

Increasing Efficiency of Pond Fish Production in Rural Bangladesh

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Abstract: Fish is the main animal source of protein for the people of Bangladesh. As a principal source of protein, the per capita production of fish is declining. The present study highlights the development of pond fish production through grassroots level organization. The study was conducted in rural areas of Bangladesh. Eight villages were selected for this study of which four were from a rural development project area, the comprehensive Village Development Program (CVDP) and the rest were from non intervened area. It was revealed that level of education, size of land holding, family income etc. were important socio-economic factors affecting the utilization of pond fish farming. The findings of the study also indicated that, ownership pattern of pond, size of pond, location of ponds had a significant impact on pond fish production in the study area. The results of the study clearly indicated that the farmers of CVDP area had used more modern inputs like, manure, fertilizer, and feed and also better management practices than the non-CVDP area. The higher number of ponds (57%) in CVDP area was under intensive and semi-intensive cultivation, which gave them higher production (2653kg/ha/yr). On the other hand the majority of the ponds (72%) in non-CVDP area were under extensive cultivation (1100kg/ha/yr). Finally it might be concluded that, there was a sharp difference in the production practices of pond fish culture between CVDP and non-CVDP area. The grassroots level village organization had played a significant role in the process of technology transfer from the Thana level to the village level in the project area.

Key words: Grassroots level organization, Comprehensive Village Development Program, Technology Transfer, Production practices.

1. INTRODUCTION

Fisheries is one of the major components of agricultural activities, playing a significant role in nutrition, employment, income generation, foreign exchange earnings and in the economy of Bangladesh as a whole. At present it contributes 4% of total Gross Domestic Product (GDP), 9% of foreign exchange earnings and 75% of the daily per capita animal protein intake (Ali: 1997). Total fish production of Bangladesh in 1994-95 (table- 1) was 12million tones, of which 77 % was from inland fisheries and the rest 23% from marine fisheries. On the inland fisheries, 63 percent were from open water flood plains, river capture fisheries and the rest, 27 % were from closed water pond, tanks culture fisheries.

However, now a day fish is becoming increasingly scarce and costly. Amongst the lower income groups, per capita consumption per annum is only about 4.4 kg, and for the poorest of the poor fish is simply unaffordable. Compared to rice, the price of fish is increasing rapidly. Most of the rural poor just cannot afford to buy fish and as such are severely animal protein deficient and consequently, malnourished.

To meet the increasing demand for animal protein, significant development in poultry and livestock farming which otherwise would have limited due to the continuously increasing pressure on land for the production of cereals. There is no scope for spatial expansion of grazing and feeding areas. But in contrast, the shortage of animal protein can be met through the development of fish farming, as it not only requires less cash investment compared to livestock and poultry but also can be produced using a land that is not suitable for agriculture

In fact, in a Country like Bangladesh where fish culture has a long tradition, pond fish culture can be expected to play an important role in supplying ever-increasing fish needs of the people. It is very important to increase the production in pond fisheries with controlled water bodies as ponds and tanks through the introduction of modern and intensive culture method. The total number of ponds in Bangladesh is estimated to be about 2million (BBS:1996). The Department of fisheries of Bangladesh had classified all ponds into three categories; (i) derelict pond (9.42%) (ii) culturable pond (17.54%) and (iii) cultured ponds (63%). The total fish production from ponds is around 250thousand metric tons (Majid: 1995). But derelict and culturable ponds depend on natural stocking of the fish fries and only a small quantity of fish is harvested from these sources. If all derelict and culturable ponds could be converted into cultured ponds and thus introduced just semi-intensive method of fish culture which is manageable with local resources and technology, it would be possible to increase the pond fish production 15 to 20 times four folding the total fish production of Bangladesh (Islam and Dewan: 1986). Thus increase in fish production can be realized by tapping resources of rural Bangladesh and cultivate them with above-mentioned methods of fish culture.

Hence, pond fish culture can also become a major income-generating element in rural development programmes and Supplemented with crop production and animal husbandry, pond fish culture can generate employment as well. All these could in thus improve the quality of life of the rural poor in Bangladesh.

1.1 Significance and Objectives of the Study

Pond fish production depends upon various inputs used and the nature of production practices and types of water bodies. Production practices and input uses depend on changes in technology, socio-economic environment and development policies on the production area. They are together responsible for affecting pond fish production in Bangladesh and can be classified into following factors. A) Management factor B) Technological factor C) Social factor and D) Policy factor

Pond fish culture practices have been going on in Bangladesh more than a century, most of the farmers still follow the traditional method and are facing many problems; biotechnical, socio-economic etc. and need to be overcome. For this, requires intensive research in biological and technical aspects, acceleration in the transfer of technology, adequate support in credit, training, extension and other essential infrastructure.

In view of this situation the present study has been undertaken to have thorough understanding of the individual characteristics of the pond fish culturists, their extent of participation and adoption of modern pond fish culture technologies, and the production in an unit area. The specific objectives of the study were

1. To identify the socio-economic characteristics of the pond fish culturists assess their efficiencies.
2. To know the role of village organisation promoting pond fish culture in the rural area.

3. To make a comparative analysis between an intervened and non-intervened area
4. To make some recommendations for policy implications for improved pond fish culture.

1.2 Methodology

The study was conducted in eight villages of Comilla district of Bangladesh. Out of these eight villages, four villages were selected from a rural development project, Comprehensive Village Development Program (CVDP) conducted by Bangladesh Academy for Rural development (BARD). 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. The researchers in the beginning made a census in both the areas to correctly find out the present population of pond owners and pond fish culturists. The information for the study was collected from the primary sources consisted by the pond owners and the pond fish culturists. The collection of data were started from December 1997 and completed by February 1998.

Table 1: Socio-economic Characteristics and its Significance on Pond Fish Production

Characteristics	Percentage of total respondent	Production per acre			Net return per acre		
		Higher	Moderate	Lower	Higher	Moderate	Lower
Level of education							
No Schooling	15.85			*			*
Class, 1-V	29.88		*				*
Class, VI-X	28.05		*				*
SSC	12.20	*				*	
HSC	9.15	*				*	
Bachelor and above	4.88	*			*		
Land holding (Acre)							
Land less	15.9		*				*
Small farmers	61.6	*			*		
Medium farmers	22.0	*			*		
Large farmers	0.6			*			*
Income group							
<23999	5.48	*			*		
24000-35999	13.41		*				*
36000-47999	19.51			*			*
48000-59999	18.29			*			*
60000>	43.29	*				*	

Source: Field Survey 1998

Production: (kg); Higher (1050+), Moderate (851-1050), Lower (650-850)

Net return (Taka); Higher (35000+), Moderate (30001-35000), Lower (25000-30000)

2. SURVEY RESULTS AND DISCUSSION

2.1 Socio-economic Characteristics of the Fish Pond Owners

Socio-economic characteristics of the fish pond owners generally influence the extent of utilization of their ponds and the accessibility of the pond owners to financial institutions when they need external finance. So a brief description of those characteristics and their impact on pond fish production is essential. Information regarding the level of literacy, size of land holding and annual income etc. were considered in this study as to influence management to management of fish culture. The table-1, presented the socio-economic characteristics of the pond owners and their impact on pond fish production in the study area.

2.1.1. Level of Education

The pond fish culture system is a scientific one. Therefore the fish culturists needs to gather knowledge on improved fish culture technique. If the farmers have some institutional educational background they can easily understand the system

In this study area it was found that (Table-1) there was a direct relationship between per acre production of fish and net return according to the level of education. Table -1, also presents the educational status of a farmer and the per acre production. Mahabubullah also (1983) found that education level to have a significantly positive relation with yield

2.1.2. Size of Land Holding

In this study fish pond owners farm households were classified into four different farm size groups on the basis of land owned by the family. These were (a) Land less (0-0.49 acre) (b) Small farmers (0.50-2.49acres) (c) Medium farmers (2.50-7.49 acres) and (d) Large farmers (7.50 acres and above) (Table-1). The table -1 reveals that the medium farmers obtained the highest production and net return.

Table 2: Structural Characteristics of Ponds and its Significance on Fish Production

Characteristics	Percentage of total ponds	Production per acre			Net return per acre		
		High	Moderate	Low	High	Moderate	Low
Number of owners							
Single ownership	38.41	*			*		
Double	23.78	*			*		
3 to 5	7.93		*			*	
6 to 8	10.98		*			*	
9 to 11	3.66			*			*
11 and above	4.27			*			*
Lease in	10.98	*			*		
Location of ponds							
Adjacent to homestead	80.49		*			*	
Outside homestead	19.51	*			*		
Water area (acre)							
Small ponds (Upto 0.33)	40.24		*			*	
Medium ponds (0.34-0.99)	46.34	*			*		
Large ponds (One acre and above)	13.41			*			*

Source: Field Survey,1998

2.1.3. Household Income

Fishpond requires considerable amount of investment for modern fish culture practices. The investment capital is necessary for the preparation of pond annually before stocking of fingerlings, and also for purchase inputs etc.

It indicates that (Table-1); most of the pond owners earn very little so it is difficult for them to save a certain portion of their income for investment in the ponds after meeting necessary family expenses.

According to the supplied data it was found that the per acre production, gross return and net return follow a definite trends. The data shows that the higher income group produces higher production, and net returns than the others, because they have their savings to invest for pond fish production. Mahbubullah, (1983) shows that family income as a factor have significant positive relationship with investment in ponds

2.2 Structural Characteristics of the Fishponds

The Structural Characteristics of a fishpond have significant impact on fish production. In this study, pond ownership pattern, pond size and pond location was considered as some of the structural characteristics of pond. Table-2 shows the structural characteristics of fishpond and their impact on fish production.

2.2.1. Pond Ownership Pattern

The existing uses of ponds, their integration into the fish farming system and the potential; for further intensification are questions, which are inextricably, tie-up with ownership and usufructuary rights. Multiple ownership is officially believed to be one of the basic constraints on such intensification. This fragmentation derives from the Muslims laws of inheritance, which give a share of the patrimony to all children, a single share to each daughter and a double share to each son. Some concentration of ownership can also take place as some of the joint owners buy (or inherent) shares from others. Therefore ownership of a pond is an important factor for better management of pond fish culture system in Bangladesh. A pond having single ownership is very easy to manage the cultural practices, which is rather difficult in the case of multiple ownership ponds.

The study conducted by Rahman and Ali (1986), found that 57 percent of the sample ponds were under multiple ownership and rest 43 percent was under single ownership. About 60% of the pond area are jointly owned by private households and 56% jointly operated in Bangladesh (World Bank, 1991).

Table -2, shows the per acre pond fish production according to the ownership pattern of the pond. It was found that the ponds under single ownership had higher production, and net return than the multiple ownership ponds. It was also observed that less the number of owner higher the production, and net return. This could be attributed to the fact that if the number of

owner of a pond are too many then it is difficult to take production decision and to share the input costs.

In this study area the village level organizations, are (CVDP) also playing a vital role to resolve the multiple ownership problem of a pond for fish cultivation. In this case, if any pond is uncultivated due to multiple ownership problems, the Comprehensive Village Development Co-operative Society (CVDCs) took the initiative for fish cultivation in such ponds. Some times CVDCs itself leases in the pond from the owners and apply modern fish culture technology for higher production and they make a good profit. Such production activities in a particular village also had a demonstration effect for the pond owners as well as to the CVDC members. This fact is supported by the response of CVDC personnel during the survey the pond owners took back their ponds immediately after the lease duration was over and the members started fish cultivation in that pond with the introduction of modern fish culture technology.

2.2.2. Ponds Location

From the table-2, it can be easily argued that majority (80%) of the fishpond were well located so far as the feeding and the other management points are concerned. None of the ponds were found to be outside the owner's village area. Rahman and Ali (1986), also made the same observation, 75 percent of the sample ponds were found to be adjacent to home. The table-2, also reveals that ponds which were outside homestead area obtained higher production, and net return than the others, because the productivity of the outside pond is higher than the ponds which are within the homestead area.

2.2.3. Area of Ponds

Generally larger the pond size the greater the efficiency of land and water utilization and higher the construction costs. On the other hand the smaller the pond size the greater the convenience of pond management and the lower the earthwork (Tang, 1979). As the ponds in Bangladesh were excavated for different purposes, so their size varies greatly. These ponds are not equally productive. The pond size in the study area varied from 0.33 acre to more than one acre. The results of this study indicate that majority of the fish ponds were suitable for fish culture as far area is concerned.

It seems that fish production, and net return was higher in medium size ponds than the others table-2.

On the other hand small size ponds are not so good for carp culture. In large size ponds the management cost is rather high than the small and medium size ponds. And also there are some other difficulties to manage the larger size ponds such as to harvest the fish, dewatering of the pond, predator fish control, aquatic weed control etc

2.3. Fish Cultural and Management Environment

Farmers in Bangladesh at present have been motivated a little about modern fish culture. It is possible to increase the pond fish production if the ponds are cultivated with the introduction of high yielding carp varieties both indigenous and exotic. Now a days, through the communication media like extension worker, result demonstration, improved fish culture in some area, radio, Television and other mass media made the farmers aware of the modern pond fish culture technology.

Table 3: Management Characteristics of Sample Ponds

Characteristics	Country	CVDP area	Non-CVDP area
	Percentage of total ponds	Percentage of total ponds	Percentage of total ponds
With preparatory works	17.17	59.25	26
Manuring	15.34	74.07	32
With artificial feed	NA	75.00	30
Pond with Composite culture	NA	98.17	92
Pond stocked with both exotic and indigenous carp	NA	89.02	92
Frequency of fry release			
Never	36.87	1.21	8
Every year	54.32	93.90	82
Once in two years	7.08	4.88	10
Once in three years	1.73	1.22	0

Sources: Field survey, 1998; Bangladesh Bureau of Statistics, 1994

NA: Not available,

In this regard table 3, reveals that majority of the fishpond in CVDP area were practicing modern fish culture and management method than the Non-CVDP area or even country as a whole.

In case of pond manuring and application of artificial feeding, the table reveals that 74 and 75 percent of the fishponds in CVDP villages using manure and artificial feed, which were 32 and 30 percent in Non-CVDP village. Islam and Dewan (1987), reports that 34% of the sample ponds used both fertiliser and feed.

2.4. Production Practices and 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 fertilisers, artificial feeding, insecticides and necessary care for pond management.

The stocking rate of a fishpond varies mainly with the fertility of the pond. Fertilization and/ or supplementary feeding can improve the fertility rate of a fishpond. There are many kinds of organic and inorganic fertilizers in Bangladesh, which can be used in pond fish culture. The organic fertilizers that can be used in fishpond are cowdung, poultry manure, compost etc and urea, triple super phosphate and muriate of potash are used as inorganic fertilizer.

As the organic fertilizer like cowdung is readily available to use, the user percentage is higher than inorganic fertilizer. Generally farmers are getting cowdung from their own reared cows.

Artificial feeding is one of the principal methods of increasing production in fishpond culture. Its importance varies according to the intensity of cultivation extensive, semi-intensive, or intensive. The amount of daily feed should be 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.

The average dose of organic and inorganic fertilizer applied were 850kg and 44Kg/acre respectively for CVDP villages and 560 and 24kg/acre for Non-CVDP villages (Table 4).

From the presented data, it is clear that, the number of ponds using supplementary feed for pond fish culture in CVDP area was much higher than the Non-CVDP area. The higher number of farmers used rice bran because it is available within their home and also needs low price to buy. Fishmeal one of the high quality fish feed but rather costly, so very few numbers of farmers used it. Also, in Bangladesh majority of the rural pond fish farmers cannot afford to buy it.

Considering all locations, there was a big gap between lower and higher dose of using rice bran. The amount of using rice bran in CVDP and Non-CVDP area

was 227kg and 141kg/acre respectively. And the amount of wheat bran were 89 and 36kg/acre in both the area (Table, 4).

Rate of applying oil cake was different in different locations in CVDP and non-CVDP area. The average amount for all farmers and all locations in both the area were 146kg in CVDP and 80kg/acre in non-CVDP area (Table, 4).

Table 4: Fertilizer Per Acre Used by the Sample Farmers

Name of	Amount (Kg/acre)	
	CVDP	Non-CVDP
Feed and Fertilizer		
Fertilizer		
Organic	850	560
Inorganic	44	24
Feed		
Oil cake	146	80
Rice bran	227	141
Wheat bran	89	36
Others	34	8

Source: Field Survey, 1998

2.5. Cost of Production

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

Costs 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 5 provides the itemised cost of pond fish production for different sample areas.

Table 5: Itemised Pond Fish Production Cost Per Acre Per Year

Item of cost	Production cost per acre per year			
	CVDP villages		Non CVDP villages	
	Total (Taka)	Percentage of total cost	Total (Taka)	Percentage of total cost
1. Material inpput cost	6397	69.35	4215.75	74.29
a. Stocking fish seeds	3683.5	57.58	2375.65	56.35
b. Fertilizer	790	12.35	575.5	13.65
c. Supplementary feed	1645	25.72	1089.55	25.84
d. Insecticide	278	4.35	175	4.15
2. Labor cost	1337.5	14.50	851.75	15.01
3. Miscellaneous	1490	16.15	607.55	10.71
Operatying cost				
Total (1+2+3)	9224.5	100	5675	100

Source: Field Survey, 1998

There was a variation of input doses and accordingly both total cost and itemized cost varied widely. Among the three cost items, material cost covered highest amount in all the sample areas and considering all locations it represented 70 percent of total in CVDP villages and 74 percent in Non-CVDP villages. Islam and

Dewan (1987) identified that material cost covered highest amount, it represented 73 percent of the total cost.

Material inputs cost included the cost of stocking of fish seeds, organic and inorganic manure and fertilizers and supplementary feed and insecticides. Within the materials cost fish seed stocking required the maximum cost and covered 40 percent for CVDP villages and 42 percent in Non-CVDP villages. Islam and Dewan (1987), also made the same observation in their study area. The cost of supplementary feed and fertilizer represented 18 and 9 percent respectively considering all the sample ponds. Uses of insecticides were very small amount, which were only 3 percent of total cost.

2.6. Farm Production and Return

Farm return can be measured in terms of yield, gross return and net return which are interrelated. 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 per kg. The price was varied according to the size, variety, quality, and also season to season. Table-6, shows that the per acre production in CVDP area was higher than the Non-CVDP area or the country as a whole.

Table 6: Average Per Acre Costs and Returns of Pond fish Production

Location	Per acre production	Gross returns	Production cost	Net returns
CVDP	1105	49725	9226	40499
Non CVDP	458	20610	5675	14935
Country	431.02	NA	3034	NA

Sources: Field Survey,1998; NA: Not Available
Bangladesh Bureau of Statistics, 1994

From table 6, it appears that both gross and net returns/acre were highest in CVDP area and the values were Taka 44200 and 35075 respectively, which were Taka 18320 and 12645 in Non-CVDP area. However no fishpond in this survey area incurred loss.

2.7. Role of Village Organisation in Pond Fish Production

The need for the participation of the local community in planning and implementation in rural development projects is a widely accepted idea. Over the past two decades many government, development agencies and non-governmental organizations have recognized that the "top-down" approach characteristics of traditional development strategies has largely failed to reach and benefit the rural people.

The close involvement of a non-governmental voluntary agencies like community councils, informal groups, cooperatives, rural workers organizations and women's associations etc. has the potential to reach the community and its individuals more easily and motivate them to adopt development activities. Participation is needed not only at the initial decision making stage, but also during implementation, including decisions on benefit sharing. 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 the Comprehensive Village Development Program which main objectives is to peoples participation in rural development projects. Comprehensive Village Development Program 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 or economic objectives. Each of the village organization provides 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.

Table 7: Farmers Opinion on Village Organisation Activity Regarding Pond
Pond Fish Culture in CVDP Area.

Nature of support services	Level of satisfaction		
	Highly (% of respondents)	Less (% of respondents)	Not at all (% of respondents)
Technical 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

Considering these, 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 its support and services.

Table 7 presents the activities performed by the village organisation. It shows that, technical advice, credit, motivation, awareness building and participatory planning etc. were performed upto the satisfactory level according to the farmers opinion. On the other hand, training, communication to the Thana level official etc. were not satisfied to the village pond owners.

3. CONCLUSIONS AND RECOMMENDATIONS

This study was undertaken with a view to know the socio-economic characteristics of the pond fish culturists, and their significance in pond fish production, to know the individual characteristics of fish pond and their significance and to know the production practices of pond fish culture.

The results of the study indicate that level of education, size of land holding, family income etc. were important factors affecting the utilization of pond fish farming. The findings of the study also shows that structural characteristics of pond like ownership of pond, size of pond, etc. had a significant impact on pond fish production. Based on the presented data, it was found that, most of the fish farmers in CVDP villages using modern pond fish culture technology and on the other hand in non-CVDP area majority of the pond owners till follow the traditional method of pond fish culture. All most all the sample ponds in both areas had enough potentiality to increase the production by intensive method of cultivation. The results of the study clearly show that the management characteristics like with reparatory works, manuring and artificial feeds were much higher in CVDP village than the non-CVDP villages. Which indicated that the framers in CVDP villages were very much aware about modern fish culture technology. The management practices of CVDP villages were also better than the country as a whole.

The higher number of farmers in CVDP villages had used manure, fertilizer and artificial feed, than non-CVDP villages. The per acre uses of fertilizer and feed were higher in CVDP village. Which indicates that the farmers in CVDP villages 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 etc. The reason might be that, the price of these feed is low, easy availability of these foodstuffs, because the farmers can also get it from their farm products. On the other hand the value of high quality feed like fishmeal, costly to buy, and also its availability is in question.

The results of the study also indicated that higher profit could be obtained by increasing the use of fertilizer and artificial feeding along with other management practices.

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, participatory planning for pond fish production etc.

Fish pond farmers are not as growth oriented as one would expected and a major portion of them don't feel the necessity of producing larger quantities to earn maximum profit. Sometimes overstock the pond and did not maintain the stocking density in relation to using other inputs which was harmful for healthy growth of fish. Therefore it is important to make the farmers understand and realize that stocking density should be balanced with carrying capacity of ponds for better production. It was also found that a substantial number of ponds in CVDP area and majority of the pond in Non-CVDP area did not aware of using supplemental inputs with proper combination in their ponds. Almost all the sample ponds have enough potentiality to increase the production by intensive method of cultivation, which has to be realized by the farmers.

Considering all these facts, the government must undertake a massive motivational program to make the pond owners understand that fish production is a very profitable business and it yields benefit to both the owners and the nation in various ways. This motivational program can be launched through department of fisheries at the Thana level. But present set up of the department of fisheries at the Thana level is too small and inadequate for positive extension work. Each Thana now has one Thana fishery officer, one assistant fishery officer and only one field assistant, and a peon. This too small manpower can not make any positive change within a vast population. So from the findings of this study it could be suggest that CVDP type village organisation may be helpful for mass motivation and technology transfer to the fish pond owners. The thana level fisheries official can use this village organisation as a platform for their purposes. It is not necessary they have to contact directly to the villager's, which is not possible for various reasons, they can use thana implementation committee meeting, union coordination meeting, and also village co-operative society monthly/weekly meeting for their purposes, like motivation, technology transfer, knowledge dissemination, government policy issue etc. They can also get field level problems oriented feed back from these forum. And the village fishery development worker also could be works as an extension agent. This process of technology transfer system might be cost effective, timesaving, efficient and effective for the farmers.

4. References

- Ali Liqueat, Fisheries Resources Potential in Bangladesh and Manpower Development for Fisheries Activities, Paper presented at the workshop on *Population Dimension of Fisheries Development and Management Policies of Bangladesh*, Held at BARD, Comilla. 1-5,1996
- Ali Harun Md. And M. Lutfur Rahaman, Developing Pond Fisheries in Bangladesh: Some Findings of a Study on Credit and Marketing Aspects. *Bangladesh Journal of Agricultural Economics*. 12(2) 15-25, 1986 Bangladesh Agricultural University, Mymensingh
- Bangladesh Bureau of Statistics (BBS), *Statistical Year Book of Bangladesh*, 1994,1995,1996. Government of Bangladesh, Dhaka.
- Chaston Ian, Business Management in Fisheries and Aquaculture, Fishing News Book Ltd. Farhan, Surrey, England 1-5,1985
- Chakrabarty R.D. et.al. Intensive Culture of Indian Major Carps. *In Advances in Aquaculture*, (Ed.by T.V.R. Pillay and W.A. Dill) Fishing News Books 153-7,1997
- Chowdhury et.al. Socio- economic Impact of Land Use Conflicts and Multiple Ownership on the Management of Fish Ponds in Bangladesh.(A Case Study of Two Upazilas). Rural Development Academy, Bogra, Bangladesh. 14-28,1987
- Islam Serajul and Dewan Somen, An Economic Analysis of Pond Fish Production In Some Areas of Bangladesh. *Bureau of Socio - economic Research and Training*. Bangladesh Agricultural University.3-6,41-55,1987
- Khan Sekendar M. Socio- economic Factors in the Development of Pond Fisheries. *Bangladesh Journal of Agricultural Economics*. 12(2) 128-131,1986 Agricultural University. Mymensingh.
- Majid, M.A. Report on a Regional Study and Workshop on the Environmental Assessment and Management of Aquaculture Development. *Food and Agricultural Organizations*; Network of Aquaculture Centres in Asia- Pacific. Bangkok, Thailand. 62-65, 1995
- Nuruzzaman AKM, Aquaculture In Bangladesh: Challenge and Opportunity, Bangladesh Agricultural Research Council, Dhaka. 1-16, 1994
- Rahman Luftor M. and Md. Harun Ali, A study on the Credit and Marketing Aspects of Pond fisheries in Two Districts of Bangladesh. Research Report No.10. *Bureau of Socio-economic Research and Training*, Bangladesh Agricultural University, Mymensingh 16-30, 1986
- Shang C. Yung , Aquaculture Economics: Basic Concepts and Methods of Analysis, West View Press, USA. 11-24, 1981
- .Shang Y.C. Comparison of the Economic Potential of Aquaculture. *Land Animal Husbandry and Ocean Fisheries: The Case of Taiwan*. Aquaculture 2: 187-195. Scientific Publishing Company. Amsterdam: Netherlands.
- World Bank , Bangladesh Fisheries Sector Review, Report no.8830-BD, 56-60,1991