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## Fish Production Technology of Small Scale Fish Farmers at Chaugachha Upazila under Jashore District of Bangladesh

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**Abstract-** The study was conducted on the fish farmer, which was situated at Chaugachha Upazila, Jashore, from October 2015 to April 2016. Data were collected using participatory rural appraisal (PRA) tools and personal observation. About 62% of the farmers have ponds of single, and 38% have multiple ownership. The homestead and commercial ponds were 79% and 21%, respectively. About 100% farmer carried out poly-culture fish farming though they did not know poly-culture just culture of various fishes. About 98% of the farmers control aquatic weeds manually. For controlling undesirable species, most of them (95.74%) used the netting method. Liming used 185.3-247 kg/ha and organic fertilizer, mainly cow dung used 741-1235 kg/ha. Average stocking density was found to be 12326 fry/ha. 91.5% of the farmers applied supplementary feed, such as both rice-bran and mustard oil-cake. The peak harvesting period was found from December to January. In this season, around 65% of the stocked fishes were reported to harvest, and the rest of the fish (35%) was harvested during another season.

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# Fish Production Technology of Small Scale Fish Farmers at Chaugachha Upazila under Jashore District of Bangladesh

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**Keywords:** culture season; pre-stocking management, stocking density, fertilization, feed and feeding practices, fish production, harvesting and marketing.

## I. INTRODUCTION

The fisheries sector contributes 3.74% of the gross domestic product (GDP), 20.87% of agricultural resources, and 4.04% of foreign exchange earning of Bangladesh (DoF, 2009). Our country has about 40.47 lakh ha open inland water body, 5.28 lakh ha closed inland water body and marine water covers an area of 1.66 lakh ha. These water bodies are very rich in fisheries resources. Bangladesh has at least 260 freshwater fish species, and over 475 marine species (DoF, 2009). Lack of adequate and authentic information on the socio-economic condition of the target population is one of the impediments in the

successful implementation of the developmental program (Ellis, 2000). Aquaculture practice has become a promising and gainful methodology to attain self-sufficiency in the food sector and also to alleviate poverty in developing countries like Bangladesh (Ahmed *et al.* 2003).

A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in future, while not undermining the natural resource base (Chambers and Conway, 1992).

Freshwater fish farming plays a role in rural livelihoods in Bangladesh. Apart from direct self-employment opportunities from fish farming, pond fish farming offers diverse livelihood opportunities for operators farming employees of hatcheries and seed nurseries, and for seed traders and other intermediaries Fisheries is one of the sub-sector in the agricultural sectors and plays a role in the socio-economic development of the rural area, fulfilling the animal protein demand, creating employment opportunity, alleviating poverty and earning foreign exchange for the country.

Therefore, the present study was conducted on the following objectives:

1. Know to improve fish farming technology of low scale fish farmers in some selected areas of Jashore district.
2. To assess the constraints of fish production.

## II. MATERIALS AND METHODS

### a) Study area and study period

The study was conducted on the fish farmer, which was situated at Chaugachha Upazila, Jashore, from October 2015 to April 2016. Data were collected from 47 pond owners randomly selected from the study area.

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Figure 1: Map of the study area

b) Data collection method

Collecting data on livelihood and technological issues, only the questionnaire interview method was used. For collecting data, both individual and group interviews were applied with different degrees of effectiveness of the farmers' information.

c) Data analysis

All the collected data were summarized and scrutinized and analyzed by MS Excel and then presented in tabular and chart forms.

III. RESULTS

General features of fish ponds

a) Pond ownership and size

In the study area, 62% of the farmers have ponds of single and 38% have multiple ownership. The average pond size in the study area was found to be 0.10 ha.

b) Pond type and depth

In the study area, ponds were of two categories: homestead and commercial. The homestead and commercial ponds were 79% and 21% and 77% were seasonal, and 23% were perennial, respectively. The water level of perennial declined during the dry season and become unsuitable for fish culture. Some farmers pump water, during the dry season. Seasonal ponds become unsuitable for fish culture during the dry season. The average depth was 6 fit and average water was 3.45 fit.

c) Fish production technology

i. Culture season and method

The season of fish farming in the study area is from April to December. Fish fries were stocked when they become available from April to June and the cultured fishes were harvested primarily during December to January. In the study area, 100% farmer carried out poly-culture fish farming though they did not know poly-culture just culture of various fishes and feeding of a different layers of water. In poly-culture system farmer cultured mainly major Indian carps are shown in Table 1. Some farmers also culture shar punti (*Puntius sarana*), indigenous Koi, and Magur.

Table 1: Indian Major carps and Exotic carps

Species (Local Name)	Scientific Name
Silver Carp	<i>Hypophthalmichthys molitrix</i>
Catla	<i>Catla catla</i>
Rohu	<i>Labeo rohita</i>
Mrigal	<i>Cirrhinus cirrhosus</i>
Grass Carp	<i>Ctenopharyngodon idella</i>
Common Carp	<i>Cyprinus carpio var communis</i>

Farmers did not follow any scientific combination of the species are shown in Figure 2.

Farming activities	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pond preparation		■	■									
Stocking				■	■	■	■	■	■	■	■	
Rearing				■	■	■	■	■	■	■	■	
Harvesting												■

Figure 2: Schedule of fish farming in a pond system

ii. Pre-stocking management

Pre-stocking management of ponds in the study area comprises dike repairing, aquatic weed control, and undesirable species (predator and trash fish) control. About 98% of the farmers control aquatic weeds manually. For controlling undesirable species most of them (95.74%) used the netting method. Some farmers used rotenone and phostoxin (4.26%) but did not follow any recommended dose. Then farmers used lime at the rate of 185.3-247 kg/ha and organic fertilizer mainly cow dung at the rate of 741-1235 kg/ha.

iii. Stocking density

From the survey, it was found that majority farmer's stocked hatchery- produced fry, and some wild fry. The average stocking density was found to be 12326 fry/ha.

iv. Fertilization

It was observed that the majority of the farmers used cow dung, and except one farmer used poultry droppings as organic fertilizer. Farmers used both Urea and TSP as inorganic fertilizers. In the study area, pond fish farmers generally used cow dung at the rate of 2964 kg/ha/yr regularly or four to five times in a month. The average dose of inorganic fertilizer such as urea and TSP was 741kg/ ha/yr and 370.5 kg/ha/yr, respectively. Most of the farmers used fertilizers irregularly.

v. Use of lime and its application rate

All the farmers used lime irregularly in variable doses. The average dose of liming was found to be 370.5 kg/ ha/yr in the study areas.

vi. Feed and feeding practices

It was found that 91.5% of the farmers applied supplementary feed such as both rice-bran and mustard oil-cake. Among them 13.95% farmers use marketed feed and 86.05% farmers use non marketed feeds. The average doses of rice-bran and mustard oil-cake were 2964 kg/ha/yr, and 1482 kg/ha/yr, respectively.

vii. Harvesting and marketing

Although fish are harvested throughout the year, the peak harvesting period was found from December to January. In this season, around 65% of the stocked fishes were reported to be harvested, and the rest of the fish (35%) was harvested during another season. Farmers harvested their fish using cast net and seine net locally known as ber jal. Harvested fish were kept in a plastic barrel. From the survey, it was found that

around 75% of the fishes are sold by the farmers to local packers and the rest 25% consumed by the households and given to the relatives. It was found that 82% of the farmers hired laborers for harvesting their fish.

In marketing systems, there found to be several middlemen, such as local agents, whole -sellers, local fish traders, and retailers. Market communication is being made through middlemen. It was observed that a few pond fish farmers directly sold their fish to local packers or local agents at the bank of the ponds, and the majority of the farmers brought their fish in local markets and sold them directly to local packers or consumers.

viii. Fish production

The average annual yield of fish was 4085.4 kg/ha.

ix. Problems faced by the fish farmers

Several of problems faced by the fishermen, such as poor technical knowledge, fish disease, insufficient water during the dry season, lack of money, and natural disaster (over flow of water). According to the survey, 36.17%, 10.64%, 25.53%, 12.77%, 14.895% respondent's poor technical knowledge, identified fish disease, Insufficient water during the dry season, lack of money and low price of the product to be the most problems, respectively .

Table 2: Problems faced by the fish farmers in the study areas

Problem	Total n=47
Poor technical knowledge	17 (36.17%)
Fish disease	5 (10.64%)
Insufficient water during dry season	12 (25.53%)
Lack of money	6 (12.77%)
Low price of the product	7 (14.89%)

d) Production cost

In the study area, it was found that the average total annual cost of fish production was Tk. 169645.72/ha (Table 3).

Table 3: The production cost of fish/ha/yr.

Cost items	Mean TK
Fingerlings	54782.22
Feed	66690
Fertilizers	21859.5
Lime	8151
Drugs and chemicals	895
Water pumping and electricity	6200
Human laborer	4528
Harvesting	3040
Miscellaneous	3500
Total	169645.72

e) *Net profit and cost benefit -ratio (CBR)*

It was found that the average return of fish production was Tk. 285998/ha/yr. From the survey, it was found that per hectare average profit from fish culture was 116332.28/ha/yr. The average cost-benefit ratio (CBR) was 1.46.

IV. DISCUSSION

a) *Pond feature*

i. *Pond size*

Size of the pond is a factor for fish culture because all measures regarding all management are planned considering the size of ponds. The management of small size ponds is than a large size pond in all management during the fish culture. In the study area, most of the ponds were the medium size (0.10 ha). That's why the farmers can easily manage their pond during the culture as well as harvesting. In my study, it was found that the average pond size was 0.10 ha with a range from 0.03 ha to 0.22 ha. Saha (2004) found that the average pond size in Tangail Sadar Upazila was 0.19 ha; this result was more or less same as my study. Rahman (2003) found that the average pond size in Gazipur was 0.12 ha. Saha (2003) found that the average pond size was 0.21 ha in Dinajpur sadar upazila. Saha *et al.* (1995) observed that the range of pond size was within 0.05 to 0.15 ha. Khan (1994) stated that fish culture efficiency varied with the size of ponds.

ii. *Pond ownership*

In the present study, 62% ponds were single, and 38% were multiple ownership. These results were matched with the findings of Saha (2004), who found that 52% ponds under single ownership, 21% ponds were under multiple ownership and 27% as leased ponds. Quddus *et al.* (2000) found that about 34% of the total ponds were joint ownership and 54% were single and, the rest of 12% ponds were under public or organization property in Demra, Dhaka. It is proved from many studies that multiple ownership is the main problem to improve the pond culture system as well as efficient use of resources for fish cultivation (Ali and Rahman, 1986 and Mollah *et al.*, 1990).

iii. *Type of pond*

From the survey, it was found that 77% ponds were seasonal and the remaining 23% were perennial. Saha (2004) found that 37% ponds were seasonal, and 63% were perennial in Tangail Sadar Upazila. Saha (2003) observed that 17% ponds were seasonal and 83% were perennial in Dinajpur Sadar Upazila. In the study area, the land position comparatively high from the sea level that is the cause of drying during the dry season.

b) *Fish production technology*

i. *Culture season and method*

From the survey, it was found that almost all farmers (100%) carried out a poly culture system. In the study area, the culture season was from April-December. Farmers in this area stocked carp (Indian major carp and exotic carp), punti, (Local Name) indigenous shing, and magur, koi, and tilapia. Ahmed (2003) observed that peak period of carp poly culture was from April to December. Rahman (2003) reported that the season of carp farming was from March to December. Saha (2003) stated that there were two culture seasons in Dinajpur Sadar Upazila (Fazilpur and Sunderban union). One was from June to December and another was from February to June.

ii. *Pre-stocking management*

As a traditional farmer, most of the farmers know that the pre-stocking management is to clear all aquatic weed, repair the side of the pond and fill up with water. Within the farmers, some know about the treatment of pond bottom, water and create natural food production in water trained by the Upazila Fisheries officers and some NGO under their project. In the study area, most of (98%) controlled their aquatic weed manually. For removing unwanted species, 95.74% farmers used the netting method, and 8-12% farmers did not use any chemicals or other methods. Only a few farmers (4.26%) used rotenone and phostoxin. Biswas (2003) found that the chemicals and other toxic substances used in pond farms for controlling aquatic weeds, pests, predators and undesirable species were rotenone, phostoxin, dipterex, bleaching powder, diseal, summation, endrin, copper sulphate, aldrin and DDT in 75.0, 65.0, 22.5, 10.0, 7.5 5.0, 2.5 and 2.5% farms respectively.

### iii. Stocking density

Stocking density is a factor for fish culture in the case of culture technique, food habit, and measurement of lime, fertilizer use. According to DoF the stocking density of carp is 30-40 per decimal. The standard stocking density for carp culture is 35 to 40 per decimal. The average stocking density in the study area, was found 12326 fry/ha. Rahman (2003) found that, the average stocking density was 25,250/ha in Gazipur. Hassanuzzaman (1997) stated that, the average stocking density was 16,196 fry/ha in the district of Rajshahi. Hossain *et al.* (1992) observed that the range of stocking density was from 10,000-31,000/ha in a village of Mymensingh district.

### iv. Fertilization

The average dose of organic fertilizer was 2964 kg/ha/yr and inorganic fertilizer such as Urea, and TSP was 741 kg/ha/yr and 370.5 kg/ha/yr, respectively. Saha (2004) observed that the average dose of organic fertilizer was 8330 kg/ha/yr and inorganic fertilizer was urea 387 kg/ha/yr and TSP 176 kg/ha/yr. Rahman *et al.* (1998) found that doses of organic and inorganic fertilizer were 11,075 kg/ha and 739 kg/ha respectively. Hassanuzzaman (1997) observed in his study in Rajshahi district that the average dose of organic fertilizer was 2,801 and inorganic 97 kg/ha/yr. Rana (1996) found in his study in Sirajgonj district that the organic fertilizer was 8,122 kg/ha/yr and inorganic fertilizer was urea 315 and TSP 111 kg/ha/yr.

### v. Feed and feeding practices

We all know sufficient supply feeds, is important to increase fish production. In the study area, the average dose of rice-bran, and mustard-oil cake was 2964 kg/ha/yr, and 1482 kg/ha/yr, respectively. Most of the farmers do not use pellet feed because it's costly and probably beyond their capacity line. Rahman (2003) found that the dose of rice-bran and oil-cake was 2,730 and 580 kg/ha, respectively. The result of the present study is different from the report of Rahman (2003). Saha *et al.* (1995) found the average dose of rice-bran and oil-cake was 5,192 and 734 kg/ha, respectively. Hassanuzzaman (1997) found in the Rajshahi district the dose of rice-bran and oil-cake was 1,250 and 1,212 kg/ha, respectively. But the farmers in the study area did not follow any scientific methods, their feeding practice was more irregular.

### vi. Harvesting and marketing of fish

In the study area, the peak-harvesting season was from December to January because during this period, fish became marketable size and market price was high. Rahman (2003) found that the main period of harvesting was from October to January. However, Saha (2004) found that, the peak-harvesting season was from November to January. Ahmed (2003) stated that the peak-harvesting season was from December to March. Farmers harvested their fish by using the cast net and

seine net in the study area. The similar results showed by Rahman (2003) and Saha (2004). Ahmed (2003) observed that farmers harvested their fish usually by using the cast net.

### c) Cost-return analysis

The average total cost of fish production in the study area was observed Tk. 169645.72/ha/year. Ahmed (2003) found that the average fish production cost was Tk. 23,210 -Tk. 24,790/ha. Biswas *et al.* (2000) revealed that the average total cost of pond fish production was in Tk. 59,813. It was found that the average CBR was 1.46.

### d) Constraints of fish production

From the study, it was found that lack of scientific knowledge, multiple ownership, lack of feed, lack of equipment for harvesting, and lack of marketing facilities were most constraints for fish production. Moreover, besides the cultivation work, the farmer takes less care in fish production. Khan *et al.* (1998) found that lack of extension work for fisheries improvements caused the greatest difficulty in pond fish culture.

## V. CONCLUSION

On the basis of the findings of the present study, the following recommendations were made for sustainable pond fish farming and to maintain sustainable livelihoods of fish farmers in Chaugachha Upazila under Jashore district. The majority of the people are little educated, so they should be educated to develop social consciousness. People should bring under group activity, and local security system should also be developed. The problem of multiple ownership can be solved by leasing the pond to a person interested in fish culture or through the cage or pen culture by different owners. To get the proper price of fish in the market, the number of middle man should be reduced. Supply of net and other harvesting and marketing equipment to the farmers with less fare may reduce harvesting and marketing costs. For this purpose, co-operative society among fish farmers should be established to make harvesting and marketing equipment and their maintenance. Government and other organizations should play their assigned role by disseminating information to the farmers and arranging necessary training for scientific methods of fish production in a pond. Such training will assist farmers to identify and solve the problems related to the fish farming.

To supply quality fish seed to the farmers more hatcheries should be established by the help of Government and NGO. In that case, existing problems in the hatcheries should be overcome.

### Conflict of interest

None to declare.

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