Pond Fish Production Through People's Participation in Rural Bangladesh

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Abstract

Aquaculture is currently responsible for a significant proportion of total fish production in Bangladesh. Fish is the main animal sources of protein for the rural people of Bangladesh. However, given increasing demand for fish, the per capita production of fish is declining. The present study highlights the development of fresh water pond fish culture through grassroots level organization in Bangladesh. The study was conducted in rural area of Bangladesh. The result of the study reveals that, management and cultural factors affect fish farming in ponds. The study also indicated that, higher production could be achieved by increasing the use of fertilizer and artificial feeding along with the improvement of other management practices. The grassroots level village organization had played a significant role in the process of technology transfer from the Thana level to the village level.

I. Introduction

Rice and fish constitute the principle diet of almost every Bangladeshi and fish is the main source of animal protein for the common people in the country. This sector contributes 75% of the daily per capita animal protein intake, 8% of agricultural GDP, 4% of total GDP and 9% of foreign exchange earnings (Ali, 1996). Total fish production in 1994-95 was 1200 thousand metric tones, of which 77 % was from inland fisheries and the rest, 23% from marine fisheries. On the inland fisheries, 63% were from open water capture fisheries and the rest 37 % were from closed water culture fisheries of which fresh water pond fish culture is the most important one.

Bangladesh possess a wide variety of fish, prawn and turtle inhabiting in its vast and highly diverse aquatic resources. Inland water fish and prawn resources were, in the past, so plentiful that these gave rise to various local adages relating to fish to the food habit and life style of the Bengali people. One such adage is *mache-bhate-bangali* meaning, "a Bengali is made up of fish and rice.". Another such adage *is likhibo poribo moribo duk-khe, motshya dhariboi, khaibo shukhe* meaning "I would catch fish

and live happily ever after rather than reading and writing which will only lead to my drudgery and miserable death." These adages imply that fish was plentiful and catch was easy and comfortable to do so in comparison to other work. The days of these adages are now a legend of the past. Since about the nineteen-fifties, scarcity of fish started becoming discernible. The inland open water capture fisheries production started to decline in 1980s in both quantity and species diversity (Tsai and Ali : 1997) and is showing erratic fluctuation in 1990s. Table 1 shows the trends of fish production from different sources of Bangladesh.

Table 1. Fish Production Trends From Different Sources of Bangladesh (1984-95)

Source	Production (Metric tons)										
	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
Inland waters											
a) Capture											
1.River and Estuary	213057	199500	195117	183317	181140	173410	135355	124843	138746	130235	136650
2.Sundarban	5825	7112	6035	3055	6416	5393	6651	6297	6939	6970	2550
3.Beels and Haor	45893	45258	42077	45610	47019	46594	47923	49201	53019	56678	62550
4.Kaptai lake	2700	2433	3991	4068	8439	3713	4392	4246	4142	4815	5500
5.Flood land	194130	187396	183795	182037	186126	193762	249083	295185	329573	353530	365500
Sub total	461605	441699	431015	418087	429140	422872	443404	479772	532419	552228	572750
b) Culture											
1.Ponds	111557	123804	142876	148423	155012	153730	181018	195034	202167	231530	285520
2.Ox-bow lake (Baors)	962	968	1174	1254	1321	1357	1544	1682	1803	2250	3550
3.Farm	11232	19951	22050	25248	27172	27505	28431	30147	33773	41500	56630
Sub total	123811	144723	166100	174925	183505	182592	210993	226863	237743	275280	345700
Inland total	585416	586422	597115	594012	607645	615464	654397	706605	770162	827508	922350
Marine Fisheries											
a) Industrial	12440	11898	12356	10395	10353	11379	8760	9623	12227	14600	17530
B)Artisinal	175123	195503	205223	217187	222928	227534	232778	235851	238265	245000	260350
Marine total	187563	207401	217579	227582	233281	238913	241538	245474	250492	259600	277880
Country total	772979	793823	814694	821594	840926	854377	895935	952079	1020654	1087108	1200230

Source: Department of Fisheries. Bangladesh 1984-1995.

Various reasons might be put forward to account for this decline in open water capture fisheries production, such as massive construction of flood control structures, over exploitation, abstraction of water for irrigation, intensive agriculture and industrial development, erosion and siltation, reclamation of land for human settlement, aquatic pollution, destruction of mangrove forests and so on. Despite the popularity of *Mach-bhat* (fish and rice) in the national Bengali food menu for the rural poor, fish is becoming increasingly scarce and costly. It will be obvious to anyone that a rapidly growing population coupled with a substantial reduction in fish production means a lower consumption level for the people with all its concomitant implications in terms of health and nutrition. Amongst the lower income groups, per capita consumption of fish is only about 4.4 kg and for the poorest of the poor it is simply unaffordable (Nuruzzaman : 1994). Compare to rice, the cost of fish is increasing rapidly, and the rural poor not being able to afford it.

However, the production of fish from pond fish culture is increasing rapidly in spite of the fact that its total produce is still less than that of inland open water capture. Hence, the purpose of this paper is to show that fresh water pond fish culture can and does play an important role in supplying fish needs of the people in Bangladesh and is possible to increase pond fish production if appropriate approaches are implemented by the development agencies. For this purpose, the rest of the paper has been so organised as to include the following section; 1) Significance of pond fishery in Bangladesh, 2) factors responsible

for pond fish production in Bangladesh, 3) farmers participation in pond fish culture, 4) methodology and objectives of the field study, 5) field study results and discussion and 6) conclusion and recommendation.

II. Significance of Pond Fishery in Bangladesh

In Bangladesh numerous impounded water bodies in the form of ponds, and *dighees* (big ponds) are spread all over the country. The need for water supply, construction of houses and flood protection measures have produced various types of ponds all over the country. Most of the ponds are irregular in shape and very few of them were built specifically with fish culture in mind. Rain, flood, and ground water are the main sources of water for the pond. Most of the ponds are utilized mainly for domestic purposes such as bathing, washing clothes and utensils, bathing domestic animals, irrigation of crop fields and so on. Ponds cover only 3.5% of the total inland waters of Bangladesh whereas they contribute about 31% of the total inland fish production thus playing a vital role in fresh water fish production. This contribution level is achieved through traditional fish culture practice where the average rate of fish production is only 1.3ton/ha/year. (UNDP: 1999). Table 2, shows the percentage of distribution of ponds according to techniques of fish culture adopted in Bangladesh. About 53% of the ponds were used for rearing fish for final consumption. About 37% of the ponds were never stocked, no preparatory work done in the case of 83% of the ponds and about 85% of the ponds were not manured.

Table 2. Percentage of Distribution of Ponds According to Techniques of Aquaculture Adopted in Bangladesh.

Items	Percentage of ponds according to	
	No of ponds	Area of ponds
A.Type of fish cultivation		
Natural practice	37.5	27.8
Stock applied for nursery	9.3	10.7
Stock applied and reared only for consumption and sale	53.1	61.4
B.Pond preparation before stocking		
With preparatory work	17.1	23.4
With out preparatory work	82.8	76.5
C.Manuring done		
Manuring	15.3	19.3
No manuring	84.6	80.6

source : BBS, 1994.

In a Country like Bangladesh where fish is one of the main source of protein and fish culture has a long tradition, pond fish culture can be expected to play an important role in supplying fish needs of the people, especially in view of steadily increasing demand for fish, due to increase in population and the fish prices.

Pond fish culture can also become a major income-generating element in rural development programs. Supplemented with agricultural crop production and animal husbandry, pond fish culture can generate income and employment in the rural areas of Bangladesh and improve the quality of life of the rural

poor.

Thus, if the existing ponds are brought under semi-intensive fish culture the present rate of pond culture production can easily be increased to approximately 352,536 metric tones per annum (UNDP: 1999). Generally, through semi-intensive method, a fertilised pond produces 2,725kg/ha/year while the production of pond without feed and fertiliser doesn't exceed 500kg/ha/year (Table 3). Therefore the yield of fishpond can be increased at least 5 to 7 times in semi-intensive or intensive cultivation. So, there is a great potential to increase fish production if the potentials of pond resources are being developed. Table 3 shows the potentiality of pond fish production in Bangladesh.

Table 3. Potentiality of Pond Fish Production by Intensity and Pond Type

Intensity	Pond type	Pond treatments	Fish production (Kg/ha/yr)
Extensive	Cultured	Stocking with carp, no fertilizer and feeding	500
Semi-intensive	Cultured	Stockoing with carp, multiple species culture with fertilization without feeding	2725
Intensive	Cultured	Stocking with carp, multiple species culture with fertilization,with low quality feeding	3745
Super-intensive	Cultured	Stocking with carp or tilapia; multiple species culture; increased water used and aeration. Regular fertilization,feeding with high quality feed	9000

Source: Adopted from Table vii-ii of vol. vii of MPO 2nd interim report as cited by Islam and Dewan 1986.

III. Factors Responsible for Increasing Pond Fish Culture in Bangladesh

It is true that fish production per unit area and time will not be uniform all over the country or in all types of water bodies. Pond fish production may be represented a function of various inputs used and production practices. For semi-intensive and intensive pond fish culture it is essential to use modern inputs such as selected fish seeds, manure and fertilizers, artificial feeding, insecticides and necessary care for pond management. Production practices and input use depend on changes in technology, socio-economic environment and development in the production area. There are many factors responsible for increasing pond fish production in Bangladesh and could be classified into four major groups: a) management factor, b) technological factor, c) social factor and d) policy factor. All these factors and their inter relations are presented in the Fig. 1.

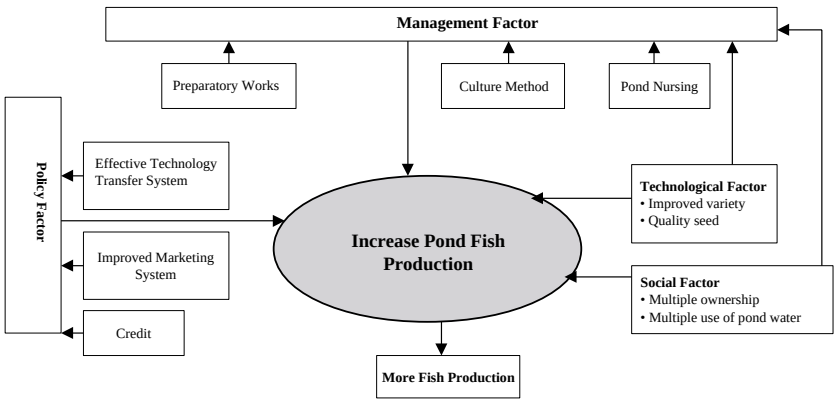


Fig. 1. Factors Responsible for Pond Fish Production in Bangladesh

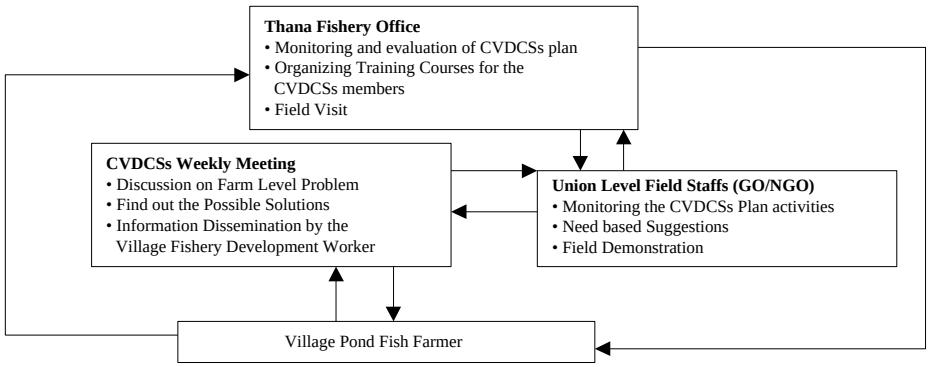
IV. Farmers Participation in Pond Fish Culture

The necessity for the participation of the local community in planning and implementation in rural development projects is a widely accepted idea. During the last two decades many governments, development agencies and non-governmental organizations have recognized that the "top-down" approach characteristics of traditional development strategies have largely failed to reach and benefit the rural people. People's participation implies the active involvement in development of the rural people, particularly disadvantaged groups that form the mass of the rural population and have previously been excluded from the development process.

Ideally, people’s participation should be spontaneous and by the free will of the community. However, in practice it has often to be achieved through effective education, persuasion, and demonstration of benefits. People's participation is needed not only at the initial decision making stage, but also during implementation, monitoring and evaluation including in sharing the benefits of development.

Considering the above facts, the Bangladesh academy for Rural Development (BARD) has taken steps for increasing inland fish production through a rural development experimental project widely known as Comprehensive Village Development Program (CVDP) whose main objective is people's participation in rural development projects. CVDP is a development approach which recognizes the need to involve the rural population in the design and implementation of policies concerning their well being. It is a membership based self-help organization whose primary aim is the pursuit of its member's social and or economic objectives. Under this project each village has a co-operative society ; the Comprehensive Village Co-operative society. One of the major objectives of CVDP is to create a platform for service receiving mechanism and over come the misuse, misappropriation and overlapping of extension services. On the other hand there are many government national building departments (NBD) at the Thana (Local administrative unit) level having not sufficient number of extension worker for the transfer of available modern technology to the village level. It is impossible for a small number of extension workers to cover 10-15 Unions (administrative village) for their activities. Considering the limitations of the NBDs and the necessity of the villagers, each of the village organisation provide necessary support and services to their members for increasing pond fish production within their village area. Each village has a trained fishery development worker who has the responsibility to disseminate technical knowledge to the fish pond owners. Increase in pond fish production essentially requires an effective information transfer system from the research and development centers to the farmers at the grassroots level. A participatory approach, whereby local fish farmers can effectively play a role both in the decision making and implementation processes concerned with pond fish culture, can help overcome the problems that may arise during the introduction of a new technology. The farmers may be illiterate or semiliterate but they are very knowledgeable people and need a very different kind of service. They need some one close at hand who can satisfy their simple needs and can translate the more complex technical knowledge into simpler ones easily understood by them. If the improved fish culture technology is made available to the farmers through an efficient extension service, production could be easily raised from 1 ton to over 3.5 ton/ha/yr, within one year without much effort. Aquaculture technology for pond fishery development is well established but the farmers (the users) are not fully aware of it. There is a need from a comprehensive program to transfer and promote this technology from experiment stations and research farms to bodies of water near villages. Therefor, a grassroots level

organization like CVDP is expected to play an important role in information dissemination mechanism process. People's participation and technology transfer mechanism in CVDP area is shown in the Fig. 2.



GO: Government Organisation
NGO: Non- Government Organisation
CVDCS: Comprehensive Village Development Cooperative Society

Fig. 2. Technology Transfer Mechanism in CVDP Area.

V. Methodology and Objectives of the Field Study

The field study was conducted in eight villages of Comilla district in Southern Part of Bangladesh. Out of these eight villages, four villages were selected from a rural development project conducted by Bangladesh Academy for Rural development (BARD), under the CVDP. The other four villages were out of the project area but within the same geographical area. The project villages were selected purposively, i.e, the village having a good number of ponds were included in the sample. This was done through discussion with the project personnel of the CVDP. In case of Non-CVDP area, the random sampling methods were used. Before conducting the survey, present population of pond owners and pond fish culturists were assessed with the help of census data.

Rest of the information for the study was collected from the primary sources consisted by the pond owners and the pond fish culturists. All ponds were considered as sample ponds and one respondent was selected from among the owners of each pond of CVDP area in the village. On the other hand only 50 percent of the total ponds were considered as sample ponds in Non-CVDP area. Main survey was conducted during 1997-1998.

The main objective of the field study was to make analysis of the activities of a rural pond fishery development program with respect to knowledge dissemination, production performances, production practices and so on. The specific objectives of the study were:

1. To make a comparative analysis on production practices of pond fish culture between CVDP and Non-CVDP area and their performances.

2. To know the role of grassroots level organization and their knowledge dissemination mechanism for promoting pond fish culture in rural area.

3. To make suggestions for policy implication for improved pond fish culture in Bangladesh.

VI. Survey Results and Discussion

A. Production Practices and Input Use in Pond Fish Culture

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 fertilisers, artificial feeding, insecticides and necessary care for pond management. The purpose of fertilisation is to increase the production of plankton, preferred as feed for fish and that of supplementary feeding is to complement the nutrients that are in short supply in the fishpond.

Production practices and input use depend on changes in technology, socio-economic environment and development in production area. Input use and its mixes are influenced to some extend by the knowledge of input usage, with significant impacts on total output, and inputs available to the producers locally in reasonable prices. In the study areas, many farmers recognized the importance of using fertilizer and supplementary feed to increase pond fish production. Utilisation of these inputs varied among the fish pond farmers in different locations and among the farmers within the same location. Production practices and input uses of the study area are examined briefly hereafter.

1. Production practices

The analysis of the data in this regard reveals that majority of the fishponds in CVDP area were practicing modern fish culture and management method than the Non-CVDP area or even country as a whole.

Table 4. Management Characteristics of Sample Ponds in CVDP and Non-CVDP Area

Characteristics	Country	CVDP	Non-CVDP
	Percentage	Percentage of total ponds	Percentage of total ponds
With preparatory works	17.1	59.20	26
Manuring	15.3	74.00	32
With artificial feed	NA	75.00	30
Pond with composite culture	NA	98.10	92
Pond with indigenous carp	NA	9.70	
Pond stocked with both exotic and indigenous carp	NA	89.00	92
Frequency of fry release			
Never	36.8	1.20	8
Every year	54.3	93.92	82
Once in two years	7	4.80	10
Once in three years	1.7	1.20	

Sources: Field survey, 1998, for CVDP and Non-CVDP area and Bangladesh Bureau of Statistics,1994, for country.
NA= Data not available

In case of pond manuring and application of artificial feeding, it was found that 74 and 75 %of the fishponds in CVDP villages were using manure and artificial feed, which were 32 and 30 % in the Non-CVDP villages. Majority of the fishpond in both the area were practicing composite / or polyculture method and they stocked with exotic and indigenous carp varieties (Table 4).

2. Production input use

1) Stocking rate

In the production of carp, either in monoculture or in polyculture, the main objective is the production of an optimum quantity of the desired size of fish at minimum cost. There are many factors that affect productivity and cost of fish production. Stocking rate of fish in the pond, the quality and quantity of food in the pond, water temperature, and availability of oxygen are the factors that influence growth rate and production. Stocking of fish seed may be considered as first and prime input among all the inputs of fishpond culture. Stocking rate depends on species, size of fry and fingerling, and pond condition as fishpond can support a certain quantity of fish in its limited space and natural food. The stocking density varies mainly with the fertility and size of the pond. A fertile fishpond produces a number of different kinds of fish food organisms; therefore stocking different kinds of fish will efficiently utilize the space as well as food. Fish density, i.e., the rate of fish stocked per unit area or volume of water is an important variable affecting fish production. Several stocking rate and rearing practices are in use in different areas of the world. Rate of stocking both in individual species and all species of the sampled in CVDP and Non-CVDP area farms are presented in Table 5.

Table 5. Stocking Rate in CVDP and Non-CVDP Area

Rate of Stocking	CVDP area	Non-CVDP area
(number/acre)	Percentage of total ponds	Percentage of total ponds
1-1000	10.9	22
1001-2000	27.4	42
2001-3000	52.4	28
3001-4000	7.9	8

Source: Field Survey, 1998.

Majority of the ponds in CVDP area had their fry stocks 2001 to 3000 and they had a good yield (1105kg per acre). On the other hand in case of Non-CVDP villages the rate of stocking was much lower than the standard rate.[1] Majority of the ponds (42%) was stocked with 1001-2000 fish fries per acre (Table 5). It was noted that some of the farmers in CVDP area adopt the system of multiple size stocking which involves stocking fry, fingerlings and young adult. Young adults belong to different size groups in the same pond inorder to utilize the food resources more efficiently.

Here it can be said that two of the exotic species like Silvercarp and Bighead were becoming very much popular among the fish pond culturists because of their high growth rate. It was also observed in both the areas some of the pond owners stocked their ponds with too small size of fish seeds which resulted in high mortality in their ponds. They did so because of inadequate supply of standard sizes of fish seed and also the lower prices of the available seed.

2) Fertilization

Pond culture of carps is mostly based on fertilization and supplementary feeding. Fertilization and/ or supplementary feeding can improve the fertility rate of a fishpond. A fishpond production level is usually much higher with fertilization and supplementary feeding than without. There are many kinds of organic and inorganic fertilizers which can be used in fishpond culture in Bangladesh. The organic fertilizers that can be used in fishpond are cowdung, poultry manure and sewage where as inorganic fertilizers which can be used mainly are urea, triple superphosphate (TSP) and murate of potash (MP). The rate of application of manure is mainly based on the environmental conditions and stocking

densities of the ponds.

It is seen from the Table 6a, that in CVDP area farmers used cowdung as organic fertilizer in 70% of the ponds, which was 22% in case of Non-CVDP area. The same table also reveals that the number of ponds using inorganic fertilizer like urea, TSP and potash was higher in CVDP area than the Non-CVDP area. In case of applying inorganic fertilizer 41% of the fish farmers in CVDP area used urea and 47% used lime for fishpond preparation and these figures were 18 and 24% respectively in Non-CVDP area. There were also about a quarter of farmers who used TSP and potash as inorganic fertilizer in their ponds in CVDP area and some 14% in Non-CVDP area. The average dose of organic and inorganic fertilizer applied were 850kg and 44kg per acre respectively in CVDP area and 560 and 24kg per acre respectively in Non-CVDP villages (Table 6b). From the above discussion it can be said that in the case of applying feed and fertilizers, the farmers in CVDP area were more progressive than those of Non-CVDP area. As the cowdung is readily available for use, the user farmers were more than inorganic fertilizer users. The farmers are getting cowdung generally produced by their own reared cows.

It can be noticed that, proper dose and combination were not maintained in case of applying organic and inorganic fertilizer, in both the areas.

Table 6a. Uses of Feed and Fertilizer in Fish Ponds in Study Area

Name of fertilizer/Feed	CVDP area	Non-CVDP area
Fertilizer	Percentage of total ponds	Percentage of total ponds
Cowdung	69.51	22
Compost fertilizer	1.83	—
Poultry waste	14.02	4
Urea	40.85	18
TSP	24.39	14
Postash	17.68	14
Lime	47.56	24
Feed		
Oil cake	57.32	30
Rice bran	66.46	36
Wheat bran	15.24	6
Fish meal	3.66	2

Some of the ponds have used more than one kind of feed / fertilizer
Source: Field Survey,1998.

Table 6b. Fertilizer and Feed Used Per Acre by Sample Fish Farms in Study Area

Name of Feed and Fertilizer	Amount Kg/acre	
	CVDP area	Non- CVDP area
Fertilizer		
Organic	850	560
Inorganic	43.5	23.5
Feed		
Oil cake	145.5	80.4
Rice bran	226.5	140.6
Wheat bran	89.2	35.7
Others	33.5	7.6

Source: Field Survey, 1998.

3) Supplementary feeding

Artificial feeding is one of the principal methods of increasing fishpond production. Its importance varies according to the intensity of cultivation like extensive, semi-intensive, or intensive. The amount of daily feed is determined by the age of the fish, water temperature, stocking density, amount of natural food available, weather conditions and price of feed. Each species requires different types of diet during its growing period and different proportion and combination of feeds are necessary to make the diet balanced. Generally there are two sources of artificial feeding, plant and animal. The plant origin includes rice bran, wheat bran and different kinds of oil cakes where as animal origin includes, fishmeal, slaughterhouse residues, poultry manure, etc. Out of a wide variety of feed stuffs, rice bran is most popular in both nursery and rearing ponds.

Considering all locations it was noticed that, there was a big gap between lower and higher dose of using rice bran. The amounts of using rice bran in CVDP and Non-CVDP area were 227kg and 141kg per acre respectively. Whereas the amounts of wheat bran were 89kg and 36kg per acre in both the areas (Table 6b). Rate of applying oil cake varied according to locations in CVDP and Non-CVDP areas. The average amounts of oil cake use were 146kg and 80kg per acre in CVDP and Non-CVDP areas, respectively. These figures reveal that, the amount of supplementary feed used for pond fish culture in CVDP area is much higher than the Non-CVDP area. The more number of farmers were using organic meal readily available on farms such as rice bran. Fishmeal is one of the high quality fish feeds but rather costly and majority of the rural pond fish farmers cannot afford to buy it, thus very few use it inspite of the fact that they were aware of its significance.

B. Intensity and Return of Fish Culture

The most important difference between the various methods of fish production lies in the intensity of rearing. Accordingly the pond fish production method may be classified into three categories, namely, extensive rearing, intensive rearing and semi-intensive rearing.[2] Under these criteria it can be said that in CVDP area majority of the ponds (57%) were under semi-intensive culture methods and in Non-CVDP area only 28% of the total ponds were under semi-intensive fishpond culture.

Farm return from pond to the farmers can be measured in terms of yield, gross return and net return. Moreover these are interrelated with each other. Gross return is the value of yield and net return is the difference between gross return and cost of production. The value of fish was calculated at prevailing market rate and it varied from Taka 35 to 45. The price was varied according to the size, variety, quality and season.

In CVDP area the average per acre production of fish was 1105kg per acre and only 458kg per acre in Non-CVDP area (Table 7). Same table shows that both gross and net returns per acre were highest in CVDP area and the values were Taka 49725 and 40499 respectively (One taka=38yen as of 1988), which were Taka 20610 and 14935 in Non-CVDP area. However no fishponds in this survey area incurred any loss.

Table 7. Average Per Acre Costs and Returns of Pond fish Production in CVDP and Non-CVDP Area

Location	Per acre production (Kg)	Gross return (Taka)	Production cost (Taka)	Net return (Taka)
CVDP villages	1105	49725	9226	40499
Non CVDP villages	458	20610	5675	14935
Country	431.02	NA	3034	NA

NA= Data not available

Source: Field Survey,1998.

C. Problems of Pond Fish Culture

The fish pond owners reportedly faced different types of constraints in regard to their fish culture operations. The major constraints affecting the spread and improvement of pond fish culture in Bangladesh are multiple ownership of pond, inadequate supply of fish seed at the village level, multiple use of pond water, absence of appropriate technology packages, poor distribution of simple technical knowledge even for semi-intensive culture in rural areas, insufficient financial resources and lack of understanding about the dynamics of pond fish culture. These constraints may be broadly classified into social, economic and technical aspects of fish culture, and they are interrelated to each other.

Several opinions were mentioned by each of the pond owners at the time of discussion. They were asked to identify some major problems they had faced in fish culture in their ponds. The lists of suggested problems and the owner's response are presented in Table 8. The major constraints faced by the pond fish farmers in CVDP and Non-CVDP area and also the role of CVDP regarding this problem is discussed briefly below.

Table 8. Fish Pond Owners' Responses Regarding the Major Problems in Pond Fish Culture

Nature of problems	CVDP area	Non-CVDP area
	Percentage of total farmers	Percentage of total farmers
A. Social		
a.Multiple ownership of pond	31.71	62
b.Multiple use of pond water	19.51	58
B. Technical		
a.Lack of technical know how	14.00	76
b.Non availability of quality fish seed	27.40	44
c.Lack of pesticide	29.88	38
d.Lack of experience	39.02	66
e.Fish disease	51.83	54
C. Economic		
Lack of capital	26.83	46

Multiple answers were allowed
Source: Field Survey, 1998.

1. Multiple ownership of pond

The problem of multiple ownership of ponds has been well documented in all recent studies and is believed to be one of the major constraints of pond fish culture in Bangladesh[3]. The main problems rise at the time of production decision making and sharing the input costs. Apart from any other problems resulting from multiple ownership itself, variations in the size of shares constitute a compounding factor. Since they will further complicate problems of ensuring proportionate shares in inputs and outputs and the share in the pond itself. The multiple ownership of ponds causes problems when the pond is or could be used for fish farming as there is communal access for all other uses like bathing, dishwashing and soon. In this study it was found that about 31.7% of the respondents in CVDP area and 62% in Non-CVDP area reported that multiple ownership of ponds was one of the main problem for pond fish culture. In the CVDP area the village level organization, under this program is playing a vital role to resolve the multiple ownership-related problem of fishpond cultivation. That is, if any pond is uncultivated due to multiple ownership problems, the Comprehensive Village Development Co-operative Society (CVDCS) takes the initiative for fish cultivation in these ponds. Some times CVDCS

itself leases in the pond from the owners and cultures the fish by applying modern fish culture technology and makes a good profit. This kind of pond fish culture has a demonstration effect to the pond owners as well and to the coop society members. During data collection the CVDCS personnel mentioned that, the pond owners took back their ponds immediately after the lease duration was over and they started fish cultivation in their ponds applying of modern fish culture technology.

2. Multiple use of pond water

Almost all the ponds in Bangladesh are household ponds with a wide variety of combinations of uses. The household or domestic uses within household compound are most important and not much can be done until alternate source of domestic water supply can be made available. The other important use of pond water is for irrigation of rice and vegetable fields during dry season. This makes the pond dry and difficult for fish culture.

Table 8, shows that 20 percent of the sample pond owners in CVDP area and 58 percent in Non-CVDP area were facing this problem. In Non-CVDP area the framers reported that domestic uses conflict with the use of input for fish culture, which includes practices like fertilizing ponds with cowdung, kitchen and poultry wastes, oil cake, lime and chemical fertilizers, together making the pond water insuitable for household uses. The report made by the Non-CVDP area was knowledge gap of using feed and fertilizer in fishpond culture along with domestic uses of pond water. The uses of feed and fertilizer don't conflict with the uses of household purposes if farmers can use them in proper way. That's why in CVDP area multiple uses of pond water was not a big constraint. Farmers are motivated and have the knowledge of using modern pond fish culture technology with the combinations of domestic uses.

3. Lack of technical knowledge

A major requirement of pond fish culture is the knowledge of modern or appropriate technology. Extension of technical knowledge among fish farmers and attempts to disseminate information on fish culture was very weak in the past all over Bangladesh[4]. However things have started to improve with the introduction of CVDP programs, which are participatory in nature. In this study it was found that only 14% of the farmer in CVDP area reported that lack of technical know-how as a major problem for pond fish culture (Table 8) and in Non-CVDP area this figure was 76%. Many fishpond owners in Non-CVDP area failed to culture fish because they stocked too small size of fingerlings at too high density in ponds that were neither fertilized nor fed causing high mortality or the fry simply did not grow. One of the challenging aspects in extension activities of pond fish culture has been the transfer of technology. The CVDP extension system was designed as a participatory extension approach, which demonstrates and disseminates appropriate pond fish culture technology among farmers through method and result demonstration incorporating both individual and group methods of extension with regular weekly meetings, field demonstrations and other discussion session.

4. Non availability of quality seeds

A supply of quality seed is crucial and is often a major constraining factor for adoption of pond fish culture. Non availability of fish seed in time and also admixture of undesirable species when fingerlings were brought from private dealers is a major constraint. This study area is somewhat better with respect to the availability of fish seed than the some other regions of Bangladesh. The reasons being the positive

effect of the presence of the government and private fish seed multiplication farms which can meet up the requirements of the farmers. So the availability of fish seed is not a major problem as the quality. In this study 27% of the fishpond owners in CVDP area and 44% in Non-CVDP area reported that availability of quality fingerlings is a major constraint for pond fish production (Table 8). They also reported that non-availability of standard size fish seed is one of the biggest problems for fishpond culture. The fish seed brought from the vendors are mostly small in size and it is difficult for the farmers to identify the desirable species. On the other hand the bigger size fingerling is rather costly to buy.

5. Lack of capital

Fishponds require considerable investment firstly, during digging and reclamation of old ponds and during the pond preparation before stocking fish fingerlings and secondly, for purchase of various inputs of feed and fertiluzer. Capital shortage particularly for purchase of supplementary inputs like feed and fertilizer, re-excavation and improvement of the ponds were recognized as a major constraint in fish culture by 27% of the respondents in CVDP area and 46% in Non-CVDP area (Table 8). In these study areas, only a few farmers received fishery credit from banks in Non-CVDP area, and the borrowed amount was claimed to be quite inadequate to meet the needs of fish farming. Further, in most cases farmers do not get bank loan in time due to cumbersome banking practices which increased the real cost of borrowing. In CVDP area demand for credit from bank was not an important factor because CVDCS was giving credit to its members for pond fish culture.

D. Role of Village Organisation in Pond Fish Production

In Bangladesh the delivery of extension services to the rural household is a serious problem due to the shortage of manpower at the grassroots level. The extension services are restricted to the supply of fish seed and training to the farmers at the fish seed multiplication farms and training centres. The extension efforts are not well organised and there is no definite plan to systematically cover the needs of the farming community. The close involvement of grassroots level organization with government support services has the potential to reach the community and its individuals more easily and motivate them to adopt development activities.

Considering this fact, an attempt has been made in the present study to find out how far the fishpond owners were getting help and co-operation from the village organization. Several questions were asked to the sample fishpond owners at the time of interview in which way the village organization extended

Table 9. Farmers Opinion on Village Organisation Activity Regarding Pond Fish Culture in CVDP Area.

Nature of support services	Level of satisfaction (percentage)		
	high	medium	low
Techinical advice	65	20	15
Credit	46	37	17
Training	35	23	42
Motivation	51	22	27
Communication	36	45	19
Participatory planning	73	11	16

Multiple answers were allowed
Source: Field Survey,1998.

its support and services. Table 9, presents the activities performed by the village organisation. According to the farmers opinion, technical advice, credit, motivation, awareness building and participatory planning were performed upto the satisfactory level. On the other hand, training and communication to the thana level official were not satisfactory to the village pond owners.

VI. Summary and Conclusion

Bangladesh, due to agroclimatic conditions, is one of the most suitable countries in the world for aquaculture. The demand for fish in Bangladesh is increasing rapidly because of increasing population. The study was conducted to find out the fresh water pond management practices of a project area under CVDP in comparison to a non-project area.

Based on the field study, it was found that, most of the fish farmers in CVDP area were using modern pond fish culture technology and those in Non-CVDP area were still following the traditional methods of pond fish culture. All most all the sample ponds in both areas had enough potentiality to increase the production by intensive cultivation. The results of the study clearly showed that the management practices like pond preparatory works, manuring and uses of artificial feeds were much higher in CVDP area than the Non-CVDP area. This indicated that the framers in CVDP area were very much aware about modern fish culture technology. The management practices of CVDP area were also better than the other areas of Bangladesh.

In respect to modern inputs uses, such as, selected fish seeds, manure and fertilizers, artificial feeding, insecticides and necessary care for pond management, the CVDP area farmers had better knowledge than those of Non-CVDP area farmers. The majority of fishpond (52%) in CVDP area stocked with fish seed according to the recommended rate, i.e., 2000-3000 fingerling per acre. Non-CVDP area farmers did not maintained this rate. Most of the farmers in both the area cultured carp varieties and followed composite/ polyculture which is more profitable and scientific than monoculture.

The pond fish production depends upon number of factors, i.e., management practices, application of fertilizers, uses of artificial feeds and their combinations. Farmers applied fertilizer and artificial feed in various combination. The higher number of farmers in CVDP area had used manure, fertilizer and artificial feed than in Non-CVDP area. The per acre uses of fertilizer and feed were also higher in CVDP area. This indicates that the farmers in CVDP area had better knowledge, information and skill in using inputs for pond fish production. The majority of the farmers in both areas had used poor quality inputs like rice bran, wheat bran and so on for feed. The reason might be that, the price of these feeds is low and easily available on their farms. On the other hand the value of high quality feed like fishmeal is costly and hardly available in the market, consequently not sought for its regular and proper use.

In regards to intensity of fish culture, the higher number of ponds (57%) in CVDP area were under semi-intensive fish culture method, giving them higher production. On the other hand majority of the fishponds in Non-CVDP area were under extensive culture. This meant that the higher number of farmers in CVDP area practiced scientific pond fish culture technology than in Non-CVDP area. The results of the study also indicated that higher profit could be obtained by increasing the use of fertilizer and artificial feedings along with other management practices. Consequently, farmers in CVDP area were getting more yield and better returns than those in Non-CVDP area.

In consideration with the village organization activities, majority of the farmers reported that they were satisfied with village organization activities like, technology transfer, credit, motivation and

participatory planning for pond fish production.

The study also identified several major problems and constraints in fishpond culture. In this respect, social and technical problems were found to be the most important constraint in Non-CVDP area. Fish disease, lack of experience and non-availability of quality fish seed were also mentioned by a few number of farmers in both the areas.

Based on the above discussion it may be concluded that people's participation in pond fishery development through CVDP approach offers the following advantages to the government, development agencies as well as rural inhabitants.

Increase in productivity: Given access to resources and a guarantee that they could share fully the benefits of their efforts as in the CVDP system, the farmers become more receptive to new technologies and services, and achieve higher levels of production and income. This helps them to increase their income, which strengthen the groups' economy and contribute to rural capital formation.

Efficiency and Cost Effectivity: The fish farmers' contributions to fishery development planning and implementation help in savings and reducing the extension expenses. CVDP participatory approach constitutes a grassroots "receiving systems" that allow development agencies to reduce the unit delivery or transaction costs of their services, thus broadening their impact

Sustainability: Participatory pond fishery development program such as CVDP leads to increased self-reliance among the fish culturists and the establishment of a network of self-sustaining grassroots level organizations. This has resulted into greater efficiency of fishery development services, which in turns can stimulate sustainable economic growth in rural areas.

In doing so, the farmers of CVDP area could produce 2.5-3 ton/acre/year, 4-5 times higher than the national average. If this program is successfully carried in Comilla district of Bangladesh where it is currently under pilot project trial, converting all derelict[5] and culturable[6] ponds into cultured ponds with the introduction of semi-intensive method of pond fish culture, the production will be increased to 61,402 metric tons per year. The implication of this increase could be very significant in increasing the fish production as a whole in Bangladesh.

Notes

1. Ameen et al. (1986a) conducted an experiment to find out the correct per acre stocking rate within 10 ponds at Noakhali district (Southern part of Bangladesh) and they found that, with the stocking of 3000 fish fries per acre the production of 1073.85 kg per acre could be attained.
2. Fish production in 11 months during 1981-82 in a traditional managed ponds (extensive culture) in Raipur of Laxmipur district (Southern part of Bangladesh) was only 265kg per ha, where as during the same period and in the same area the production in a semi-intensively managed fish pond was 3.1ton/ha, an 11 fold increase (Ameen et al.: 1983). In china the average fish production in pond fish culture is reported to be 2.5 ton/ha, the maximum being 7.5 ton/ha (Lin: 1982). The average fish production with semi-intensive culture practice from 16 rural ponds in Bangladesh during 1981-82 was 2.8 ton/ha, with a range of 1.8ton to 3.8 ton/ha over a 12 months study period (Davis et al.: 1983).
3. i. Islam and Dewan (1986), noted that multiple ownership of ponds to be a great problem for increased pond fish production in Bangladesh. A baseline survey in Noakhali (Southern part of Bangladesh) showed that 30% of the total ponds surveyed and 44% of the non-utilized ponds remained so due to disagreement among owners. The same survey showed that only 36% of the ponds had individual ownership, 45% had 2-4 owners and 14% more than 6 owners per pond (Ameen et.al: 1986).

ii. Gill and Mothar (1982) also recorded that multiple ownership of pond is one of the basic constraints of the existing uses of ponds and their integration into the farming system. They also found that 91% of the ponds were multipurpose with a wide variety of combinations of uses.

iii. Ali et al. (1982), found that out of 297 ponds nearly 84% were under joint ownership and only 16% were under single ownership. The number of share of a pond in some cases were as many as 7, the average being 4. In this respect it were found that 47 ponds under single ownership, 6, 25 and 16 ponds were utilized upto the extent of 75%, 50% and 25%, respectively and out of 201under joint ownership, 8, 74, and 119 ponds were utilized upto extent 75%, 50% and 25%, respectively

iv. Islam (1987), found that ownership of pond is a social factor which affects the production decision of the farming unit. He observed that, generally single owner pond is well managed and more productive than multiple owner pond.

v. Ali and Rahman (1986), indicated that in Rangpur (Northern part of Bangladesh) about 68% of ponds were under single ownership and 32% were under joint ownership. About 45% of the fish pond owners felt that joint ownership of the pond was the major problem for modern pond fish culture.

4. Gill and Mothar (1982), noted that Lack of know-how (technical knowledge) on the part of the farmer and poor fish growth have been listed as two of the major problems of fish farming from their survey in Joydevpur area of Bangladesh. They noted that although only a minority of the farmers listed lack of training as a problem yet it was evident that only a few of them had received instruction on modern methods of fish farming, including the need to feed fish for optimizing growth.
5. A pond which cannot be used for fishing without expensive re-excavation (digging), repair of embankment, or other measures. According to BBS survey (1994), 9.42% were derelict ponds in Bangladesh.
6. Ponds with more suitable physical conditions than the derelict category and require less investment to rebuild and put into culture. The culturable ponds in Bangladesh were 17.54% (BBS:1994)

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