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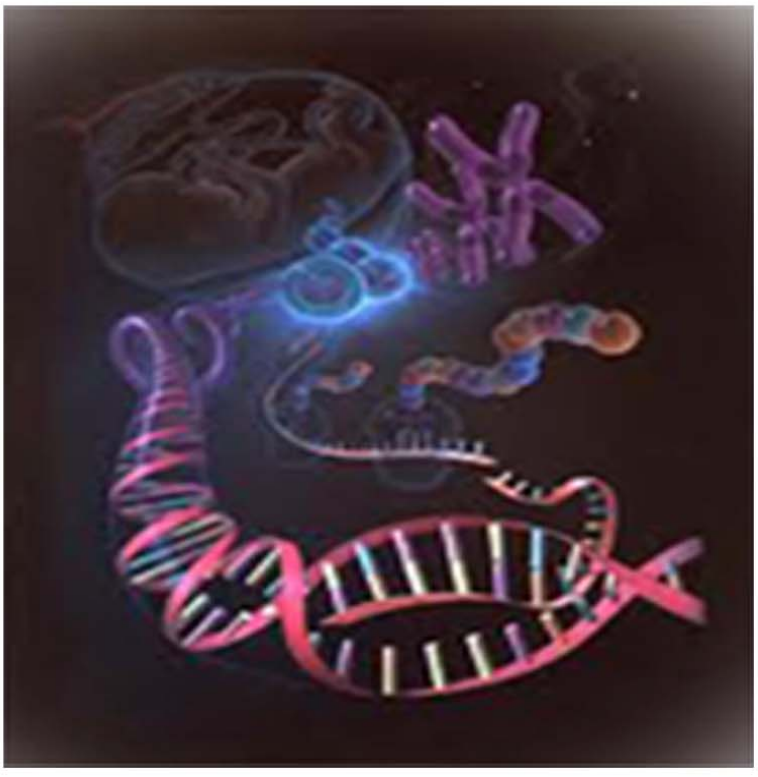

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Research Paper

A STUDY ON FISH CULTURE SYSTEM IN KOTALIPARA UPAZILA, GOPALGANJ

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Pond fish culture can become an important element of income generation activities in rural development programs. A survey was performed at *Kotalipara* upazila, Gopalganj to analyze fish culture system especially culture methods, stocking density, feeding and relative profitability during April to September 2008. It was observed that 64% of the total farmers were practicing carp polyculture whereas 17% and 19% farmers were cultivating their ponds with pangus monoculture and tilapia and carp polyculture respectively. The average stocking density was found 10378 fry/ha for polyculture and 14466 fry/ha for pangus monoculture. The average doses of Urea, TSP and MP used by the farmers for mixed culture were 361 kg, 340 kg and 133 kg per ha per year respectively. The commercial fish feed used for mixed culture was the highest in *Kalabari* that was 250 kg followed by 200 kg in *Radhaganj* and 170 kg in *Sadullapur* per hectare per year. In case of mixed culture, Benefit Cost Ratio (BCR) was the highest in *Sadullapur* which was 3.47and BCR was 4.05, the highest in *Radhaganj* for pangus culture. The present study highlights the development of pond fish production through grassroots level organization.

Keywords: Aquaculture activities, Stocking density, Benefit Cost Ratio, Production practices, Pond based farming systems

INTRODUCTION

Fishery resources and fishing plays a vital role in improving the socio-economic status, the fight against malnutrition, earn foreign exchange and creating employment opportunities in Bangladesh (Mahfuj *et al.,* 2012). It has been estimated that about 1.28 million people are directly related to fishing activities and fish farmers in Bangladesh are about 3.08 million. The importance of the fisheries sub-sector in the national economy has been demonstrated by their contribution (Al Mahmud *et al.,* 2012). In 2010-11, 4.43% of GDP and 2.73% of the total export earnings came from this sub-sector (DoF, 2012). The total fish production in Bangladesh was estimated at 3061687 mt in 2010-2011 and annually fulfilling

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18.94 kg fish per person of which 1460769 metric tons came from culture system (DoF, 2012).

However, now a day, fish becomes increasingly scarce and expensive. Compared to rice, the price of fish is increasing rapidly. Most of the rural poor cannot afford to buy fish and, as such, are seriously deficient animal protein and hence malnutrition has been observed. But instead, the shortage of animal protein can be met through the development of aquaculture, as it not only requires less investment of money compared to livestock and poultry, but can also be produced using a land not suitable for agriculture (Chowdhury and Maharjan, 2001)

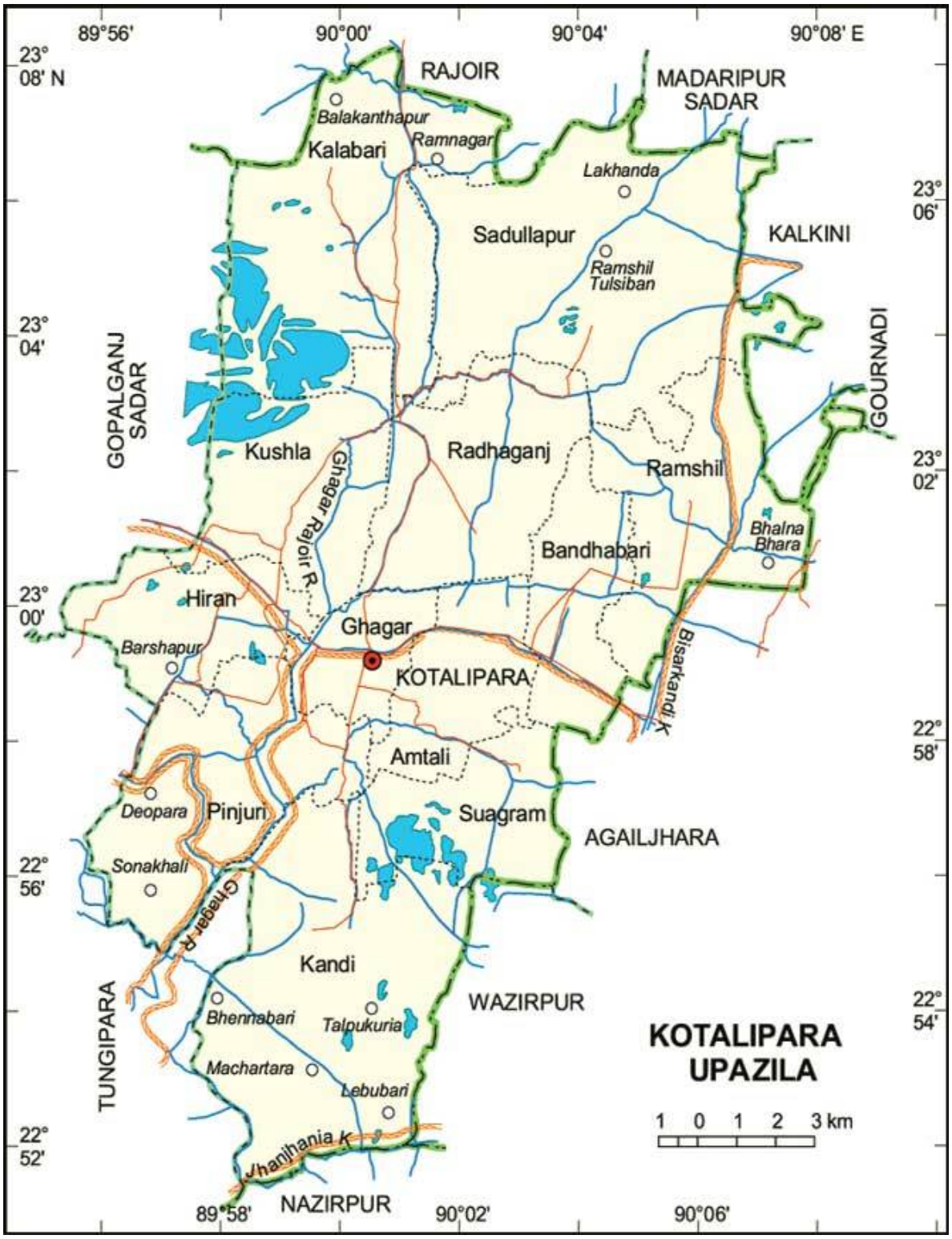
For the people of Bangladesh, fish farming on a small scale is an important opportunity to generate income with an important nutritional source providing protein-rich foods throughout the year. It consists of a number of options that can be tailored to meet the needs and capacities of people living in rural areas of our country (Roos, 2001; Roos *et al.,* 2003). The detailed study of the various factors involved in freshwater aquaculture development reveals that the potential for fish farming in Bangladesh is very high (Ahmed *et al.,* 2012; Hossain *et al.,* 2012). The climate is generally favorable and the water area is very wide with a high rainfall make the country a good place for aquatic production. At present there are about 290 freshwater fish are available in this country. Among them, a lot are now produced within the home based system or other aquatic bodies (Rahman *et al.,* 2013). Besides there is a considerable scope to increase aquaculture production through technology semi-intensive or intensive system. There is always a demand for fresh fish market, enticing owners of ponds for aquaculture company (Minar *et al.,* 2013). Many governmental and nongovernmental organizations are found dedicated for the effective transfer of technologies from top to bottom. More over funds for credit aquaculture are also available in this country (DoF, 2012).

Bangladesh has got a large number of ponds scattered all over the realm. BBS (1997) reported that there are 52, 77,572 ha water bodies of which 9, 15,506 ha ponds are suitable for fish culture. So the country has good potential for freshwater aquaculture, this potential cannot be fully utilized for various reasons, because most of them are still rare. Unable to carry many aquaculture activities in Bangladesh, the production rate is much lower than it is in China and other Southeast Asian countries (DoF, 2012; Kabir *et al.,* 2012; Chowdhury and Maharjan, 2001). If the gaps are subject to fish culture then proper planning, proper management and re-excavation of water bodies, the current level of fish production can easily be increased two or three times the existing level. Therefore, pond fish culture can also become an important element of income generation in rural development programs and is complemented by the production of crops and livestock (Chowdhury and Maharjan, 2001). All these could in thus improve the quality of life of the rural poor in Bangladesh. Thus, this study was conducted to determine the practice of production and input use, costs and returns of fish production in ponds three *thana*s of *kotalipara* upazila under Gopalganj district.

MATERIALS AND METHODS

This study was conducted during April to September, 2008 at *Kalabari, Radhaganj* and *Sadullapur* of *kotalipara* upazila under Gopalganj district (Figure 1). The area was selected because pond farmers were concentrated in these areas, no study was carried out in this area with respect

Figure 1: Figure shows the Area Where the Survey was Done



to the economics of pond fish production, and lastly there were some successful private farmer's seed of fish in this area since where farmers are used to buy fish fries as a local source. This chapter discusses the materials and methods followed to achieve the objectives of the study, including the selection of the study site, the selection of the unions, the different aquaculture system, the selection of the population and sample/respondents, data sources, the data collection tools and the method of data processing and analysis. Direct observation, Interviewing respondents, Record kept by respondents there are three methods by which farm survey and data can be gathered (Dillion and Haradaker, 1993). To obtain primary data, the study employed some techniques such as reconnaissance survey, key informants interview, questionnaire survey, PRA with focus group discussion (FGD), discussions, observations, case study and documents screening time to time. Data collected from various sources were coded and entered into a database using "Microsoft Excel Software" computer package. At each stage of study, data sheets were compared with the original data to ensure accuracy of the data entered.

RESULTS AND DISCUSSION

Bangladesh is considered as one of the most suitable countries in the world to carry out small-scale freshwater rural aquaculture because of its resources and favorable agro-climatic conditions. In the last three decades, there has been a steady increase in inland freshwater aquaculture production in Bangladesh. Aquaculture development has generated significant employment opportunities in Bangladesh for the production and marketing of fish and other activities associated.

Culture Season and Method

In the study area, the farmers were practicing both mono and polyculture. In case of monoculture they preferred Thai Pangus (*Pangasius hypophthalmus*). They stocked various carps such as rohu (*Labeo rohita*), catla (*Gibelio catla*), mrigal (*Cirrhinus mrigala*), silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharingodon idella*), mirror carp (*Cyprinus carpio var. specularis*), Thai sharpunti (*Puntius gonionotus*), tilapia (*Oreochromis niloticus*), etc., as polyculture.

It was found that 64% of the total farmers were practicing carp polyculture while 17% and 19% farmers were cultivating their ponds with pangus monoculture and tilapia and carp polyculture respectively (Table 1).

Ahmed (2003) observed that peak period of carp polyculture was from April to December. Rahman (2003) reported that the season of carp farming was from March to December. These results were more or less similar to the present study.

Stocking Density

Table 2 shows that stocking rate of rohu, catla, etc., for mixed culture was 10378 fingerlings per ha per year on an average basis. In the case of pangus monoculture, the average stocking rate was 14466 fingerlings per ha per year. The average prices of fish seeds paid by the fish pond farmers were Tk. 1.10, 1.20, 1.10, 0.90, 0.80, 0.90 and Tk. 0.70 for rohu, catla, mrigal, grass carp, silver carp, mirror carp and pangus respectively. Khaleque *et al.* (1998) also reported fingerling cost was the largest cost item followed by fish harvesting cost. Hassanuzzaman (1997) found the average density of carp at the rate of 16,196

Table 1: Fish Culture Methods in the Study Area

Culture Method	Study Areas							
	Kalabari		*Radhaganj*		*Sadullapur*		*All Locations*	
	N=30	%	N=30	%	N=30	%	N=90	%
Carp polyculture	21	70	20	67	17	57	58	64
Pangus monoculture	4	13	6	20	5	17	15	17
Tilapia and Carp culture	5 5	17	4	13	8	27	17	19
Totall	**30**	**100**	**30**	**100**	**30**	**100**	**90**	**100**

Note: N=Sample size

Table 2: Average Stocking Rate of Fish Fry per Hectare

Location	Number of Species of Different Fish Seeds							
	Rohu	*Catla*	*Mrigal*	*Grasscarp*	*Silvercarp*	*MirrorCarp*	*Mixedculture*	*Pangus*
Kalabari	2164	1340	2100	1250	3250	560	10664	15500
Radhaganj	1900	1250	2330	1160	2950	600	10190	13600
Sadullapur	2050	1300	1970	1350	2960	650	10280	14300
(average)	2038	1296	2483	1253	3053	600	10378	14466

$ha^{-1}.y^{-1}$ in Rajshahi district and NFEP-II (1998) suggested that the stocking density of carps was optimum at the rate of 14,820 fry.ha^{-1}. Hossain *et al.* (1992) found that the stocking density of carps varied from 10,000 to 31,000 fry.ha^{-1} in the pond fisheries of Mymensingh district.

Mixed Culture Includes Rohu, Catla, Mrigal, Grass Carp, Silver Carp and Mirror Carp

Fish production depends on the rate of fry stocking. The average population density in the study area was found 10.378 fingerlings/ha for mixed cropping and 14,466 fingerlings/ha for growing pangus (Table 2). For mixed culture, it is suggested to stock fry 5900-9880/ha/year (DoF, 2002), which were more or less similar in the study area. Hassanuzzaman (1997) states that the average population density was 16,196 fingerlings / ha in the district of Rajshahi. NFEP-II (1998) suggests that the population density of 14,820 fiy/ha. Hossain *et al.* (1992) observed that the range of the charge density was 10.000 to 31.000 fingerlings/ha in a village in Mymensingh district. From all reports it can be concluded that the population density was satisfactory pangus mixed culture. Chowdhury and Maharjan (2001) found the degree of concentration of pond fertility varies mainly with pond.

Fertilizer Use

There are many kinds of organic and inorganic fertilizers found 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. In the study area, fish pond farmers commonly applied three kinds of fertilizers such as Urea, Triple Super Phosphate (TSP) and Murate of Potash (MP). It was observed that the average doses of Urea, TSP and MP used by the farmers for mixed culture were 361 kg, 340 kg and 133 kg per ha per year for all locations. The average dose of fertilizers used for mixed culture was 834 kg per ha per year (Table 3). No fertilizer was used for pangus culture. The average prices of fertilizers paid by the fish pond farmers were Tk. 6.50, Tk. 40.00 and Tk. 18.00 for urea, TSP and MP respectively.

Manure and fertilizers are used to increase the production of phytoplankton, as it serves as a natural food for fish. It is recommended that pond should be fertilized with 500-600 kg / ha / year to 15 days to produce good range (DoF, 2002). In the study area, the dose of manure was 7517 kg/ha/year for the mixed culture (Table 3). Saha *et al.* (1995) found that the average dose of inorganic and organic fertilizers were 15.210 and 432 kg/ha/year. In the study area, the mean dose of fertilizer was 834 kg/ha for mixed culture. Rahman *et al*. (1998) found in their study that doses of organic and inorganic were 11,075 kg / ha and 739 kg/ha, respectively, and the results were more or less similar. The mean dose of organic and inorganic fertilizers were applied respectively to 850 kg and peoples 44 kg/acre CVDP and 560 and for Non-CVDP 24kg/acre villages in Comilla district of Bangladesh (Chowdhury and Maharjan, 2001)

Supplementary Feeds

Table 4 reveals that commercial fish feed used for mixed culture was the highest for *Kalabari* which was 250 kg followed by 200 kg in *Radhaganj* and 170 kg in *Sadullapur*. The average dose of commercial fish feed used for mixed culture was 207 kg per ha per year for all locations. The average dose was 550 kg per ha per year in case of pangas culture and the highest dose was found to be applied in *Kalabari* (600 kg) (Table 5).

It was found that average dose of wheat bran for mixed culture was 527 kg per ha per year and 516 kg for pangus culture for all locations (Tables 4 and 5).

Table 3: Distribution of Manure and Fertilizers Used per Hectare per Year for Mixed Culture by Locations

Items	Locations			All locations (a.v.)
	Kalabari	*Radhaganj*	*Sadullapur*	
Manure				
Cow dung (kg)	8050	7500	7000	7517
Compost (kg)	-	-	-	-
Fertilizers	-	-	-	-
Urea (kg)	375	370	340	361
TSP (kg)	350	340	330	340
MP (kg)	150	135	115	133
All fertilizers (kg)	875	845	785	834

Table 4: Supplementary Feeds Applied per Hectare per Year for Mixed Culture by Locations

Items	Kalabari		Radhaganj		Sadullaur		All locations	
	Qty(kg)	(%)	Qty(kg)	(%)	Qty(kg	(%)	Qty(kg) (a.v.)	(%)
Rice bran	2700	64	2600	64	2540	66	2613	65
Commercialfish feed	250	6	200	5	170	4	207	5
Wheat bran	500	12	530	13	550	14	527	13
Oil-cake	750	18	720	18	600	16	690	17
All groups(total)	4200	100	4050	100	3870	100	4037	100

Note: Commercial fish feed: Market available Rupsi, Aftab, Quality, etc.

Table 5: Supplementary Feeds Application per Hectare per Year for Pangus Culture by Locations

Items	Kalabari		Radhaganj		Sadullaur		All locations	
	Qty(kg)	(%)	Qty(kg)	(%)	Qty(kg	(%)	Qty(kg) (a.v.)	(%)
Rice bran	2512	58	2468	60	2300	59	2426	60
Pelleted feed	600	14	550	13	500	13	550	13
Wheat bran	550	13	500	12	500	13	516	12
Oil-cake	650	15	620	15	600	15	623	15
All groupsTotal	4312	100	4138	100	3900	100	4115	100

Note: Commercial fish feed: Market available Rupsi, Aftab, Quality, etc.

Table 4 shows that the average amount of oil-cake applied for mixed culture was 690 kg for all locations where as it was 623 kg per ha per year for pangus (Table 5). The average rates worked out with the farmers were Tk. 10.00, Tk. 18.00, Tk.14.00 and Tk. 25 per kg for rice bran, commercial fish feed, wheat bran and oil cake.

Supply of feeds can compliment nutritional deficiency and it is important to increase fish production. In the study area, the average dose of rice bran, commercial fish feed, wheat bran and oil cake were 2613 kg/ha, 207 kg/ha, 527 kg/ha and 690 kg/ha for mixed respectively (Table 4). The rate of rice bran and oil cake were 2426 kg/ha and 623 kg/ha for pangus culture (Table 5). Rahman (2003) found that the dose of rice bran and oil cake were 2730 and 580 kg/ha, respectively. The result of the study area more or less matched with the above finding of Rahman.

Relative Profitability

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. Table 6 shows that in case of mixed culture, Benefit Cost Ratio (BCR) was the highest in *Sadullapur* which was 3.47 followed by 3.34 in *Radhaganj* and 3.37 in

Table 6: Per Hectare per Year Costs and Returns of Pond Fish Production for Mixed Culture by Locations

Items	Kalabari	Radhaganj	Sadullapur	AllLocations(a.v)
A. Yield(Kg)	5400	5000	4800	5067
B. Gross return(Tk)	521996	483330	463997	489774
C. Gross cost (Tk)	154749	144643	133477	144280
D. Net return (B-C)	367247	338687	330550	345495
E. B.C.R (B/C)	3.37	3.34	3.47	3.39
F. Net return perTk. Invested (D/C)	2.37	2.34	2.47	2.39

Kalabari. The average BCR was 3.39. Net return per Tk invested for mixed culture was the highest, 2.47 in *Sadullapur,* 2.34 in *Radhaganj* and 2.37 in *Kalabari* respectively; considering all locations it was 2.39.

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. Table 7 shows that in case of pangus culture, Benefit Cost Ratio (BCR) was the highest in *Radhaganj* which was 4.05 followed by 4.001 in *Kalabari* and 3.97 in *Sadullapur*. The average BCR was 4.01. Net return per Tk. invested for pangus culture was the highest in Radhaganj which was 3.05, 2.97 in *Sadullapur* and 3.001 in *Kalabari*. Considering all locations net return per Tk. invested was 3.01 on an average basis. Chowdhury and Maharjan (2001) found similar type of result while making a comparative analysis between an intervened and non-intervened area of Comilla district.

In the study area, it was found that the average gross returns of fish production were Tk. 489774 and Tk. 487500 for mixed and pangus culture respectively (Tables 6 and 7). Akhter (2001) found that the average gross return from fish culture was Tk. 300532. Kausari (2001) found average gross return of Tk. 160210 from carp polyculture. 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

Table 7: Per Hectare per Year Costs and Returns of Pond Fish Production for Pangus Culture by Locations

Items	Kalabari	Radhaganj	Sadullapur	AllLocations(a.v)
A. Yield(Kg)	7000	6500	6000	6500
B. Gross return(Tk)	525000	487500	450000	487500
C. Gross cost (Tk)	131212	120483	113388	121693
D.Net return(B-C)D.Net return (B-C)	393788	367017	336612	365807
E B C R (B/C)	4.001	4.05	3.97	4.01
F. Net return per Tk. Invested (D/C)	3.001	3.05	2.97	3.01

management practices. Alam *et al.* (2009) found that regarding the economic return, the gross return and gross margin were recorded Tk. 4230 and 2423, respectively, from the only fish component in traditional pond management at nine farmers' ponds covering area of 0.12 ha each in Farming Systems Research and Development (FSRD) site, *Goyeshpur*, Pabna during the year 2000-01 to 2002-03 to assess integrated pond based production, income and employment opportunity of the rural farm households. Similar results were reported by Hanif *et al.* (1990) from integrated but in case of livestock-fish-crops fanning.

This study was conducted to know the socioeconomic characteristics of farmer's fish ponds, and its importance in pond fish production, to meet the individual characteristics of the fish pond and know its importance and production practices fish pond culture. Pond fish farmers are not so oriented as expected growth, and a significant portion of them don't feel the need to produce large amounts for maximum benefit. Sometimes liquidations pond and maintain the population density in relation to the use of other inputs that was detrimental to the healthy growth of the fish. Therefore, it is important to understand farmers and realize that the population density must be balanced with the carrying capacity of the ponds for better production.

CONCLUSION

The need to involve the local community in the planning and implementation of rural development projects is a widely accepted idea. In the last two decades, many governments, development agencies and NGOs have recognized that the "top-down" approach features traditional development strategies has failed to reach and benefit the rural population.

REFERENCES

1. Ahmed S, Rahman A F M A, Mostafa M G, Hossain M B and Nahar N (2012), "Nutrient Composition of Indigenous and Exotic Fishes of Rainfed Waterlogged Paddy Fields in Lakshmipur, Bangladesh", *World Journal of Zoology,* Vol. 7, No. 2, pp. 135-140.
2. Ahmed F (2003), "A Comparative Study on Carp Culture of Three Different Ngos In Mymensingh District", M.S. thesis, Department of Aquaculture, Bangladesh Agricultural University, Mymensigh, p. 66.
3. Alam M R, Ali M A, Hossain M A, Molla M S H and Islam F (2009), "Integrated Approach Of Pond Based Farming Systems For Sustainable Production And Income Generation", *Bangladesh J. Agril. Res.,* Vol. 34, No. 4, pp. 577-584, ISSN 0258-7122.
4. Al Mahmud N, Hasan M R, Hossain M B, and Minar M H (2012) "Proximate Composition of Fish Feed Ingredients Available in Lakshmipur Region, Bangladesh", *American-Eurasian J. Agric. & Environ. Sci.*, Vol. 12, No. 5, pp. 556-560, ISSN 1818-6769.
5. AIS (2006), "Bangladesh fisheries resources at a glance", Agricultural Information Service, Krishi Diary, Khamarbari, Fanngate, Dhaka, pp. 5-12.
6. BBS (1997), "Statistical Yearbook of Bangladesh", Bangladesh Bureau of Statistics. Statistics Division, Ministry of planning, p.170
7. Chowdhury M H and Maharjan K L (2001), "Increasing Efficiently of Pond Fish Production in Rural Bangladesh. In:

Microbehavior and Macroresults", Proceedings of the Tenth Biennial Conference of the International Institute of Fisheries Economics and Trade, July 10-14, 2000, Corvallis, Oregon, USA. Compiled by Richard S. Johnston and Ann L. Shriver. International Institute of Fisheries Economics and Trade (IIFET), Corvallis.

8. DoF (2002), "Fisheries statistical yearbook of Bangladesh. Fisheries Resources Survey System", Department of Fisheries, Ministry of Fisheries and Livestock, Government of People's Republic of Bangladesh, Park avenue, Ramna, Dhaka, pp. 1 and 41.

9. DoF (2012), "Fisheries statistical yearbook of Bangladesh. Fisheries Resources Survey System", Department of Fisheries, Ministry of Fisheries and Livestock, Government of People's Republic of Bangladesh, Park avenue, Ramna, Dhaka, pp. 133-140.

10. Dillion J and Haradaker M (1993), "Husbandry Factors Affecting Survival And Growth of Carp Fry and Evaluation of Dietary Ingredients Available In Bangladesh for the Formulation of a Carp Fry Diet", Ph.D. Thesis, Institute of Aquaculture, University of Stirling, Scotland, UK, p. 4415.

11. Khaleque M A, Masud A K M S, and Mirza J A (1998), "Economics of pond fish farming under semi intensive culture and management". Bangladesh *J. Train. Dev.,* Vol. 11, No. 2.

12. Kabir K M R, Adhikary R K, Hossain M B, and Minar M H (2012), "Livelihood Status of Fishermen of the Old Brahmaputra River, Bangladesh", *World Applied Sciences Journal,* Vol. 16, No. 6, pp. 869-873, ISSN 1818-4952.

13. Khan M A H (1996), "A Comparative Economic Study of Fingerlings And Pond Fish Production in Some Selected Areas of Mymensingh District", M.S. Thesis, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh, p. 78.

14. Hanif M M J, Tajuddin Z A, Doyah O S, and Mohamad M (1990), "Maximising Farm Production Output Through Fish, Prawn, Chicken, Duck and Crop Farming", Proc. 13th MSAP Ann. Conference, Malacca, Malaysia.

15. Hasanuzzaman A K M (1997), "Comparative Study on Pond Fish Production Under Different Management Systems In Some Selected Areas In Rajshahi District", M.S. Thesis, Department of Agriculture Production Economics, BAU, Mymensingh, p. 76.

16. Hossain M S, Dewan S, Islam M S and Hossain S M A (1992), "Survey of pond fishery resources in a village of Mymensingh district", *Bangladesh Journal of Aquaculture*, 1Vol. 4-16, pp. 33-37.

17. Hossain M B, Amin S N, Shamsuddin M, and Minar M H (2012), "Use of Aqua-chemicals in the Hatcheries and Fish Farmers of Greater Noakhali, Bangladesh", *Asian Journal of Animal and Veterinary Advances.* ISSN 1683-9919/DOI:10.323/ajva. Academic Journals Inc.

18. NFEP-11 (1998), "Aquaculture Manual for

Literate and Semi-literate Farmers", North-west Fisheries Extension Production-2, Parbatipur, Dinajpur. 81 pp.

19. Mahfuj M S E, Hossain M B, and Minar M H (2012), "Biochemical Composition of an Endangered Fish, *Labeo bata* (Hamilton, 1822) from Bangladesh Waters", *American Journal of Food Technology.* ISSN: 1557-4571/ DOI: 10.3923/ajft.

20. Minar M H, Hossain M B, and Shamsuddin M (2013), "Climate Change and Coastal Zone of Bangladesh: Vulnerability, Resilience and Adaptability", *Middle-East Journal of Scientific Research,* Vol. 13, No. 1, pp. 114-120, ISSN 1990-9233. DOI: 10.5829/idosi.mejsr.2013.13.1.64121, IDOSI Publications.

21. Rahman M S, Mamun A A, Rahman M, Hossain M B, Minar M H, and Maheen N J (2013), "Illegal Marketing of Freshwater Turtles and Tortoises in Different Markets of Bangladesh", *American-Eurasian Journal of Scientific Research,* Vol. 8, No. 1, pp. 15-23. ISSN: 1818-6785. DOI: 10.5829/ idosi.aejsr. 2013.8.1.66124

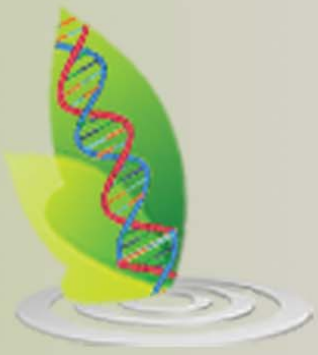
22. Rahman M M (2003), "Socio-Economic Aspects of Carp Culture Development in Gazipur, Bangladesh ", M.S. Thesis, Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh, p. 72.

23. Roos N, Islam M M and Thilsted S H (2003), "Small Indigenous Fish Species in Bangladesh: Contribution to Vitamin A, Calcium and Iron Intakes", *J. Nutr.,* p. 133: 4021S-4026S.

24. Roos N, (2001), "Fish cOnsumption and Aquaculture in Rural Bangladesh: Nutritional Contribution And Production Potential of Culturing Small Indigenous Fish Species (Sis) in Pond Polyculture With Commonly Cultured Carps", Doctoral thesis. Research Department of Human Nutrition, The Royal Veterinary and Agricultural University, Frederiksberg, Denmark.

25. Saha N C, Islam M S, Saha J K and Modak P C (1995), "Economics of pond fish production in some selected areas of Bangladesh", *Bangladesh J. Aquaculture,* Vol. 17, pp. 13-18.

26. Rahman, M A, Sofiquzzoha M Z and Nurullah M (1998), "Efficiency of Pond Fish Production in Bangladesh", *Bangladesh J. Agril. Sci.,* Vol. 25, No. 2, pp. 235-239.



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