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RESOURCE USE AND ECONOMIC RETURN IN POND FISH CULTURE[*]

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ABSTRACT

Production practices of pond fish culture are described in this study. Pond fish production in the sample areas was mainly based on stocking of fish seed, use of fertilizer and feed, and human labour for different operations and management. The majority of the farmers no various species of indigenous and exotic carps and produced 1700 to 3889 kg/ha/year in different locations. However, higher yield was not the only factor for higher net return.. Net return was influenced by price of the output and economic use of both material inputs and labour.

I. INTRODUCTION

Bangladesh has a. long tradition of aquaculture. Inland fish culture is expected to play an important role in supplying the fish needs of the people, specially in view of rapidly rising fish prices. Due to uncontrolled catching of wild stock and lack of water management, inland production has declined in last few years but from 1980-81, it has been increasing steadily (BBS 1984a, p. 242). At present, inland fish is contributing about 80 percent of total fish production and of this, 39percent is coming from pond fish culture.

There are 915,425 hectares of pond in our country and their total estimated production is only 165,0OD'metric tons (BBS 1984b, p.16). Therefore, per hectare production is very few due to improper culture and management and many of the ponds are still derelict.

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Generally, through semi-intensive method, a fertilized pond produce 2,725 kg/ha/year while the production of pond without fertilizer and feed does not exceed 500 kg/ha/year (Table 1). Again, by using fertilizer and artificial feed, production can be increased upto 3,745 kg/ha/year. Therefore, the yield of fish pond can be increased at least 5 to 7 times through intensive cultivation employing more supplementary inputs. In other countries, production of multispecies carp and tilapia have exceeded 8 metric tons with improved management and intensive feeding.

TABLE 1. POND PRODUCTION BY INTENSITY AND POND TYPE

Intensity	Pond type	Pond treatments	Fish production (Kg/ha/yr)
Extensive	Cultured	Stocking with carp. No fertilization and feeding.	500
Semi-intensive	Cultured	Stocking with carp; multispecies culture with fertilization, without feeding.	2725
Intensive	Cultured	Stocking with carp. Multispecies culture with fertilization, with low quality feeding.	3745
Super-intensive	—	Stocking with carp or Tilapia ; multispecies culture ; increased water use and aeration. Heavy and regular fertilization. Feeding with high quality feed.	9000

Source : Adapted from Table VII-II of Vol. VII of MPO 2nd Interim Report.

Why then the per hectare production of pond is very low in our country and how this can be improved ? This study attempts to answer these questions. In this paper, production practices of prevailing fish pond and their economic returns have been analysed and discussed.

The analysis is based on data for the year 1985 of a sample of 180 stocking ponds, selected from four districts namely, Mymensingh, Gazipur, Lakshmipur and Jessore. Only those ponds cultivating fish were selected purposively. The study areas were divided into 6 locations according to distance covered for selecting the stocking ponds.

II. PRODUCTION PRACTICES AND ECONOMIC RETURNS OF FISH POND

Cultural and Management Practices

Farmers in our country, at present, are little motivated about scientific fish culture. We know, it is possible to increase pond fish production if the ponds are cultivated scientifically with high yielding carp varieties, both indigenous and exotic. Even 10 years back most of the fish farmers did not know the modern technology of aquaculture and were not interested to improve their pond condition. At present, through the communication media such as extension worker, result demonstration, improved fish culture in the same area, national broadcasting and other mass media made some farmers understand about scientific pond fish culture. However, in the study areas it was observed that 47 percent of fish farmers cultured indigenous carp and 2 per cent cultured exotic carp and both indigenous and exotic carps were stocked in 51 percent ponds. Ponds with composite culture were 96 percent (Table 2).

TABLE 2. CULTURAL AND MANAGEMENT PRACTICES OF SAMPLE PONDS

Particulars	No	Percent
A. Cultural characteristics :		
i. Pond with monoculture ..	7	4
ii. Pond with composite culture ..	173	96
iii. Pond with indigenous carps ..	84	47
iv. Pond with exotic carps ..	4	2
v. Pond stocked with both exotic & indigenous carps	92	51
B. Management characteristics		
i. Pond without fertilizer & feed ..	45	25
ii. Pond fertilized	15	8
iii. Pond with artificial feeding ..	58	33
iv. Pond with both fertilizer & artificial feed ..	62	34

Source : Field survey.

Although most of the farmers cultivated carp varieties but some of them did not use supplementary inputs such as fertilizer and artificial feed. Table 2 shows that only 34 percent of the sample farmers used both fertilizer and feed; on the other hand, either fertilizer or feed were supplied only in 8 percent and 33 percent ponds respectively. But the farmers who used either fertilizer and/or feed, used below standard dose. A similar observation was also made by Gill & Motahar (1982).

Quantity of Input Use

Pond fish production may be represented by a function of various inputs used and production practices. For intensive fish culture it is most essential to use modern inputs such as selected fish seeds, manure and fertilizer, artificial feed, insecticides and necessary care for pond management. A pond fish production level is usually much higher with fertilization and supplementary feeding than without because the rate of fertility as well as productivity of pond can be improved by fertilization and/or supplementary feeding. The purpose of fertilization is to increase the production of plankton, which fish prefer as feed and on the other hand, supplementary feeding can complement the nutrients that are in short supply in the fish pond.

Production practices and input use depend on changes in technology, socioeconomic environment and development in the production area. On the other hand, input use, and input mix are influenced, to some extent, by a knowledge of what inputs to use, which inputs have significant impact on total output, what inputs are available to the producer in his area and prices of inputs. In the study areas, many farmers recognised the importance of using fertilizer and supplementary feed to increase production but some of them did not use these inputs at all.

Pond fish productin in the sample areas was mainly based on stocking of fry and fingerling, use of manure and fertilizer, supply of artificial feed and human labour for different operations, and pond management. These four factors or inputs covered about 90 percent of total cost. Proper and timely utilization of first three inputs are most important to increase production per unit area of pond. Utilization of these four inputs varied among the fish pond farmers in different districts and among the farmers within the same district or location.

Stocking of fish seed. Among all the inputs of pond fish culture, stocking of fish seed may be considered as first and prime input. Per hectare stocking rate depends on species, size of fry and fingerling and pond condition, because a fish pond can support a certain quantity of fish in its limited space and natural food. The stocking rate of fish varies mainly with the fertility of pond. In the study areas, stocking rate varied from 8,322 pieces/ha in Gazipur to 19,868 pieces/ha in Jessore South and considering all locations, the average rate was 12,157 pieces (Table 3). Almost all the sample farmers in

different locations stocked Rui, Catla, Mrigal and Silver Carp, and other varieties such as Carpio, Mirror Carp, Grass Carp, Common Carp, Calbaush, Tilapia were cultured additionally by some of the farmers.

Fertilization. There are many kinds of organic and inorganic fertilizers that can be used in fish pond. In the sample areas only cowdung was used as organic fertilizer and the inorganic fertilizers were Urea, T.S.P., and Muriate of Potash. But in case of applying organic and inorganic fertilizers, proper dose and combination were not maintained. The average doses of organic and inorganic fertilizers applied were 266 kg and 255 kg/ha

TABLE 3. INPUT USE PER HECTARE IN THE SAMPLE AREAS

Location	Fry and fingerling (pieces)	Fertilizer		Artificial feed		Human labour (hr.)
		Organic (kg)	Inorganic (kg)	Oil cake (kg)	Rice bran (kg)	
Gouripur	13771	500	250	324	147	2614
Mymensingh	10036	120	107	300	504	2021
Gazipur	8322	195	112	217	250	880
Lakshmipur	10790	171	55	306	234	1319
Jessore North	10183	282	278	591	58	2396
Jessore South	19868	261	716	659	62	1780
All locations	12157	266	255	400	203	1775

respectively for all the sample ponds. Rate of organic fertilizer was highest in Gouripur (500 kg/ha) and lowest in Mymensingh sadar (120 kg/ha). On the other hand, per hectare rate of inorganic fertilizer was highest in Jessore South i.e., 716 kg/ha which was about 13 times higher than that of Lakshmipur (Table 3). Therefore, the application of fertilizer was not even in the study areas, and standard doses of either organic or inorganic were not maintained.

Artificial feeding. From Table 3 it can be seen that fish pond farmers in the sample areas applied only o l cake and rice bran. Rice bran is a low-priced feed yet it was applied

in only 36 percent of sample ponds. There was a big gap between lower and higher doses of using rice bran i.e., 58 kg and 504 kg/ha in Jessore North and Mymensingh respectively, and the average dose was 203 kg/ha. Oil cake is a richer food than rice bran and it was used in 55 percent of the sample ponds. Rate of applying oil cake was different in different locations. Jessore South applied the highest amount i.e., 659 kg/ha. The average for all sample ponds was 400 kg/ha.

Human labour. Most of the production operations of pond fish culture required human labour. The intensity of labour use depends upon how carefully and what operations have been done by the producers. Both family and hired labour were used in different phases of production. From Table 3 it appears that there was wide variation in labour use. Total labour use varied from 880 man hours in Gazipur to 2614 man hours in Gouripur. However, among all the operations, reconstruction of pond required highest amount of labour.

Structural Composition of Cost of Production

Cost of production is the main determining factor to earn more farm income. Considering its importance the present study gave emphasis on the structure of cost of production and its impact on farm income.

Cost of producing pond fish have been divided broadly into three - material cost, labour cost and miscellaneous operating cost. All these costs were accounted for one production year. Table 4 provides the itemised cost of pond fish production for different sample areas.

There was large variation of input doses and accordingly, both total cost and itemised cost varied widely. Total cost was highest in Jessore South, Taka 23,413 and lowest in Gazipur, Taka 9,966. Second highest cost was incurred by Jessore North i.e., Taka 16,599 and it was about Taka 500 more in comparison with Mymensingh. According to the total cost incurred, Mymensingh was in third position. Lakshmipur and Gouripur had almost the same amount of total costs and the corresponding amounts were Taka 14,364 and Taka 14,119 respectively.

Among the three heads of cost items, material cost covered highest amount in all the sample areas and considering all locations it represented 73 percent of total cost amounting Taka 11,280/ha. Like the total cost, material cost was also highest in Jessore South and lowest in Gazipur and their difference was about 3 times. It was quite reasonable because material cost shared the major percentage of total cost. Except Gazipur and Mymensingh, material cost of other areas was near to the average level of all locations.

Material cost included the cost of stocking of fry and fingerling, organic and inorganic fertilizers, supplementary feed and insecticides. Of these items, fish seed stocking

TABLE 4. ITEMISED COST OF POND FISH PRODUCTION/HA/YEAR

Item of cost	Production cost/ha by location						All locations	
	Gouri-pur	Mymen-singh	Gazi-pur	Lakshmi-pur	Jessore (North)	Jessore (South)	Cost	% of total cost
1. Material input cost:	10058	8713	6942	11327	12425	19317	11280	73
a) Stocking (fry & fingerling)	5479	4319	3718	6936	5265	8588	5717	37
b) Fertilizer	2373	1847	1507	929	2456	4499	2269	15
c) Supplementary feed	2207	2547	1717	2063	4069	4998	2934	19
d) Insecticide	—	—	—	1395	635	1232	360	2
2. Labour cost	3065	1972	1755	1547	3389	3233	2493	16
3. Miscellaneous operating cost	996	5404	1269	1495	784	862	1803	11
Total cost (1+2+3)	14119	16089	9966	14364	16599	23413	15575	100

Note : Miscellaneous operating costs comprise costs of fuel, depreciation expenses, commission for care taker, interest charges and leasehold fee.

Source : Field survey.

required the maximum cost and covered 37 percent for all locations, and it varied from 27 to 48 percent in different sample areas. Next to stocking, costs of supplementary feed and fertilizer can be lined up which represented 19 percent and 15 percent respectively considering all the sample ponds. Use of insecticides was insignificant. Only 4 farmers in Jessore (North and South) and 2 farmers in Laksmipur used this input (Table 4). As a result, per hectare cost of insecticides was very small.

According to the amount of cost, labour cost was in third position, next to stocking and supplementary feeding and represented 16 percent of total cost for all sample ponds. It appears from Table 4 that Gouripur and Jessore (North and South) incurred higher amount of labour cost, ranging from Taka 3,065 to Taka 3,389/ha while rest of the three areas incurred about Taka 1,000 less than that of the above mentioned areas, However, the average labour cost for all the sample areas was Taka 2,493/ha.

Per hectare miscellaneous operating cost for all locations was Taka 1,803 and represented 11 percent of total cost. In Mymensingh, this item of cost was exceptionally high, Taka 5,404/ha which was about 3 to 6 times higher in comparison with other areas. In this area two farmers took higher amount of bank loan (Taka 14,000 and Taka 25,000) against their fish pond and were supposed to pay higher amount of interest per year. Again, few farmers in this area paid higher amount of leasehold fee. Consequently, these two major factors made the miscellaneous cost so high.

Farm Returns

Farm returns may be measured in terms of yield, gross return and net return. Moreover, these are interrelated. Gross return is the value of yield and net return is the difference between gross return and costs of production. The value of fish was calculated at prevailing market rate and it varied from Taka 21 to 29/kg in different sample areas.

From Table 5 it appears that both gross and net returns/ha were highest in Lakshmipur and the values were Taka 96,416 and Taka 82,052 respectively. Lakshmipur has got the advantages of higher market price of fish and lower production costs. Again, yield per hectare was comparatively higher (3,359 kg) next to Jessore North and South. All these factors ensured highest net return in this area.

In Jessore (North and South) per hectare yield was higher in comparison with other areas but the gross and net returns were lower than Lakshmipur due to higher production costs and lower market price of fish. According to net return, Gazipur and Gouripur occupied fourth and fifth positions and earned Taka 43, 460 and 35,873/ha respectively. In Mymensingh, per hectare yield was too low but costs of production was comparatively high which pushed down net return to the lowest position i.e., Taka 29,331/ha. However, no fish pond in survey areas incurred loss.

TABLE 5. AVERAGE PER HECTARE COSTS AND RETURNS OF POND FISH PRODUCTION

Location	Yield (kg)	Gross return (Tk)	Total cost (Tk)	Net return (Tk)
Gouripur	2264	49992	14119	35873
Mymensingh	1700	45420	16089	29331
Gazipur	2039	53436	9966	43460
Lakshmipur	3359	96416	14364	82052
Jessore (N)	3889	82661	16599	66062
Jessore (S)	3706	79606	23413	56193
All locations	2867	69201	15575	53626

Source : Field survey.

IV. CONCLUSIONS

Based on survey results, it was found that most of the fish pond farmers still follow the traditional method and they were not aware of the benefits of using supplementary inputs in their ponds. Almost all the sample ponds have good potentiality to increase production by intensive method of cultivation which is not yet realised.

Pond fish output was influenced to a great extent by the level of cultural and management practices performed. Farmers applied fertilizer and artificial feed in various combinations and rates. But neither combination nor rate of supplementary input application had any consistent relationship with yield. Again, higher yield was not the only factor for higher net return. Higher net return was influenced by price of the output and economic use of both material inputs and labour.

In general, there are two different ways to increase fish production, either by constructing new ponds or improving existing condition of ponds, or both. Choosing between these alternatives is primarily an economic consideration i. e., that alternative

should be chosen which is more profitable for producer and at the sametime provides cheaper fish for consumers. But considering the scarcity of land in our country, fish production should be increased through intesification i.e., by using more inputs rather than increasing farm size or constructing new ponds. In this context, all the culturable and derelict ponds may be brought under scientific fish culture to increase the farming areas as well as production.

Fish pond farmers are not as growth-oriented as one would expect and most of them do not feel encouraged to produce larger quantities to earn more profit. Some farmers overstocked the pond which was harmful for healthy growth of fish and did not maintain the stocking density in relation to using other inputs. Again, the farmers were not found to maintain proper species combination at the time of stocking. Therefore, it is important to make the farmers understand and realise that stocking density should be balanced with carrying capacity of ponds for better production. Extension service from Upazela Fishery Office can help them to overcome these problems.

Finally, in order to promote the development of pond fish culture, government and other related organizations must provide variety of incentives because scientific aquaculture is a fairly new or infant industry in our country. From this study it has been observed that pond fish production has already been improved upto 2,867/kg/ha through semi-intensive culture. Therefore, production of fish will further increase with the introduction of improved cultural practices. To augment this, technical and financial assistance must be extended in time of need and on the other hand, a systematic production-oriented research is needed to maintain continuous improvement of aquaculture.

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