ISSN-1991-3036 (Online)
Int. J. Sustain. Crop Prod. 6(1):36-42(April 2011)

STUDY ON TECHNICAL ASPECTS OF PANGASIUS (*Pangasianodon hypophthalmus*) FARMING IN MYMENSINGH REGION

M.S. MONIR[1]*, M.R. HAQUE[2] AND S. RAHMAN[1]

[1]Scientific officer, Bangladesh Fisheries Research Institute, Freshwater Sub-station, Saidpur, Nilphamary-5310; [2]Ph.D. Fellow, Dept. of Fisheries Management, Faculty of Fisheries, BAU, Mymensingh.

*Corresponding author & address: Md. Shirajum Monir, E-mail: monir_bau22@yahoo.com
Accepted for publication on 30 March 2011

ABSTRACT

Monir MS, Haque MR, Rahman S (2011) Study on technical aspects of pangasius (*Pangasianodon hypophthalmus*) farming in mymensingh region. *Int. J. Sustain. Crop Prod.* 6(1), 36-42.

The present study was concerned with existing status of pangasius (*Pangasianodon hypophthalmus*) farming highlighting its technical aspects in two areas viz. Trishal and Muktagacha Upazila under Mymensingh district during March to December 2008. Needed data were collected with questionnaire by personal interviewing of the respondents. Ponds soil and water samples were collected from three categories (small, medium and large) of pangasius ponds from Trishal to determine the important chemical changes of water and soil. Only some socio-economic aspects varied between the pangasius farmers in two areas regarding their training and education levels. In the areas, about 45% pangasius farmers had leased ponds and lease value was BDT 35,000-45,000/ha/yr. In general, 92% of the pangasius farmers practiced polyculture while only 8% practiced monoculture. The average stocking density was found to be 29,574 fingerlings/ha. About 100% of the pangasius farmers used supplementary feeds for pangasius culture and the average yield of pangasius was 12,000 kg/ha/yr. Generally, there were no remarkable differences between two study areas in terms of technical aspects. The mean values of ammonia-nitrogen and phosphate-phosphorous of water and soil parameters were higher than the suitable level in the pangasius pond. Though the potential of pangasius farming in two regions is mentioned-worthy, it is currently facing a number of constraints such as, lack of quality fingerling, lack of capital, high production cost mostly for feed, proper technological knowledge and low price of pangasius. To improve the overall conditions of the pangasius farmers, it is necessary to upgrade the existing pangasius management practices through institutional initiatives.

Key words: *pangasius, technical aspects, chemical changes, constraints*

INTRODUCTION

Aquaculture contributes more than 50% of the total inland fish production (capture and culture) indicating the importance of aquaculture in Bangladesh for food security of the fish eating nation (DoF 2008). In total aquaculture production, greater Mymensingh area has got significant advancement regarding fish production commercially. Total fish production from pond culture was 483,416 t in the year 1998 and now it was predicted to increase 811,954 t in 2006-2007 (DoF 2008). Aquaculture contributes increasingly to animal protein supply with creating employment opportunities for both urban and rural people.

Pangasianodon hypophthalmus is commonly known as pangas in Bangladesh, belonging to the family pangasiidae, under the order Siluriformes. According to Roberts and Vidthayanon (1991) reported the origin of *P. hypophthalmus* was from the Mekong river of Vietnam to the Chao Phraya River to Thailand; subsequently it was spread over other countries such as Malaysia, Indonesia and China. According to David (1962) *Pangasius sp*. is highly tolerant to salinity, pH, dissolved oxygen, temperature or even pollution. *P. hypophthalmus* is well accepted by a wide range of people and therefore, it has been a good source of protein and calorie poor, medium and better-off people in rural as well as urban areas.

The polyculture of carps account about 80% of the total freshwater aquaculture production in extensive and semi-intensive system of Bangladesh (ADB 2005; Ahmed 2005). The remaining 20% are mainly from pangasius, tilapia, small indigenous species (SIS) of fish and rice-fish farming (Muir 2003). In the total aquaculture production, catfish particularly pangasius is an important fish species and it receives popularity showing an importance substantially in terms of commercial culture. There is a huge demand for pangasius in local markets due to lower market price. Moreover, the vast majority of poor people consume pangasius due to its delicacy and taste with high fat content. It indicates that pangasius has made a significant contribution increasing fish production, poverty alleviation and livelihoods support in Bangladesh.

Polyculture of pangasius (*P. hypophthalmus*) with carps is the existing culture practice along with monoculture being practiced by many households in Bangladesh. Recent survey shows that most of ponds in Bangladesh are not cultured in planned and scientific way, which hampers the pond fish farmers to improve their production and socio-economic status (Ali and Rahman, 1982). Over the last two decades spectacular development has taken place in farming of this species in Bangladesh. However in the recent years, economic benefit from this farming is being depleted partly due to increasing feed cost, lack of proper management, unavailability of low cost supplementary feeds and some socio-economic constraints (Akter 2001). As a result, it was reported that pangasius farmers are gradually loosing their interest to invest in pangasius farming in the study area (Wahab *et al.* 2008). In this changing condition, the present study was designed to know the chemical changes of water and soil in different categories pangasius ponds highlighting the detail technical aspects of pangasius farming being practiced.

MATERIALS AND METHODS

Study area

The most important pangasius (*P. hypophthalmus*) producing region "Mymensingh District" in the country was selected for the present study. It has 11 upazilas, of which, 2 pangasius producing upazilas (Trishal and Muktagacha) having abundance of pangasius farms along with a total 60 pangasius aquaculture farmers (30 farmers from each upazila) were selected for the study.

Data collection and sampling methods

A combination of participatory, qualitative and quantitative methods was used for data collection. Data were collected for seven months from March to December, 2008. A traditional survey method of direct interview from the selected pangasius farmers was followed, using pre-tested questionnaire. After completing primary data collection procedure, focus group discussion with farmers and cross-check interviews with key informants were carried out to justify of previously collected data. Pangasius farmers are categorized on the basis of farm size such as, small (<0.5ha), medium (0.5-1.0ha) and large (>1.0ha) in Thishal and Muktagacha upazila. Three farms were selected to collect water and soil samples from each type of farm size.

Water pH, ammonia, nitrite-nitrogen, nitrate-nitrogen and phosphate-phosphorus values were recorded at monthly interval during the study period. pH was measured with a portable pH meter. On each sampling day, 500 ml of water was collected in a clean black plastic bottle with cap from each pond very carefully without any agitation. The bottles were then brought to the Water Quality and Pond Dynamics Laboratory, BAU, Mymensingh to determine ammonia, nitrite, nitrate and phosphorus.

Bottom soil samples from three different sites of the pond were collected. Then they were brought to the laboratory and kept for drying in the air. After completion of drying, the soil samples were ground and sieved by fine-mesh sieve and made ready for analysis. Prepared and labeled samples were sent to Soil Resource Development Institute (Mashkanda, Mymensingh) to analyze for the parameters of pH, phosphorus (µg/g), potassium (me /100 g soil) and sulpher (µg/g).

Data analysis

The data from the questionnaire were grouped and categorized according to the different pangasius farmers of the pangasius farming. The whole data were entered into the MS Excel program and in the tabular from in the computer. Mostly the tabular and graphical methods were used for analyzing the data.

RESULTS AND DISCUSSION

Starting of pangasius farming

Among the 60 sampled farmers, 5% pangasius farmers started pangasius farming in 1995-00, 38% farmers started in 2001-05 and another 17% farmers started in 2006-08. However, the trend of pangasius farming is still increasing in both of the areas with a little higher trend in Trishal upazila (Fig. 1).

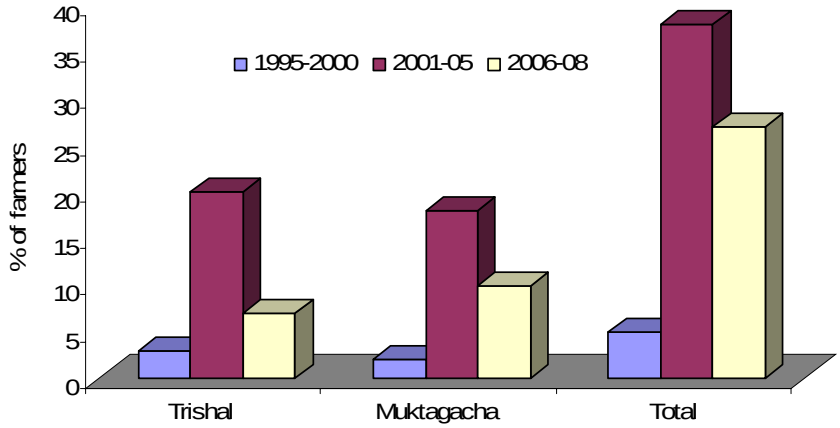

Fig. 1. Starting year of pangasius farming in Thishal and Muktagacha upazila

Category of pangasius farmers on the basis of farm size

According to the survey, 41% was found to be small (<0.5ha), 52% medium (0.5-1.0ha) and 7% large (>1.0ha) farmers. The number of small and medium farmer's trend to be higher in Trishal compared to Muktagacha area (Table 1).

Table 1. Category of pangasius farmers on the basis of farm size in Thrishal and Muktagacha upazila

Farmers category	Upazila		
	Trishal (n =30)	Muktagacha (n = 30)	Total(n = 60)
Small(<0.5ha)	12 (40)	13 (43)	25 (41)
Medium(0.5-1.0ha)	15 (50)	16 (54)	31 (52)
Large(>1.0ha)	3 (10)	1(3)	4 (7)

n = Sample size; Figures in parentheses indicate percentage

Experience and training of pangasius farming

Out of 60 pangasius farmers interviewed, 43% gained experience from friend and neighbors, 8% farmers acquired experience by NGO and remaining 47% obtained experience from DoF, BFRI. A relatively higher percentage (50%) of farmers in Muktagacha learnt the pangasius farming from DoF and BFRI (Table 2). Saha (2006) reported that 45.6% pangasius farmers gained experience from friends and neighbors.

Table 2. Farming experience of pangasius farmers in Trishal and Muktagacha upazilas

Acquired Experience	Trishal(n = 30)	Muktagacha(n = 30)	Total (n = 60)
Self study	1 (3)	0 (0)	1 (2)
Friends and neighbors	14 (47)	12 (40)	26 (43)
NGO	2 (7)	3 (10)	5 (8)
Others (DoF, BFRI etc)	13 (43)	15 (50)	28 (47)

n = Sample size; Figures in parentheses indicate percentage

Pond size

The average pond size used for pangasius farming was found to be 3.12 acre. The maximum pond size was 6 acre found in Trishal and minimum was 0.24 acre found in Muktagacha upazila. The highest average pond size was found to be 4 acre in Trishal upazila (Table 3). Saha (2003) reported that the average pond size was 0.21 ha in Dinajpur sadar upazila and 3.00 acre was in Mymensingh region.

Pond ownership

Twenty eight percent of the farmers had own pond, 45% had leased ponds and rest 27% had both leased and own ponds. Lease value of land was BDT 35,000-45,000/ha/yr which varied with the pond location, pond productivity and pond size (Table 4).

Table 3. Pond size of pangasius farms in Trishal and Muktagacha upazila

Area	Average pond size (acre)	Largest pond size (acre)	Smallest pond Size (acre)
Trishal	4.00	6	2.50
Muktagacha	2.25	5	0.24

Table 4. Ownership status of the pond in Trishal and Muktagacha upazila

Ownership	Trishal (n = 30)	Muktagacha(n = 30)	Total (n = 60)
Single own	7 (23)	10 (33)	17 (28)
Leased in	15 (50)	12 (40)	27 (45)
Single own and leased in	8 (27)	8 (27)	16 (27)

n = Sample size; Figures in parentheses indicate percentage

Depth of water

Eighteen percent of the ponds were seasonal and 82% ponds were perennial. The pond water level of the perennial ponds declined dry season and became unsuitable for fish culture. Then farmers had to fill the ponds up to certain level by pumping water from outside. It was found that the average depth of water in dry season (December to April) was 1.5 m and in the rainy season (May to November) 2 m.

Soil types of ponds

Loamy soil is suitable for aquaculture farming and sandy, clay soils are not suitable. From the study, it was found that 60% of pond had loamy soil, 30% had sandy loamy and rest 10.00% had silt loamy soil (Fig. 2).

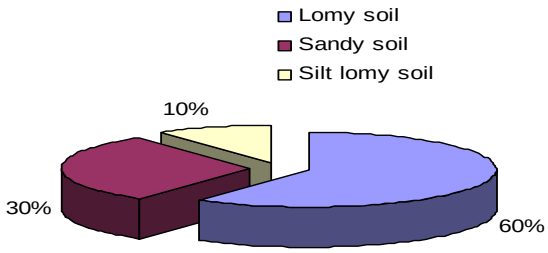

Fig. 2. Soil type of pangasius ponds in Trishal and Muktagacha upazila

Culture methods

Ninety two percent farmers cultured pangasius with other fish (polyculture), whereas only (8%) farmers cultured only pangasius (monoculture). Highest percentage of polyculture farmers was found in Trishal (93%). Maximum polyculture farmers used carps including 10% rui (*Labeo rohita*), 6% silver (*Hypophthalmichthys molitrix*), 6% catla (*Catla catla*), 5% mrigal (*Cirrhinus cirrhosus*) with 73% pangasius (*Panasianodon hypophthalmus*) (Fig. 3). Rahman (2006) showed that around 90% of the farmers cultured pangasius with carp fishes. In this respect, it is argued that majority farmers cultured pangasius with other fish.

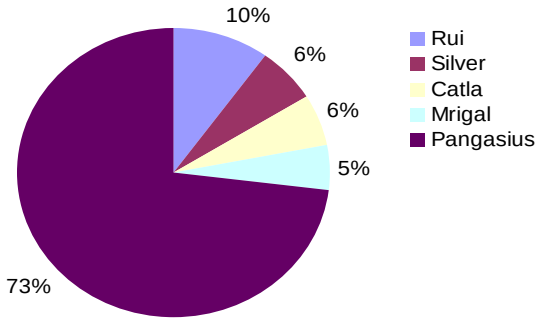

Fig. 3. Polyculture system of pangasius farming in Trishal and Muktagacha upazila

Pre-stocking management and inputs used in pond of pangasius farming

About 90% of the surveyed farmers made necessary preparation before stocking of fingerlings. About 43% farmers were found to use lime, 15% removed organic deposits from pond bottom, 5% used potassium permanganate and 9% used common sodium chloride (NaCl) salt (Table 5).

Table 5. Pre-stocking management and inputs used in pangasius farming in Trishal and Muktagacha upazila

Description of works and inputs used	Number of farmers		
	Trishal (n =30)	Muktiagacha (n = 30)	Total (n = 60)
Pond drying	3(10)	5 (17)	8 (13)
Dykes repairing	5(17)	4 (13)	9 (15)
Removal of bottom mud	3(10)	6 (20)	9 (15)
Liming	14(46)	12 (40)	26 (43)
Use of potassium permanganate	2(7)	1 (3)	3 (5)
Use of common salt (NaCl) solution	3(10)	2 (7)	5 (9)

n = Sample size; Figures in parentheses indicate percentage

Sources of pangasius fingerlings

About 87% of the farmers collected fries/fingerlings from the fry traders, 8% from the government farms and 5% from the local private farms or nurseries (Table 6). The traders brought fish fries and fingerlings from private nurseries at Adamdighi in Bogra, some of them collected from BFRI and other local hatcheries. Fingerlings size varies from 1-2 cm with price of BDT 0.8-3/fingerling.

Table 6. Sources of pangasius fries/fingerlings for stocking in Thishal and Muktagacha upazila

Sources of fries/fingerlings	Number of farmers		
	Trishal (n = 30)	Muktagacha (n = 30)	Total (n = 60)
Fry trader	25 (83)	27 (90)	52 (87)
Government farm	3 (10)	2 (7)	5 (8)
Local private farm	2 (7)	1 (3)	3 (5)

n = Sample size; Figures in parentheses indicate percentage

Stoking density and feeding management applied for pangasius farming

Regardless of pangasius farming systems, the average annual stocking density of fingerlings was estimated at 29,574 per ha. Most farmers reported multiple stocking while few farmers stocked once per year. Pangasius can be stocked at a much higher density in ponds compared to other cultivable species (Ali *et al*. 2005).

The productivity of pangasius farming is closely related to feed inputs. About 90% farmers used commercial pelleted feeds and 10% farmers used farm made feed for the fishes. Commercial pelleted feed produced by the different feed industries, such as Saudi Bangla feed, Quality feed, National feed, Sunny feed and ATI feed etc. On average, the annual quantity of feed supply was estimated at 26,842 kg/ha. Ahmed and Hasan (2007) reported that average quantity of feed used by the farmers was 13,723 kg/ha in pangasius polyculture pond. In the present study, pangasius farmers fed at a higher rate for higher density to raise the production of pangasius in their farming system.

Disease occurrence in pangasius ponds

According to the survey, 32% pangasius was affected by disease and 68% farmers did not find any disease in their farm throughout the farming cycle. (Table7). Major diseases or clinical signs including rectal protrusion, tail and fin rot, cotton wool type lesion and black spot in skin etc were found throughout the farming cycle. Faruk *et al.* (2004) reported that approximately 15% income loss is occurred due to fish disease.

Table 7. Disease occurrence of pangasius in Thishal and Muktagacha upazila

Disease occurrence	Trishal (n = 30)	Muktagacha (n =30) 30)	Total (n = 60)
Yes	8 (27)	11 (37)	19 (32)
No	22 (73)	19 (63)	41 (68)

n = Sample size; Figures in parentheses indicate percentage

Pangasius production

About 90% ponds were under polyculture system and farmers stocked mainly pangasius along with Indian major's carps and exotic carps. According to the 60 pangasius farmers, average production was 12,000 kg/ha/yr and for carps 600 kg/ha/yr. The medium and large farmers (90%) sell their fishes to large traders who transport the fish in live condition to Dhaka. The selling price of pangasius varies according to the size and qualities; however the average selling price of pangasius was BDT 70-80 /kg.

Impacts of pangasius farming on water and soil quality

Chemical analyses of water: The highest mean values of pH, ammonia-nitrogen, nitrite-nitrogen, nitrate-nitrogen and phosphate- phosphorous of pangasius pond were 8.2 ± 2.93, 0.86 ± 0.47mg/l, 0.091 ± 0.6 mg/l, 0.29 ± 0.8 mg/l, 5.12 ± 0.59 mg/l, respectively in three different categories of pangasius farms in Trishal upazila (Table 8). Boyd (1998) observed <0.1 ppm ammonia concentration in aquaculture pond water. The possible reason for higher values of ammonia in the present study might be due to higher stocking density and irregular water change. The observed phosphate- phosphorous contents in water of the experimental ponds was higher than those reported by Mollah and Haque (1978) who recorded 0.55 to 0.35 mg/l. The possible reason of higher phosphate-phosphorous content might be due to heavy rainfall increasing the amount of phosphate- phosphorous in the experimental ponds over the period.

Chemical analyses of soil: The highest mean values of pH, phosphorus, potassium, sulphur content were 6.9 ± 0.12, 32.69 ± 6.43 µg/g soil, 0.38 ± 0.06 me/100g soil, 42.58 ± 6.94 µg/g soil, respectively in three different categories of pangasius farm in Trishal upazila (Table 9). The suitable ranges of phosphorus, potassium and sulfur for soil are 12-18 µg/g soil, .0151-.0225 me/100 g soil and 18.1-27 me/100 g soil, respectively (BARC guide 1997). The mean values of soil parameters were higher than the suitable ranges in the pangasius ponds that might be for high organic matter content in pond soil. However, farmers should remove sediment and regular change of water for increasing pangasius production.

Table 8. Water quality parameters (mean ± SE) in three different categories of pangasius farm in Trishal upazila

Sample No.	pH	NH_3-N (mg/l)	NO_2-N (mg/l)	NO_3-N (mg/l)	PO_4-P (mg/l)
Large (>1.0 ha)	6.7 ± 2.15	0.86 ± 0.47	0.004 ± 0.35	0.07 ± 0.01	2.23 ± 0.24
Medium (0.5-1.0ha)	7.8 ± 3.32	0.31 ± 0.07	0.091± 0.06	0.11 ± 0.11	5.12 ± 0.59
Small (<0.5ha)	8.2 ± 2.93	0.51 ± 0.25	0.077 ± 0.04	0.29 ± 0.08	2.11 ±1.81

Table 9. Soil parameters (mean ± SE) in three different categories of pangasius farm in Trishal upazila

Sample No	pH	P (µg/g soil)	K (me/100 g soil)	S (µg/g soil)
Large (>1.0 ha)	6.9 ± 0.12	14.48 ± 2.61	0.38 ± 0.06	26.89 ± 3.80
Medium (0.5-1.0ha)	6.9 ± 0.06	30.58 ± 7.40	0.35 ± 0.03	33.65 ± 6.96
Small (<0.5ha)	6.8 ± 0.33	32.69 ± 6.43	0.28 ± 0.05	42.58 ± 6.94

Socio-economic condition of pangasius farming

Though 37% farmers living condition were poor, the survey suggests that they have improved their socio-economic condition through pangasius, as narrated by 63% of pangasius farmers. Higher percentage (70%) of positive response was found in Trishal (Table 10).

Table 10. Opinion of pangasius farmers about their socio-economic condition

Improved condition	Name of Upazila		
	Trishal (n = 30)	Muktagacha (n = 30)	Average(n = 60)
Yes	21(70)	17 (57)	38 (63)
No	9 (30)	13 (43)	22 (37)

n = Sample size; Figures in parentheses indicate percentage

Constraints of pangasius farming

Quality fries/fingerlings appeared to be the most important problem for the pangasius farmers as indicated by about 37%. It was followed by low market price, high price of feed, lack of money and lack of scientific knowledge with respective percentage of 23%, 15%, 13%, and 12% in the study area (Table 11). Mian *et al.* (2006) stated that high price of feed, low price of pangasius during harvest and non-availability of quality fingerlings were the major constraints in the study area.

Table 11. Key constraints faced by the pangasius farmers in Thishal and Muktagacha upazila

Constraints	Trishal (n = 30)	Muktagacha (n = 30)	Average (n = 60)
1. Lack of money	5(17)	3(10)	8(13)
2. Lack scientific knowledge	3(10)	4(13)	7(12)
3. Poor quality fries	10(33)	12(40)	22(37)
4. Low market price	8(27)	6(20)	14(23)
5. High price of feed	4(13)	5(17)	9(15)

n = Sample size; Figures in parentheses indicate percentage

CONCLUSION

From the findings it may be concluded that, though the potential of pangasius farming in two regions is mentioned-worthy, it is currently facing a number of constraints such as, lack of quality fingerling, lack of capital, high production cost mostly for feed, proper technological knowledge and low price of pangasius. To improve the overall conditions of the pangasius farmers, it is necessary to upgrade the existing pangasius management practices through institutional initiatives.

REFERENCES

ADB (2005) An Evaluation of Small-scale Freshwater Rural Aquaculture Development for Poverty Reduction. Operation Evaluation Department, Asian Development Bank (ADB), Manila, Philippines.

Ahmed GU (2005) National Aquaculture Sector Overview-Bangladesh. Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy.

Ahmed N, Hasan MR (2007) Sustainable livelihoods of pangus farming in rural Bangladesh. Aquaculture Asia Magazine, October-December, 2007, 5-11.

Akter N (2001) An economic analysis of pond pangas fish production in a selected are of Trishal upazilla in Mymensingh district. MS Thesis. Department of Agriculture Economics BAU, Mymensingh. 44 p.

Ali MH, Rahman MI (1982) An investigation on some socio-economic and technical problems in pond fish culture in two districts of Bangladesh. *Bangladesh J. Aquacult.* 8(1), 47-51.

Ali MZ, Hossain MA, Mazid MA (2005) Effect of mixed feeding schedule with varying dietary protein levels on the growth of sutchi catfish, *Pangasius hypophthalmus* (Sauvage) with silver carp, *Hypophthamichthys molitrix* (Valenciennes) in ponds. *Aquaculture Research* 36, 627-634.

BARC guide (1997) Fertilizer recommendation guide. Soils Publications No-41. The Bangladesh Agriculture Research Council, Farmgate Dhaka.

Boyd CE (1998) Water Quality for Pond Aquaculture. Research and Development Series No. 43. International Center for Aquaculture and Aquatic Environments, Alabama Agricultural Experiment Station, Auburn University, Alabama.

David A (1962) Brief taxonomic account of the Gangetic *Pangasius pangasius* (Ham.) with description of a new sub-species from the Godavari. *Proc. Indian Acad. Sci*. 34(3), 136-156.

DoF (Department of Fisheries) (2008) Matsha Sampad Unnoyan Ovijan. Department of Fisheries, Dhaka. pp.79-85.

Faruk MAR, Sarker MMR, Alam MJ, Kabir MB (2004) Economic loss from fish diseases on rural freshwater aquaculture of Bangladesh. *Pak. J. Bio. Sci*. 7, 2086-2091.

Mian MRU, Rahaman MO, Ahmmed U (2006) Pangas monoculture and carp-pangas polyculture: an economic analysis of pond fish production in two areas of Bangladesh. *Progress. Agric.*, 17(2), 107-114.

Molla MFA, Haque AKMA (1978) Studies on monthly variations of plankton in relation to the physico-chemical conditions of water and bottom soil of two ponds. *Bangladesh J. Fish*. 1(2), 99-103.

Muir JF (2003) The Future for Fisheries: Economic Performance. Fisheries Sector Review and Future Development Study, Commissioned with the association of the World Bank, DANIDA, USAID, FAO, DFID with the cooperation of the Bangladesh.

Rahman MM (2006) Livelihoods of the people involved in pangasiid catfish (*Pangasius hypophthalmus*) farming in Mymensingh. MS Thesis. Department of Fisheries Management, BAU, Mymensingh. 75 p.

Roberts TR, Vidhayanon C (1991) Systematic revision of the Asian catfish family Pangasiidae, with biological observation and descriptions of three new species. *Proc. Acad. Nat. Sci. Philad*. 143, 97-144.

Saha MK (2003) A study on fish production Technology in North-west Bangladesh. MS Thesis. Department of Aquaculture, BAU, Mymensingh. 71 p.

Saha SR (2006) Status of pangasiid catfish (*Pangasius hypophthalmus*) farmining in Mymensingh region. MS Thesis. Department of Fisheries Management, BAU, Mymensingh. 47 p.

Wahab MA, Faruk MAR, Haque MM, Hossain MS (2008) Paper presented Pangasius (*Pangasianodon hypophthalmus*) farming in Bangladesh: current status and future challenges in the catfish symposium in Can Tho University, Can Tho Vietnam, 5-7 Dec, 2008.