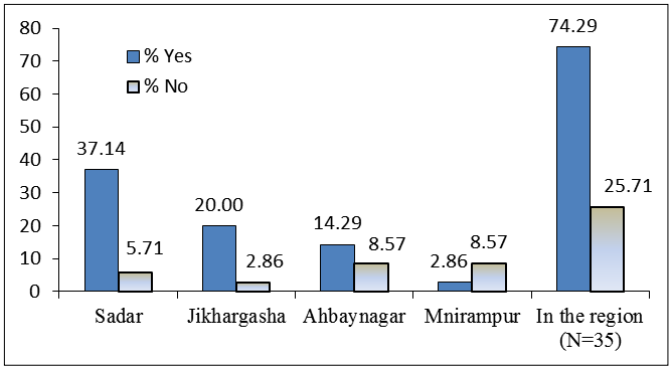


**Fig 7:** Farmers responded about the occurrence of disease in the fish farms

**Table 5:** Location wise production of small fish in the surveyed areas

| S. No. | Locations | Production±SD kg/ha |
|---|---|---|
| 1 | Jessroe *sadar* | 4,193.87± 2,695.56 |
| 2 | Jhikorgacha | 3.595.60± 2,248.20 |
| 3 | Avaynagar | 3,449.74± 2,132.49 |
| 4 | Monirampur | 4,586.08± 2,820.05 |
| 5 | All location | 3,956.32±2,474.08 |

It was found that the average fish production in the surveyed area was 3,956.32 ±2,474.087 kg/ha. The average fish productions (kg) per cycle were in Jessore Sadar 4,193.87 ±2,695.56 kg/ha, Jikhargaha 3.595.60 ±2,248.20 kg/ha, Ahbaynagar 3,449.74 ±2,132.49 kg/ha and Monirampur 4,586.08 ±2,820.05 kg/ha (Table 5). The annual production varies because of differences in farm size, feed, seed, other inputs and management measures.

**Acknowledgement**
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**Conclusion**
In the study area, the education level, fish culture experiences, selection of species, fish fry age, culture duration were understood of small fish farmers. The Framers were stocked higher density of fishes seed instead of recommended numbers per unit area and often results disease outbreak. Farmers remained in unsafe and sometimes with the traditional culture system. They concerned about standard value of water quality parameters for fish culture, but they did not care about the measure. There is a scope of producing valuable some other indigenous high valued small fish species like gulsa (*Mystus cavasius*) and pabda (*Ompok pabda*) in alternate mono or mixed culture system.

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