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Article

Fry production and its marketing system of North-West fisheries extension project at Parbatipur, Dinajpur, Bangladesh

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Abstract: In order to understand the present status of hatcheries, questionnaire interview and participatory rural appraisal tools were used in North-west Fisheries Extension Project (NFEP), Parbatipur during the period from July to December 2015. There are two hatcheries in NFEP, Parbatipur- a carp hatchery and a prawn hatchery. The production of spawn was around 611 kg in the year 2015. According to the target hatchery manager collected brood fish from rivers and other sources which he maintained in their brood stock ponds with proper management. The hatchery manager maintained proper age and weight of broods for spawning and followed the guideline of hatchery operation so that the quality of spawn and fry were good. It was found that the hatcheries produced fish seed of a variety of species such as Indian major carps, carpio, sarpunti, silver carp, grass carp, magur, shing as well as freshwater prawn. The hatchery production activities took place starting from February and continued up to September. The quantity of fish seed produce varied from 25 to 75 kg per hatching cycle depending on size and facilities of hatcheries. The price of fry in NFEP was being fixed by the hatchery manager. However, the price variation was seen due to seasonal variation, species and demand. The average price of fish seed was highest in monsoon and lowest in winter. A number of middlemen were involved in the fry marketing channel of NFEP at Parbatipur. They were responsible for increasing the price of fry at each stage of marketing channel.

Keywords: fry production; marketing; North-West fisheries extension project; Parbatipur

1. Introduction

Fisheries sector is one of the major components of agricultural activities which are also well recognized for nutrition supply and employment generation of rural population as well as for foreign exchange earning in Bangladesh (Ali *et al.*, 2014). This sector directly contribute approximately 3.69% of the country's Gross Domestic Product (GDP), however, the indirect contributions from gross agricultural income are estimated at 22.60% (DoF 2015). The availability of fish seed is an essential prerequisite for fish culture. The main sources

of fish seeds in Bangladesh are spawn produced in government and private hatcheries, and some collected from rivers. In 2013-2014, the number of government fish hatcheries or fry production farms was 136 and private fish hatcheries 903 (DoF, 2014). The fish seed being the major input for fish farming, there is always a growing demand for quality fish seeds. The uncertainty in the quantity of riverine fish seed collection led to development of many private hatcheries in the country. The department of fisheries, Bangladesh, in their recent report stated that the country produced 10338kg fry in public hatchery and 478993kg fry in private hatchery during the year 2014 (DoF, 2015). However, one of the major constraints experienced in expanding aquaculture industry in the country is the unavailability of quality fish seeds. In recent past although a spectacular growth of carp seed hatchery has been taken place in the private sector; the country's fish production has not increased significantly. This is an important issue which needs to be addressed by the fisheries scientists, policy makers and fish seed producers. In recent years increased attention has been given to broodstock management and fish breeding to minimize negative selection and inbreeding in hatcheries. Along with the collection of spawn from rivers, induced breeding of carps was initiated in 1967 (Ali, 1996). Next to seed production and nursing, timely supply of seed to the farmers is a very important task for aquaculture. There is a complex network of seed supply, not institutionally organized, involving hatchery operators, nursery operators, middlemen (seed traders) and fish farmers. Fish fry quality depends on many factors, including the conditions in the hatcheries and during transportation to final users, and handling and acclimatization prior to stocking. Fish fry traders are the last and most critical actors in a complex network linking hatcheries and seed nurseries to fish farmers. In addition to selling fry these traders often provide advice to fish farmers and disseminate knowledge of fish farming to their customers. Fry trading is a seasonal occupation that, in most places, begins in April and ends in September. Production of fry is also hampered by the lack of broods as they are caught by extreme fishing pressure. Combining both reasons, the production of fry in rivers becomes critically low. Artificial fish breeding techniques and low cost hatchery designs have been successfully adapted to Bangladeshi conditions since 1975. Aquaculture practices in Bangladesh started with seed collected from rivers, but now it is almost entirely (99.55%) replaced by hatchery-produced seed (FRSS/DoF, 2006-2007). There are six public hatcheries in Dinajpur, among them one is located in Parbatipur named North-west Fisheries Extension Project (NFEP). The project office was centrally situated at the Parbatipur hatchery complex with twenty hectare site includes a modern farm, trial hatchery, library, laboratory and residential training facilities. Aquaculture contributes to the livelihood of the poor farmers through improved food supply, employment and income (Edwards, 2000). It also contributes over 70% of the total aquaculture production in Bangladesh. Day by day many private hatcheries were established in our country. Most of the hatchery owners did not follow aquaculture code of conduct, breeding protocols, brood stock and hatchery management technology. They might use same age group (brother and sister) of male and female brood for induced breeding in their hatcheries. As a result, several problems such as inbreeding, growth stagnation, production of small fish happened and finally reduced aquaculture production occurred. The present study was undertaken to know the hatchery management system in NFEP and to analyze the fish fry marketing system.

2. Materials and Methods

2.1. Study area and periods of study

The study was conducted in Holdibari, Parbatipur upazila, Dinajpur and the exact study location of the study was a public hatchery along with extension program named, North-West Fisheries Extension Project (Figure 1). Thedata collections were conducted in NFEP from July to December 20l5. The geographical position of NFEP is given in the following Figure 1.

Figure 1. Map shows the location of NFEP, Parbatipur, Dinajpur.

2.2. General information of NFEP

The North-West Fisheries Extension Project was established during the year 1994. It was the largest farm in the north Bengal region. The total area of that farm was 20 hectare and number of ponds was 45. Among these, nursery ponds were 10, fry rearing ponds were 26, brood rearing ponds were 03, boropits were 03 and trial ponds were 04. It had a carp and a prawn hatchery, a training building, a dormitory building, a guest house, a officer's dormitory building, a A type residential building, a B type residential building, a D type residential building, two deep tubewell and a sub center of electricity (Figure 2).

Figure 2. The map shows the general structure of the farm area.

2.3. Data collection

For collection of data, a structural questionnaire was prepared keeping consistent with the objectives of the study. Then the questionnaire was finalized and prepared for survey work. The primary data were collected through Interviewing NFEP hatchery manager involved in hatchery operation. The secondary data were collected through different sources like Central library of Bangladesh Agricultural University, Mymensingh; Library of Bangladesh Fisheries Research Institute; Different websites and journals; District Fisheries Office, Dinajpur; Upazilla Fisheries Office, Parbatipur.

2.4. Data processing and analysis

After collection of data from the hatchery, data were verified to eliminate errors and inconsistencies. The qualitative data were categorized and analyzed mainly based on descriptive statistical analysis by MS excel and Statistical Package for the Social Sciences (SPSS).

2.5. Cost benefit analysis

Cost of production of fish fry has been measured with the help of the survey data. In the short run, some costs are fixed some are changing. Variable costs are the costs of adding the variable inputs. These costs will be incurred only if production is carried on and the amount of these costs will depend on the kind and quality of inputs used. Fixed cost plus variable cost is equal to total cost of production. The importance of recording the costs by the hatchery manager is essential for the materials and equipment's (such as plastic drum, gunny bag, clothing bag, polythene bags, oxygen cylinder etc.), labor, machine or product. As far as fish hatchery is concerned the cost on material represents the purchase of brood fish, hormones, manures, fertilizers, supported food material and other material. The cost incurred on machine represents the cost of hatching tank, nursing tank, engine pump, inlet and outlet of water system. While studding the economics of a hatchery various items such as economic rent or lease of the land or dam for contract, cost of brood fish including transportation, cost of fertilizers and food materials, transportation charges for marketing are considered as a cost of production. Whereas on the return side present market price and about 10 per cent market price fluctuation is considered for calculating the cost benefit ratio.

3. Results

4.1. Hatchery status

4.1.1. Types of hatchery

There were two hatcheries in NFEP, Parbatipur. These hatcheries were a carp hatchery and a prawn hatchery (Figures 3 and 4). At the beginning of the breeding season they prepared and repaired ponds and tanks if necessary. Hatchlings of several species were produced in these hatcheries in every successive five days interval during the breeding season. The yearly production of the selected hatcheries was around 611 Kg in 2015.

Figure 3. Carp hatchery.

Figure 4. Prawn hatchery.

3.1.2. Sources of broods

The broods were mainly collected from natural sources. Among the sources were Padma, Jamuna and Halda river for carps and Voirob, Kacha, Rupsha rivers and others for prawns. The collections of broods from various rivers are shown in percentage in the following Figures 5 and 6.

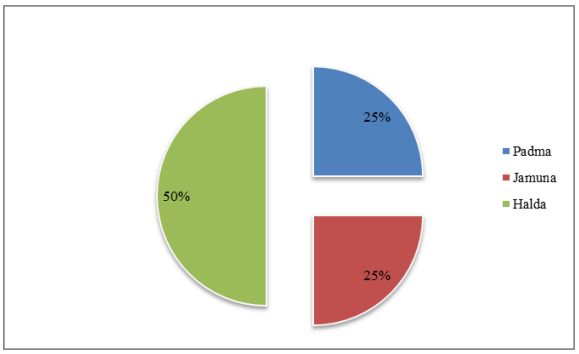

Figure 5. Collection of carp's brood from various rivers in percentage.

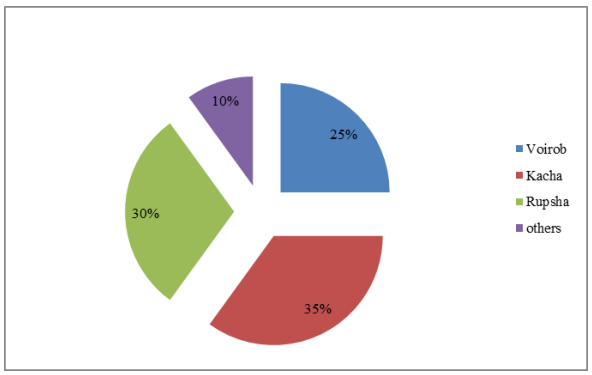

Figure 6. Collection of prawn's brood from various rivers in percentage.

3.1.3. Brood stock management

The management techniques adopted by different hatcheries were varied from one another. Brood fish were reared in 3 ponds having the area of 1.5 ha and water depth in between 5 -7ft. During preparation of brood fish ponds the usual practice was to eradicate the predators and weed fish by dewatering and drying. Sometimes toxins such as rotenone, phostoxin etc. were applied to kill the unwanted fish species. Aquatic weeds were removed manually. After cleaning the pond, lime was applied at the rate of 1-2 kg/dec. and five to seven days after liming cow dung used at the rate of 5-7 kg/dec. or 3-4 kg/dec. of poultry droplets as organic fertilizer. Inorganic fertilizers such as urea, TSP were also used at the rate of 150 g, 75- 100 g per decimal respectively. The brood fish were first reared in the rearing pond with special care. In this case 25% protein level was maintained in the feed. Commercial and casual feeding was doneyear round by the hatchery operationteam (Table 1).

Table 1.The brood fish were maintained in rearing pond.

Name of species	No. per acre	Types of feed applied	Frequency of feeding
Rui	1ton/ha	Ready feed, MOC, Rice bran	3-5%
Catla	1ton/ha	Ready feed, MOC, Rice bran	3-5%
Mrigal	1ton/ha	Ready feed, MOC, Rice bran	3-5%
Calibasu	1ton/ha	Ready feed, MOC, Rice bran	3-5%
Silver carp	1ton/ha	Ready feed, MOC, Rice bran	3-5%
Common carp	1ton/ha	Ready feed, MOC, Rice bran	3-5%
Grass carp	1ton/ha	Ready feed, MOC, Rice bran	3-5%
Thai Sharpunti	1ton/ha	Ready feed, MOC,	3-5%
Shing	1ton/acre	Ready feed	3-5%
Magur	1ton/acre	Ready feed	3-5%

3.1.4. Brood transportation

The hatchery manager used clothing bags, aluminum pots, drums etc. to carry the brood fish from rearing pond to hatchery (Figure 7). An individual brood fish usually used for 3-5 years for breeding and after that it was sold in the market, because the amount of eggs lying by them after five years was comparatively less.

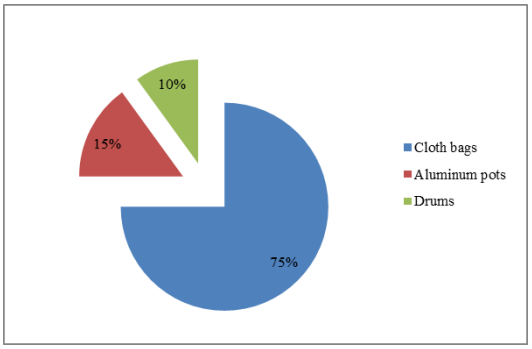

Figure 7. Brood transportation materials used in NFEP.

3.1.5. Age and weight of broods

Age and weight of broods varied from species to species. In NFEP the hatchery manager used the same brood for 3-5 years. Minimum age and weight of the brood for successful spawning is shown in Table 2.

Table 2. Minimum age and weight of the broods used in breeding.

Name of the species	Minimum age (years)		Minimum weight (kg)	
	Male	Female	Male	Female
Rui	2	2	2.5	2.5
Catla	3	3	4	4
Mrigal	2.5	2.5	2	2
Calibasu	2.5	2.5	2	2
Silver carp	2.5	2.5	2	2
Common carp	2	2	1.5	1.5
Grass carp	2.5	2.5	3.5	3.5
Thai Sharpunti	1.5	1.5	0.4	0.4
Shing	1	1	0.2	0.3
Magur	1	1	0.4	0.5

3.1.6. Hatchery equipment

In the study period, the research team found some mandatory hatchery equipment like, Overhead tank, Hatching tank, Brood and fry holding tank, Egg collection tank, Hatching jar/incubator, Deep tube well, Generator, Pump and hatchery Shed (Figure 8).

Figure 8. Brood and fry holding tank of NFEP, Pabatipur.

3.1.7. Sources of hormone

Hormone is an important factor for induced breeding in any hatchery. In the study area, hatchery manager used imported hormone which were introduced from different countries like Ovuprim (Imported from China). Hormone like national source (Company produced and legally imported) like- Ovuhom (ACI Animal Health).

3.1.8. Induced breeding

The hatchery manager mainly practiced induced breeding and used stimulants to induced breeding. They used PG, HCG and S-GnRHa/Ovaprim^{TM}/Ovuhomfor carp species. At first the broods kept in rearing tanks for 4-7 hours. After completing the first dose, the broods kept at rest for 6-8 hrs. Then the second dose was administrated. After 6-7 hours of the second dose, the broods become ready to spawn. Then the eggs and sperms were collected and mixed. The fertilized eggs were kept in hatching tanks for hatchling. After 16-18 hours the fertilized eggs are hatched. The hatchery manager kept the new hatchling for 70- 72 hours in tank. After 72 hours of spawning first feed was given to the post larvae. The total procedure is done with the involvement of skilled technicians in the hatchery. Then the post larvae were sold to nursery owners. The optimum female and male doses for the artificial propagation of different carps are shown in Table 3.

Table 3. The optimum female and male doses (PG) of different carps.

Name of species	First dose (mg/kg)	Interval (hours)	Final dose (mg/kg)	Ovulation (hours after final dose)
Labeo rohita	Female =1.5	6	6	6-8
	Male =---	---	1.5	
Catla catla	Female =2	6	7	6-8
	Male =---	---	2	
Cirrhinus mrigala	Female =1	6	5	6-7
	Male =---	---	1	
Labeo calbasu	Female =1.5	6	6	6-8
	Male =---	---	1.5	
Ctenopharyngodon idella	Female =1.5	8	4.5	6-8
	Male =---	---	1.5	
Cyprinus carpio var. communis	Female =1.5	6	7	5-6
	Male =---	---	1.5	

After 6-8 hours of S-GnRHa/Ovaprim^{TM}/Ovuhom administration, rui and thaisarpunti bred naturally and silver carp and catla were bred by hand stripping. Fertilized eggs were kept in hatching tank and within 16-18 hours spawns were come out. After 72hours of spawning first feed was given to post larvae. The percentages of fertilization of eggs are given in the Figure 9.

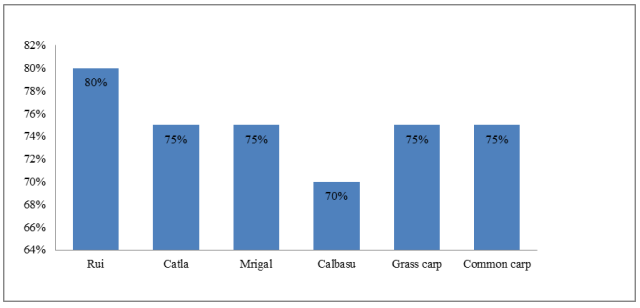

Figure 9. The percentages of fertilization of eggs in NFEP.

3.1.9. Diseases problem and prevention method at NFEP, Parbatipur

There were two diseases problem in NFEP, Parbatipur. These were lernaeasis and argulosis (Table 4).

Table 4. Diseases and prevention method.

Disease name	Fry mortality (%)	Treatment (Liming)
Lernaeasis	10	200g/dec
Argulosis	15	200g/dec

3.1.10. The amount of fry production per spawning season in NFEP

Manager of NFEP, Parbatipur had successfully produced a large number of fry per spawning season and fulfilled the demand of fry in Parbatipur area's farmer for fish culture. If a farmer had faced any problem, they provided their right hand. The amount of fry production per spawning season in NFEP is given in the Table 5.

Table 5. Amount of fry production per spawning season in NFEP.

Name of the species	Amount of fry (kg)
Indian major carp	300
Minor carp	50
Chinese carp	250

3.2. Marketing channel of fish fry

Marketing channel of the hatchery included fish hatchery, nursery, wholesalers, fry traders and fish farmers (Figure 10). In this hatchery fry were sold five days in a week. Nursery owners, wholesalers and fry traders were bought large amount of fry from this hatchery and sold in their respective local area.

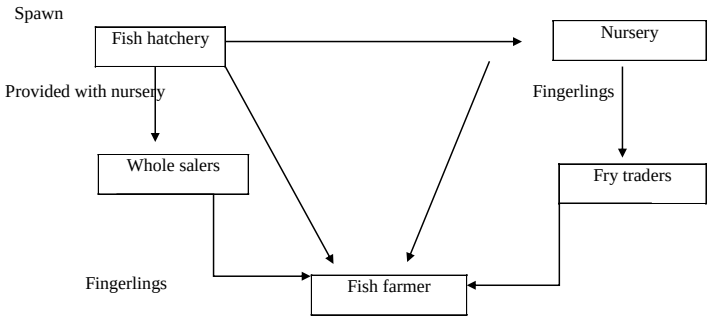

Figure 10. Fish fry marketing channel from hatchery to fish farmers.

3.2.1. Fry transportation in NFEP, Parbatipur

Transportation is one of the major concerns in fry marketing channel. The factors that affect the marketing channel are materials, carriers, and routes. Immediate disposal of farm products in perfect condition adds to the overall farm income and reputation. Fry and fingerlings and table size fish are the main products which require different ways and means of disposal. They need immediate transportation after harvesting so that it may reach the destination in live condition.

3.2.2. Transport of fry and fingerlings

For safe delivery of live fry and fingerlings to destinations, two systems were followed by the hatchery. One is open system for short distance and closed system for short and long distance transport.

3.2.1.1. Open system of transport

This is the traditional system of transport where fish seed materials are transported in open containers. These containers were earlier in the form of earthen hundies which have now been replaced by aluminum vessels. This

method of open system of live seed transport for short distances is of significant relevance for localized marketing scattered throughout the region, in spite of its many limitations.

3.2.1.2. Closed system for short and long distance transport

In this system modern techniques are followed where fingerlings are transported in polythene bags filled with oxygen. In case of large-scale seed transportation, fish transportation tank equipped with agitator and oxygen supply is used. Sometimes the body of the truck is temporary converted into a water pool using plastic pool filled with water. Plastic drums are also used to transport fry and the drums are carried by pick-up van or truck.

3.2.2. Conditioning and preparation for transport

After netting, the fry and fingerlings are transferred to the conditioning hapa and kept for about 6 hours with continuous and vigorous splashing of water from all sides of the hapa. Conditioning time depends on the distance to be covered and the anticipated time of confinement during transport. During this period they pass their remaining excreta and the gut becomes almost empty.

3.2.3. Packaging and transportation

In NFEP, Parbatipur fry was transported all over the country. About 250-300 fry were packed in oxygenated polythene bag of 91.44cm length and 45.72cm wide with two third of water and rest of oxygen. For long distance fry were transported by pick up or truck (large quantity) and locally for small fry traders, they were transported by rickshaw, van etc.

3.2.4. Distribution area of fry of NFEP

Each year in the spawning season a large number of fry of various fish species were produces in NFEP. These fry were distributed all over the country. In Dinajpur district fry were distributed among the markets Bahadur bazaar, Rail bazaar, Chalk bazaar, Pulhat bazaar, Sikder bazaar, Khanpur bazaar, Choupothi bazaar, Bura bazaar, Aftabgnj bazaar, Chakla bazaar, Dangarhat, Vadri bazaar, Deoani bazaar etc.

3.3. Cost benefit analysis

In Table 6 there represent that from 2007-2015 fry production and profit were gradually increasing. Last nine years the hatchery were produced the higher production of fry of 611 kg in 2015 and got the maximum profit of 3,66,600 TK. Among the maximum profit the higher contribution of the species of *Labeo rohita* was reported.

Table 6. Previous few years fry production and profit.

Years	Size (no/kg)	Total amount of fry (kg)	Cost of production (TK)	Fry selling price (TK)	Profit (TK)
2007	200000-250000	345	414000	621000	207000
2008	200000-250000	360	432000	648000	216000
2009	200000-250000	380	456000	684000	228000
2010	200000-250000	400	480000	720000	240000
2011	200000-250000	445	534000	810000	276000
2012	200000-250000	510	612000	918000	306000
2013	200000-250000	560	672000	1008000	336000
2014	200000-250000	600	720000	1080000	360000
2015	200000-250000	611	733200	1099800	366600
	Total production of fry = 4,211 kg		Total cost =5053200 TK	Total income =7588800 TK	Total profit = 25,35,600 TK

Here,
The fry selling prices are 1800 TK/kg.
And fry production costs are 1200 TK/kg.
Fry selling price (TK)/year = Total amount of fry (kg) x 1800 TK
Cost of production (TK)/year = Total amount of fry (kg) x 1200 TK
Profit (TK)/year = Fry selling price (TK)/year - Cost of production (TK)/year
Total 9 years production of fry = 4,211 kg
Total 9 years cost =505320 TK
Total 9 years income =7588800 TK
Total 9 years profit = 25, 35,600 TK

Benefit-Cost Ratio = Total income ÷ Total costs
So, BCR = 7588800 ÷5053200 = 1.5 = 1.5: 1
So profit rate = (Total income ÷ Total costs) x 100 = (7588800 ÷505320) x 100 = 150%
And average annual production of fry in NFEP = Total 9 years production of fry ÷ 9 years = 4211 ÷ 9 = 467.889 = 468 kg.
Average annual profit of NFEP = Total 9 years profit ÷ 9 years = 2535600 ÷ 9 = 281733.333 = 2, 81,733 Tk.

4. Discussion

According to Hossain *et al.* (2016), the main sources were world fish center, BFRI, Haldariver, Padma river, govt. brood bank which is relevant with present study. According to Sharif and Asif (2015), total Fry production of Indian major carps in Bangladesh were 399596 kg. According to the report of DoF (2014), in our country, there were 136 public fish hatchery and 903 private fish hatchery in 2014 and the total production of the public fish hatchery and private fish hatchery were 489331kg fish fry/fingerlings, respectively. Phillips (2002) observed that private sector hatcheries and nurseries, particularly hatchery and fry/fingerling nursery operated by farmers constituted a significant source of fish seed which exceeded far of the natural sector contribution. The number of hatcheries in NFEP, Parbatipur was two in 2015. The yearly production was around 611 kg in 2015. This present study is focused on a specific area of Bangladesh that's why the amounts were fluctuated from previous research and present study. There is no previous data was available on the present study area. Proper care of brood stock is essential for good quality eggs, larvae and juvenile production. Methods differ from one species to another, but the hatchery must provide optimum conditions for maturation and spawning. Factors to be considered include pond management, water quality and temperature, disease control, food supply, brood stock age, density and sex ratios. Dwivedi and Zaidi (1983) reported that brood stock management which led to better breeding responses and increased fecundity, fertilization, hatchlings and larval survival rates and more viable fish seed. In the present study, it was found that the hatchery manager had sufficient broods and they followed proper brood stock management. So the spawning performance (fecundity, fertilization rate, hatchling rate, survival rate of fry) of the broods were satisfactory. Nam *et al*. (2005) said that the successful reproduction and brood selection, procedure was essential where the largest individuals with correct body shape color and free from external deformations needed to be selected. The hatchery manager collected all broods from natural sources. They used healthy and disease free broods and also maintained proper age and weight of the broods during spawning. So the quality of fry was good. Selection of male and female fish from two separate sources as brood fish was advisable as it would reduce the possibility of pairing that could lead to inbreeding problems. Nevertheless, this practice was largely ignored in selecting fish from fingerlings to develop brood stock. In NFEP, Parbatipur hatchery manager collected broods from natural sources such as Padma, Jamuna, Halda, Voirob, Kacha, Rupsha rivers. With the introduction of induced breeding technology of Indian major carps, it became possible to obtain quality fish seed of the major carps for aquaculture. This resulted in an increased reliance on induced breeding for obtaining quality fish seed. Shabuj *et al.* (2016); Hossain *et al.* (2016); Islam *et al.* (2016); Rahman *et al*. (2015) and Ali *et al.* (2015) did the same research on breeding and brood stock management, their result is more or less similar with the present study. Fish fingerlings were transported by using indigenous and modern techniques. Generally earthen pots and aluminum or metallic containers with hand agitation of water were generally used for transportation of fish seed. During longer period of transportation, the water became dirty and was periodically replaced with new water. Sharif and Asif (2015) observed that broods were found to transport by plastic drum and other metal pots with hand agitation of water. Oxygenated poly bag was used for transportation of broods. Sometimes high stocking density in a bag or more time consumes and improper transportation caused higher mortality. The present study is similar with the previous research. Dead and injured fry/ fingerlings were also removed from the container at times to prevent any decaying and fouling of water. During transportation the containers were often covered with moist cloth and gunny bags to keep the container cool. In case of large-scale seed transportation, fish hauling tank equipped with agitator and oxygen supply were used. In Dinajpur district maximum traders used plastic drum and other traders used aluminum pots for fry/fingerlings transportation. Each and every hatchery had a goal to get an optimum profit through the hatchery practice. In this study we observed the hatcheries in NFEP, Parbatipur were viable. In the present study it was observed that the profit rate was 150% and the cost benefit ratio recorded 1: 1.5. Hosain *et al.* (2015) reported that the profit rate was 872.76% and the cost benefit ratio recorded as 1: 8.72 which were relevant to the present study. It was found that the profit rate was higher than the other relevant study. Among the Indian major carps the higher sell value of *Labeo rohita* fry was reported. Shahjahan (2009) reported that Among the Indian major carps the higher sell value of *Catla catla* fry was reported which were not similar to that of the present study. So it was found that the amount fry production and fry selling value of *Labeorohita* were higher in the Parbatipur region. Shabuj *et al.* (2016); Hossain*et al.*

(2016); Islam *et al.* (2016); Rahman *et al*. (2015) and Ali *et al.* (2015) did the same study on captive breeding. Their management and the present study is more or less similar with the present study. In Bangladesh, production of fish seed was not a problem but the crucial factor was to maintain its quality. Over the last two decades Bangladesh became self- sufficient to produce and distribute fry to the users but the quality of fish seed had been deteriorating day by day. Inbreeding, inter-specific hybridization, negative selection of broods, improper brood stock management were common phenomena in hatcheries especially in the private hatcheries. These factors resulted in low growth rate, high mortality, deformities, less fecundity and so on. Edwards *et al.* (2002) emphasized the importance of freshwater fish seed quality in Asia and suggested criteria for selecting good quality seed for aquaculture. The hatchery operation system at NFEP, Parbatipur was free from improper management of brood stock, unconscious negative selection of broods, unplanned hybridization and inbreeding. So the quality of fish seeds at NFEP, Parbatipur was good. The broods had tendency to breed artificially. The hatchery manager used cloth bags, aluminum pots, drums etc. to carry the brood from the brood rearing pond to hatchery. An individual brood fish was used for breeding for 3-5 years and after that it was sold in the market, because the amount of eggs lying after 3-5 years was comparatively less. Hussain and Mazid (1997) reported reduced growth, physical deformities, disease and high mortality in hatchery produced carp fish seed and they identified improper management of brood stock, unconscious negative selection of broods, unplanned hybridization and inbreeding as probable reasons behind these reduced performances. Poor quality seed, perceived as a major constraint to expansion of fish culture, could have deleterious effect on fish production and brood stock development. Shabuj *et al. (*2015); Chowdhury *et al.* (2015); Yeasmin *et al.* (2015) and Rahman *et al.* (2017) had worked on disease management and treatment. The present study is more or less similar with the previous work. In this hatchery fry were sold five days in a week. Nursery owners, wholesalers and fry traders were bought large amount of fry from this hatchery and sold in their respective local area. The present marketing system and management is similar with the study of Hossain *et al.* (2015); Asif *et al.* (2015) and Rahaman *et al.* (2015).

5. Conclusions

Aquaculture mainly depends on the availability of fry and fingerlings. Based on the market demand, the business had been well flourished and a lot of people were involved in this trade and improved their socio economic condition. But, problems were evident in the present study such as the transportation system of fry and fingerlings, involvement of multiple middlemen, high fry mortality, lack of technical knowledge etc. For this reason, hatchery manager faced economic loss to some extent. Unless decentralized fish seed production includes appropriate breeding strategies to maintain the genetic quality of brood stock, the performance of the production stocks will decline. Improve management practices and regular replacement of high-quality fish seed for brood stock, regular training and intensive hatchery operation can improve production of North-West Fisheries Extension Project, Parbatipur.

Conflict of interest

None to declare.

References

Ali MM, AA Asif, MAI Shabuj, O Faruq, S Vaumik, BMN Sharif and MA Zafar, 2016. Technology of artificial breeding of catfish species in the hatcheries in Jessore Region, Bangladesh. International Journal of Fisheries and Aquatic Studies, 4: 180-188.

Ali MM, AA Asif, MAI Shabuj, O Faruq, S Vaumik, MA Zafar and BMN Sharif, 2015. Dose optimization with synthetic hormone flash forinduced spawning of *Shing* (*Heteropneustes fossilis*). International Journal of Fauna and Biological Studies, 3: 39-45.

Ali MM, MB Hossain, MH Minar, S Rahman and MS Islam, 2014. Socio-Economic Aspects of the Fishermen of Lohalia River, Bangladesh.Middle-EastJournal of Scientific Research 19: 191-195.

Ali MY, 1996. Carp nursery and rearing ponds management, Jessore Bangladesh. pp. 74-78.

Asif AA, MA Samad, MH Rahman, MA Farid, SM Yeasmin, BMS Rahman, 2015. Socio-economic condition of fish fry and fingerling traders in greater Jessore region. International Journal of Fisheries and Aquatic Studies, 2: 290-293.

Asif, AA, MA Samad, BMS Rahman, MA Rahman, MH Rahman, SM Yeasmin and A Nima, 2014. Study on management of fish fry and fingerling marketing of jessore in Bangladesh. International Journalof Business, Social and Scientific Research, 2: 127-135.

Chowdhury AA, MS Uddin, SVaumik and AA Asif, 2015. Aqua drugs and chemicals used in aquaculture of Zakigonjupazilla, Sylhet. Asian J. Med. Biol. Res., 1: 336-349.

DoF, 2014. Matsha Sampad Unnoyon Avijan 2014. Department of Fisheries, Ministry of Fisheries and Livestock, People Republic of Bangladesh. pp. 1-3.

DoF, 2015. Jatio Matsha Saptaho Shankalan. Department of Fisheries, Ministry of Fisheries and Livestock, Dhaka. pp. 13-134.

Dwivedi SN and GS Zaidi, 1983. Development of carp hatcheries in India.Fishing Chimes 31 -19.

Edwards P, 2000. Aquaculture, poverty impacts and livelihoods, natural resources perspective, ODI. No. 56 June 2000.

Edwards P, K Benoy, C David and Little, 2002. Small-Scale Fish Culture in Northwest Bangladesh: a Participatory Appraisal Focusing on the Role of Tilapia, In Rural Aquaculture, edited by Peter Edwards, David C, Little and Harvey Demaine. Wallingford, UK: CABI Publishing. pp. 227-244.

FRSS/DoF, 2006-2007. Fisheries Resources Survey System, Bangladesh. Ministry of Fisheries and Livestock, People Republic of Bangladesh. pp. 37-38.

Hosain ME, MN Alam and MZ Hossain, 2015. Breeding performance, spawning and nursing of black carp (*Mylopharyngodon piceus*). Bangladesh Journal of Zoology, 43: 73-83.

Hossain MT, MS Alam, MH Rahman, AA Asif and SM Rahmatullah, 2016. Present status of Indian major carp broodstock management at the hatcheries in Jessore region of Bangladesh. Asian Australas. J. Biosci. Biotechnol., 1: 362-370.

Hossain MA, AA Asif, MA Zafar, MT Hossain, MS Alam and MA Islam, 2015. Marketing of fish and fishery products in dinajpura livelihoods of the fish retailers. International Journal of Fisheries and Aquatic Studies, 3: 86-92.

Hussain MG and MA Mazid, 1997. Problems of inbreeding and cross breeding in hatchery and their remedial mitigating measure. pp. 7-11. In MR Hasan, MM Rahman and MA Sattar (eds). Quality assurance in induced breeding Jessore, Department of Fisheries.

Islam MM, AA Asifand MR Amin, 2016. The Induced Breeding of Common Carps (*Cyprinus carpio*) in Bangladesh. Indian Journal of Science, 23: 619-632.

Nam S, E Tong, S Norng and K Horlte 2005. Use of freshwater low value fish for aquaculture development in the Cambodia's Mekong basin. Consultancy report for Mekong River Commission-Assessment of Mekong Capture Fisheries Project. Phnom Penh, Cambodia, Department of Fisheries. pp. 27-28.

Phillips MJ, 2002. Freshwater aquaculture in the Lower Mekong Basin, MRC Technical Paper No 7. Phnom Penh, Mekong River Commission, Cambodia.

Rahaman MM, MA Zafar, BMN Sharif, P Paul, AA Asif, MM Islam and MI Hossain, 2015. Tilapia (*Oreochromis mossambicus*) marketing system in greater Jessore region, Bangladesh. International Journal of Fisheries and Aquatic Studies, 3: 95-103.

Rahman MA, MH Rahman, SM Yeasmin, AA Asif and D Mridha, 2017. Identification of causative agent for fungal infection and effect of disinfectants on hatching and survival rate of bata (Labeo Bata) larvae. Adv. Plants Agric. Res., 7: 00264.

Rahman MH, MA Rahman, MMM Hossain, SM Yeasmin and AA Asif, 2015. Effect of feeding management of broodstock on breeding performance of bata *(Labeo bata).* Asian J. Med. Biol. Res., 1:553-568.

Shabuj MAI, Asif AA, Faruq O, Bari MR, Rahman MA, 2016. Brood stock Management and Induced Breeding of Thai Pangus (*Pangasius hypophthalmus*) Practiced in the hatcheries of Jessore Region, Bangladesh. Int. J. Bus. Soc. Sci. Res., 4: 235-246.

Shabuj MAI, T Bairagi, AA Asif, O Faruq, MR Bari and MS Neowajh, 2015. Shrimp disease investigation and culture strategies in Bagerhat district, Bangladesh. Asian J. Med. Biol. Res., 1: 545-552.

Shahjahan, 2009. Induced breeding of Indian major carps and cost benefit analysis in a private hatchery, Mymensingh. MS Thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh.

Sharif BMN and AA Asif, 2015. A Present status of fish hatchlings and fry production management in greater Jessore, Bangladesh. International Journal of Fisheries and Aquatic Studies, 2:123-127.

Yeasmin SM, MA Rahman, MMM Hossain, MH Rahman and AA Asif, 2015. Identification of causative agent for fungal infection and effect of disinfectants on hatching and survival rate of common carp (*C. carpio*) larvae. Asian J. Med. Biol. Res., 1: 578-588.