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Assessment of Pond Fishery Resources and Sustainable Development of Fisheries at Sirajganj, Bangladesh

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Abstract: An assessment was conducted in Sirajganj district of Bangladesh to determine the pond fishery resources and sustainable development of fisheries. Researchers observed 123 (56%), 59 (27%) and 37 (17%) of ponds were culture, semi-culture and non-culture ponds and on the basis of the season 192 (88%) of perennial and 27 (12%) of seasonal ponds were found out of 219 during this study period. It was observed that the highest number of ponds 175 (80%) was personal pond which occupied by the single owners and 44 (20%) was leased in pond which privately occupied by the multiple ownership. The range of cost for lease was varied from Tk. 6,000-8,000 acre^{-1}. The average pond fish production from 219 sampling ponds in Sirajganj district was 80.51 kg decimal^{-1}. Therefore, by using sustainable development model, pond fisheries production can be increased to a considerable level and contributes to the national economy.

Key words: Pond fishery, sustainable development, SWOT analysis, Sirajganj district, Bangladesh

INTRODUCTION

Bangladesh has extensive wetlands that form an important fisheries resource. The wetlands are the key to the economy and environment of Bangladesh. Wetlands have great ecological, economical, commercial and socio-economic importance. Thousand of poor and fishers are dependent on these wetlands for their livelihood. Almost all the entire country can be considered as a vast network of wetlands which include rivers, lakes, floodplains, ponds, beels and even seasonally flooded agricultural land. Bangladesh is the drainage outlet for a vast river basin complex made up of the Ganges-Brahmaputra, Meghna river system. The inland water areas include 2,832,792 ha of flood plains, 853,863 ha of rivers, 114,161 ha of natural depressions (Beels) and a further 305,025 ha of pond and ditches (DoF, 2009).

As food security in our country, fishes have played a very important role in improving the socio-economic condition, combating malnutrition, earning foreign currency and creating employment opportunities in Bangladesh. In the rice-fish society, the freshwater capture and culture fisheries have been greatly recognized since the time immemorial. The decline of fish abundance in the rivers system is due to siltation of river beds, flood control and drainage system, irrigation, encroachment on riverbeds for agro-cropping in the dry season, over exploitation due to poverty, government policies for leasing, licensing and sometime lack of control of fishing activity in the river system (Hossain *et al*., 2002). Hossain (1996) has mentioned three problems, viz., crop damage, loss of domestic animals and properties, etc., due to sudden high flood. The capture fishery is decreasing very rapidly on the other hand the culture fishery is increasing due to recruitment of HYV of fish species and higher technological development.

The district of Sirajganj is an important for its wetland and considered as one of the harbor of fish production in the North region of Bangladesh. Bangladesh has got a large number of ponds scattered all over the country. The total area of pond in Bangladesh was 305,025 ha and the total production from pond was 866,049 mt whereas in Sirajganj district was 6,917 ha and 16,265 mt, respectively (DoF, 2009). In Bangladesh, the major constrains to increase fish production are lack of technical knowledge non-availability of credit and multi-ownership of pond (Hussain, 1999).

In sequence on socio-economic framework of the fish farmers forms a good base for planning and development of the economically backward sector. Lack of adequate and authentic information on socio-economic condition of the target population is one of the serious impediments in the successful implementation of developmental programme (Ellis, 2000). Aquaculture practice has become a promising and gainful methodology to attain self-sufficiency in food sector and also to alleviate poverty in developing country like Bangladesh (Ahmed, 2003). A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain to enhance its capabilities and assets both now and in the future (Chambers and Conway, 1992).

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The social content is especially important particularly access arrangement and assessments of benefits to livelihood (Azucena *et al*., 2001).

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). In rice-fish society, rivers and other water bodies have great role to play for the livelihoods of the people of Bangladesh. All poor fishers want fishes in the open water and fish cultivators need quality seeds for better way of stocking and production. The present research helps the fisheries associates and the fisheries scientist for better management of Renewable Natural Resources (RNR). The main objective of this research was to evaluate the pond fishery resources and sustainable development of fisheries at Sirajganj, Bangladesh. The study highlights the development of fresh water pond fish culture through grassroots level. The grassroots level had played a significant role in the process of technology transfer from the district level to the village level.

MATERIALS AND METHODS

Study area and methods of observation: The study was conducted at Sirajganj district of Bangladesh at 24°00'-24°40' North latitude and 89°20'-89°50' East longitudes during the period of July, 2004 to June, 2008 (Fig. 1). The survey was conducted on 219 sampling ponds from 145 growers, 49 villages, 29 union/

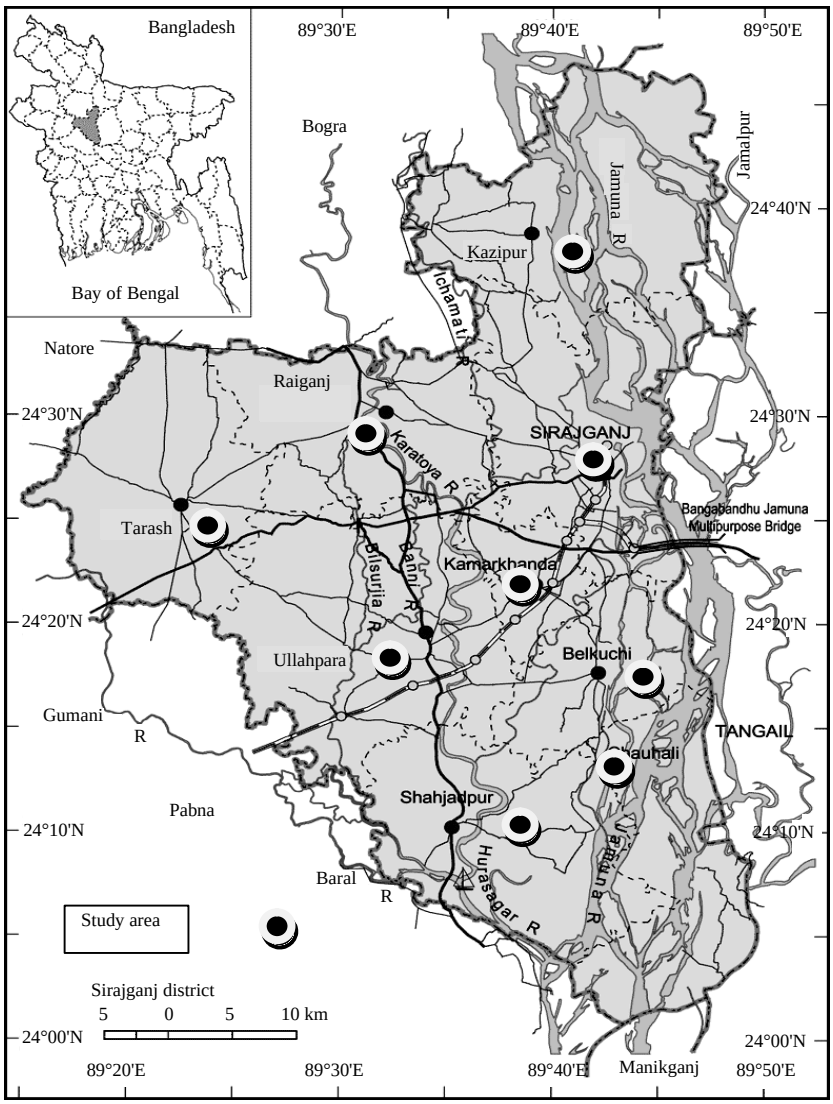

Fig. 1: The study area at Sirajganj district of Bangladesh

municipality and 9 upazilla at Sirajgonj district of Bangladesh. Data were collected through personal visit and oral interviews from the pond owner and growers of those villages following a detailed questionnaire. A questionnaire was made and necessary information collected for studying the pond management and fish production. Literatures and statistical data were collected from District Fisheries Office, Local Government and Engineering Department (LGED) office and Statistical Office at Sirajganj district.

Analysis of data: All of the collected data were accumulated and competitive analysis (SWOT) and then presented in textual, tabular and graphical forms to understand the present condition of pond fisheries, resources. Finally, recommendation for sustainable development model of pond fisheries for better livelihood of fish farmers and conclusion was made from the observation.

RESULTS AND DISCUSSION

Pond fishery resources: There were about 123 (56%) ponds out of 219 observations are culture. These ponds are near or inside the village. The embankments of this pond are high. So, the floodwater cannot enter in to this pond. Fish culture properly practice all the year around. So, this is also called perennial pond. According to fish culture period, there were 192 (88%) perennial ponds and 27 (12%) were seasonal ponds. Khan *et al.* (1991) conducted a study on pond fishery resources and reported that 90% of the ponds were perennial while rests of the ponds were capable of retaining water for 3-11 months in Trisal Upazila. During the investigation, researchers found 59 (27%) ponds were semi-culture and 37 (17%) were non-culture ponds out of 219 observation fish resource ponds in the study area (Table 1). It was observed that the highest number of ponds 175 (80%) was personal pond which occupied by the single owners and 44 (20%) was leased pond which privately occupied by the multiple ownership. The range of cost for lease is varied Tk. 6,000-8,000 acre^{-1}. Zaman *et al.* (2006) recorded that 57.8% was single owners and 42.2% was joint or multiple ownership pond. Hossain *et al.* (2002) reported that multiple pond ownership was a major constrains for pond aquaculture where more than one fish farmer operated 66% ponds. Ali *et al.* (1982) and Ali and Rahman (1986) reported that lack of scientific knowledge, multiple ownership of ponds, attack of fish disease and non-availability of good quality fish fry are a major problems in pond fish culture in Bangladesh.

Table 1: Thana wise percentage distribution of culture, semi-culture and non-culture pond at Sirajganj district of Bangladesh

Names of the Thana	Total number ponds	Culture pond (%)	Semi-culture pond (%)	Non-culture pond (%)
Sirajganj sadar	49	30 (62)	11 (22)	8 (16)
Kazipur	22	5 (23)	12 (54)	5 (23)
Raigonj	34	22 (64)	5 (15)	7 (21)
Tarash	38	34 (90)	2 (5)	2 (5)
Ullapara	25	21 (84)	2 (8)	2 (8)
Kamarkhanda	16	7 (44)	4 (25)	5 (31)
Belkuchi	11	2 (18)	5 (46)	4 (36)
Chauhali	11	1 (9)	7 (64)	3 (27)
Shahjadpur	13	1 (8)	11(84)	1 (8)
Total	219	123 (56)	59 (27)	37 (17)

Fish production: The total pond fish production from 219 sampling ponds in Sirajganj district was 80.51 kg decimal^{-1}. Thana wise average fish production was 8.95 kg decimal^{-1}. The highest fish production was 12.75 (16%) kg decimal^{-1} at Tarash Thana and the lowest was 2.95 (4%) kg decimal^{-1} at Kamarkhanda Thana (Table 2). Zaman *et al.* (2006) and UFO (2000) also recorded that average 7-8 and 10-12 kg decimal^{-1}, respectively at Mohanpur Upazila in Rajshahi district of Bangladesh.

Competitiveness analysis (SWOT): Competitive analysis shows the competitiveness of something in terms of its internal and external factors. Strengths and weaknesses are the internal factors, whereas opportunities and threats are the external factors. This analysis is also called SWOT analysis. Table 3 provides ideas a competitive analysis (SWAT) of the pond fishery at Sirajganj district in Bangladesh for sustainable development as their role is likely to enhance in the near future.

Sustainable development: The development of the pond fishery sector depends on the policy and institutional environment which spans a wide range of laws, regulations, administrative directives, institutions, services, infrastructure support, incentives, etc. 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

Table 2: Thana wise percentage of seasonal and perennial pond and fish production (after multiple harvests) at Sirajganj district of Bangladesh

Names of the Thana	Total number ponds	Seasonal pond (%)	Perennial pond (%)	Fish Production (kg decimal^{-1}) (%)
Sirajganj sadar	49	10 (20)	39 (80)	9.49 (12)
Kazipur	22	0 (0)	22 (100)	11.29 (14)
Raigonj	34	2 (6)	32 (94)	10.05 (12)
Tarash	38	0 (0)	38 (100)	12.75 (16)
Ullapara	25	4 (16)	21 (84)	11.24 (14)
Kamarkhanda	16	5 (31)	11 (69)	2.950 (4)
Belkuchi	11	2 (18)	9 (82)	6.170 (8)
Chauhali	11	2 (18)	9 (82)	9.84 (12)
Shahjadpur	13	2 (15)	11 (85)	6.730 (8)
Total	219	27 (12)	192 (88)	80.51 (100)

Table 3: SWOT analysis of the fisheries sector at Sirajganj district of Bangladesh

S = Strengths	W = Weaknesses	O = Opportunities	T = Threats
Resources and production			
Total pond fishery resources in Bangladesh was 305,025 ha and production was 866,049 mt whereas at Sirajganj was 6,917 ha and 16,265 mt, respectively	Unfortunately, directly affected the spawning and larval rearing of fish in the floodplain. Continued poor land and water use planning without considering fisheries requirements affects fish habitat	With such as a high primary productivity its fish production potential is quite high	During monsoon season it looks like an aquatic orchard. Abrupt change in stream flow, increase in turbidity of water and in flooding will have adverse effect on fish habitat
Biodiversity			
There are 129 species, 66 genera, 29 families, 12 orders of fish are recorded	Biodiversity decreasing in study area day by day. Few years ago fishes were available but now fishes are not available	All these fish species have economic value but there are about 57 species under 34 genera are most economic important	Some species of fishes are endangered or threatened
Fish as food			
Fish and fisheries are inseparable part of their livelihood and food. There is an insatiable demand of fish in the country	People in the community cannot use their product as food due to poverty	Fish in the diet is essential to existing serious malnutrition in the country. It is reported that 94% of Bangladeshi children suffer with malnutrition	They cannot manage cash money without shelling the small catch. Because they need money for their livelihood
Transports (Rail, waterways and highways)			
Its strategic location coupled with modern methods of quick transportation	High cost of transportation inputs and outputs result in consumers paying more for the commodities and producers getting less of profit	Bangladesh can contribute to the global basket and also can play a very important role in HRD and transfer of technologies to African continents	Low price of the product attract the Faria and Baparies but it one kind of threat in their livelihood
Marketing system			
Fish landing center (15 major and 83 small landing centers); fish consumer market; transporting center	High cost of marketing results in consumers paying more for commodities and producers getting less profit. Middlemen make substantial profits	There is a possibility to develop the cooperative marketing network which will be reducing the marketing cost	Some of the local power group may to help to develop such cooperative marketing network
Post-harvest management			
Fish is generally preserved in ice, drying, sometime short time preserved in hapa	Ice factories or fish processing centers are not found	Need to develop processing factories for local or foreign market. Financers are available locally	Threat is there because of social conflicts in locality as well in the country
Consumer			
Majority of the consumers they prefer small fishes which is economically accepted. Big fishes are generally outside of Sirajganj	Big sized costly fish are not getting good price due to want of proper consumer or economically well to do people	Proper packing may help to get better price at the distance market. Some of the local people they are also parched at higher price	Quality loss due to low or below standard presentation
Ownership			
Privately owned; very few fishers cooperative; some are khas water; multi-ownership, etc.	Open access to natural resources results in over exploitation and multi-ownership of ponds results at times in apathy to develop the resources for productivity	Management system can improve the existing situation	Still need mental development to adjust the conflict condition
Sanctuary	Not properly maintenance	Need protection and maintains	Fish kill by poisoning or illegal flu
Cooperative endeavor	Fisheries are large need to cooperative endeavor for operation but cooperative movement has not yet gained	Possibility is there to organize the cooperative society	Power group in the society is more power full to disorganize the cooperative society
Water pollution	Country suffers seriously with heavy aquatic pollution; recorded 1,200 industries are generating wastewater and discharging in the aquatic ecosystem	Aquaculture can profitably utilize ever-increasing wastewater in the country if it is integrated suitably with sewage effluent	Pollution will increase with increasing human and animal population; untreated sewage could become the most serious source of aquatic pollution
Others			
Women had a strong incentive to struggle to obtain and retain their rights; a long-term structure for credit was provided by NGOs for women groups (15-50 people)	A long-term institutional structure for credit was not found for fishermen's groups (50-250 people); NGO and civil society organizations gave poor support to women establishing their users' rights	Increased income for fishermen through semi-intensive fish culture; training in CPR method and fish culture systems; additional income was ensured for women from fish culture and gardening	Renewal of lease is an opportunity for powerful entities to lobby and deny renewal; poor cohesion in a group of fishermen would lead to the apparition of new elite of fishers, taking a higher share of fish income

function of various inputs used and production practices (Chowdhury and Maharjan, 2001). There are many management factors responsible for improvement pond fish production at Sirajganj district in Bangladesh and could be classified into 5 major groups:

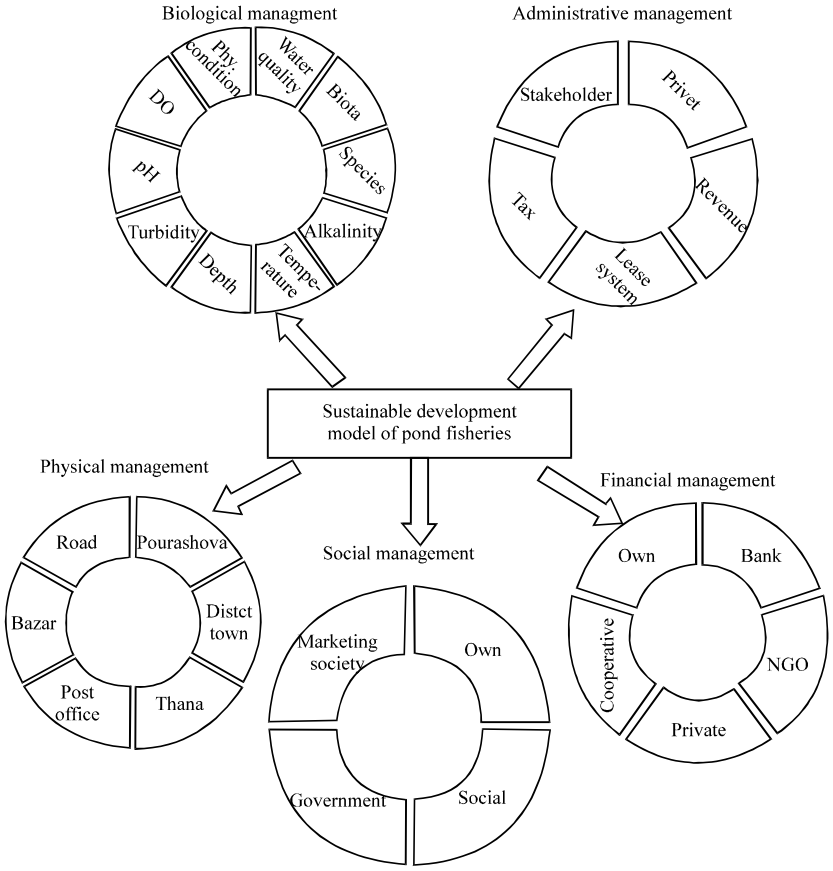

Fig. 2: Sustainable development model for improvement of pond fisheries by the developing different management system

- Biological management
- Administrative management
- Physical management
- Financial management
- Social management

All these management factors and their inter relations are represented as a sustainable development model in the Fig. 2. Sustainable development and production of pond fisheries sector are sustainable only if complemented with adequate support services. Training, extension, credit, skilled human resources and market infrastructure lay the groundwork for increasing productivity and competitiveness. The adoption of a technology depends on the characteristics and preferences of the individual, the technology and the environments within which an individual adopts the technology (Rogers, 2003).

CONCLUSION

The pond fisheries production can be increased to a considerable level, properly planned and well managed development of it should be able to contribute significantly to an increase in protein food supplies at reasonable prices. Most of the ponds are suitable for fish culture. So, all pond resources should be well managed and utilized for getting maximum yield by using sustainable development model. Consequently, if fishers adopt improved fish culture technology and management then fish production will be amplified and contributes to the national economy.

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