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AQUALCULTURING IN MYMENSINGH DISTRICT: A SOCIO-ECONOMIC IMPACT ANALYSIS

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Abstract: The study examines the socioeconomic impacts of freshwater aquaculturing in the Mymensingh district. The study has attempted to compare fish farming with much practiced alternative paddy farming regarding some social factors such as health and education. As compared to paddy farmers fish farmers have spent higher amount on health and on education that creates some external benefits. Fish farmers are now able to avail themselves with the opportunity of improved health services and better education. Directly and indirectly freshwater aquaculturing generates employment opportunities in this region. Nutritional attainment and increased earnings play significant roles in alleviating poverty in this region. Among many problems of fish cultivation lack of supply of hassle-free and low interest credit as well as little access to credit-market have appeared as major ones.

Key words: Aquaculture, Health, Education, Income, Profitability, Pangas, Farm Management.

Introduction

In the economic development of an agro based county like Bangladesh the contribution of fishery sub-sector is very important and prospective. This sub-sector's role to the national economy is increasing day by day. The contribution of this sub-sector to GDP is almost 3.7 percent. It accounts for 22.23 percent of total income of agricultural sector. In 2008-09 the average growth rate of fishery sub-sector was approximately 5.4 percent. However, the past record of growth of this sub-sector was much impressive with annual average 10 percent growth rate. The fishery sub-sector accounts for approximately 3 percent of total national export earnings. Apart from its contribution to the GDP, it is more important in

the national economy as it provides the population with nutrition and employment opportunities. Fish account for 60 percent of the animal protein consumed by the population. Moreover, approximately 10 percent of the total populations directly or indirectly earn their livelihoods from this sub-sector. Analyzing the production records of last ten years, total production of this sub-sector was 16.61 metric ton in 1999-2000 whereas the production jumped to 27.01 metric ton in the year of 2008-2009 (Rahman, 2010).

Mymensingh was one of the 22 districts targeted by the Department of Fisheries (DoF) under the ADB-financed Second Aquaculture Development Project for the dissemination of improved fish culture practices, using semi-intensive carp polyculture pond technology, through the establishment of demonstration fishponds and farmer-to-farmer contact. According to the Mymensingh district fishery office, in 2009, there were a total of 111,695 fish farmers in the district with 99,570 male and 12,125 female. There were 1,871 commercial fish farms. To provide fish-fry there are 7 government and 85 hatcheries. For some comparative advantage Mymensingh district produces more fish than its demand in every year. Total fish production of the district in 2009 was 196,595 metric tons of which 105,751 metric tons was consumption demand and 90,844 metric tons was surplus. The growth rate of total production is 4.7 percent. The number of fishery loan-recipients increased by 73 percent, from 1,686 in 2008 to 2,915 in 2009. Most of the surveyed farmers said that if fishery loan was available to them they could produce more fish. Mymensingh has benefited from the Mymensingh Aquaculture Extension Project (MAEP) financed by Danish International Development Assistance. Small-scale fresh water pond aquaculture has also been benefited from sustained efforts of extension services through various development projects funded by the Government, bilateral agencies, and multilateral organizations in collaboration with DoF. Aquaculture development initiatives in the Greater Mymensingh area have focused on the dissemination of technology for fish seed production and grow-out.

As the study purposively focused on some socioeconomic aspects of aquaculturing in Trishal *upazilla*, it is pertinent to introduce some facts and figures of Trishal *upazila*. According to Trishal *upazilla* fishery office in 2009 there were 6,020 fish farmers with 5800 male and 220 female. There were 11,475 non commercial and 810 commercial ponds. There were only 265 farmers who received loan (4.4%). This *upazila* produces

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more surplus fish. In 2009 the surplus production was estimated 30,595 (80.9%) metric tons out of a total production of 37,795 metric tons.

Objective of the Study

The main objective of the study is to assess impact of aquaculturing on the fish farming households including an assessment of the relative profitability of fish farming vis-à-vis paddy farming and the impact on health and education due to increased earnings from fish-farming. The study attempted to find possible problems of fish farming as well.

Methodology

The study is based on a survey of fish and paddy farming households, secondary data, and key informant interviews with farmers, fish traders, seed traders, fish harvesters and peasants. The survey involved 200 fish farming households owning individually managed ponds and 100 paddy farming households owning individual land and cultivating on share cropping basis. Household respondents were selected randomly from 3 *Upazilas* of Mymensingh district namely Trishal, Bailor and Mymensingh Sadar. In these *Upazilas* there are no intensive extension support and where small-scale pond fish farming was practiced. In order to avoid bias due to direct assistance, the respondents were selected among those who had not been appointed by DoF as demonstration farmers or as extension contact agents. Although the data were collected from the above mentioned places but more emphasis has been given on Trishal *Upazila* purposively. The research is biased towards the catfish *Pangas* culture as *Pangas* culture is dominant in these places. The survey, including the preparation and testing of questionnaires, took place in June 2010. The data were collected, summarized, tabulated and analyzed according to the objective of the study. A tabular method of analysis was followed in analyzing the collected data.

Operation and Management of Fish Farm

Most households, including those of marginal and small-scale farmers, have ponds. Who don't have own pond lease in ponds or make contact with the pond owner on profit sharing. The former seasonal ditches have nearly been converted into at least traditional extensive aquaculture by stocking them with the readily available fingerlings distributed by seed traders. New ponds are being dug on paddy farming land as aquaculture sees brisk profit compared to paddy farming. In extensive farming, little pond management is undertaken following the stocking of fingerlings. However, fertilizers and supplementary feeds for pond culture are readily available. As a result of widespread promotion of improved pond

management practices, fish farming has become generally semi-intensive with provision of nutritional inputs for stocked fish through pond fertilization and provision of supplementary feed. Apart from traditional feed, more commercial feeds are used because of its quick supply and availability. Fertilization of fishponds with cattle manure stimulates the growth of plankton in the water and of microorganisms and invertebrate animals on the bottom. The plankton and benthic organisms serve as food for filter-feeding carps and bottom-feeding carps, respectively. Although manure has alternative uses as a fuel and a crop fertilizer, many villagers use it as a pond fertilizer because of the profitability of fish farming. But for large farming manure is rarely used because of its low supply. Households generally own livestock that are fed on wayside vegetation, rice straw obtained from sharecropping, and other agricultural wastes. The most common supplementary feeds used in fishponds are rice bran and mustard oil cake, which are readily available on-farm or in local markets. In addition, grass carp a common component of polycultures of indigenous and alien carps, is commonly fed with on-farm vegetation such as grass, banana leaves, and duckweed. In the surveyed area it is found that most of the farmer culture fish whatever polyculture or single culture, once a year. Single cultivation per 1.2-2 year is more profitable but it requires much more investment and longer payback period. Uncertainty about future price of fish and feed is another setback for more long-period cultivation. Lack of capital is the major stumbling block both for short-period cultivation and long-period cultivation.

Popularity of Catfish *Pangas* Culture.

Of the 200 fish farming households included in this study (Table 1), 53 percent farmer were involved in single catfish *Pangas* culture, 38 percent in *pangas* with other carp culture and only 7 percent were involved in only carp culture. Only 2 percent households reported that they were involved in nursing fry. If we consider *pangas* culture solely and jointly with other carp culture it accounts for 91 percent of the total surveyed farmers. *Pangas* culture is being popular among marginal farmers and less-endowed farmer as it can be cultured profitably in relatively small ponds. Compared to the other carp cultures *pangas* has higher growth rate and it involves shorter payback period on investment. Due to shorter payback period investment, relatively higher growth rate and possibility of small scale operation and polyculture with indigenous and alien carp fish, the *pangas* culture is reported to be popular among the surveyed households.

Table 1: Different types of fish culture.

Type of culture.	No. of respondents.	%
Only <i>Pangas</i>	106	53
Only Carp	14	7
<i>Pangas</i> with Carp	76	38
Nursing Fry	4	2

Source: Field survey

The data revealed that the majority of the farmers (87%) were attracted to fish farming because of its relative profitability and 20 percent because it provided protein for own consumption. Those who culture fish only for attainment of personal nutrition use on-farm feed. *Pangas* is cultured with the popular indigenous Indian major Carps, Catla, Rohu, and Mrigal, and alien species, including the Chinese Silver Carp, Grass Carp, and common carp. Other alien species grown in fishponds include the Silver Barb, locally called Shorputi, and Bighead Carp for household consumption.

Frequency of Harvest

In response to the question about the frequency of harvesting, majority (76%) of the respondents reported that they harvested twice per year and 26 percent responded that they harvested once per year. Whereas 50 percent paddy farmers reported that they harvested thrice per year and 46 percent reported twice per year. Only 4% households reported once per year. From the above findings it is evident that partial harvesting is common in paddy farming. In the interview session it was observed that those households had bigger pond size and sufficient capital tended to practice single harvesting. Single harvesting is relatively more profitable as fish get enough time to grow optimally.

Income and Profitability

Income and profitability heavily depend on the fish yield. The respondents frequently alleged that the quality of feed sold in the market varies. Sometimes the proclaimed quality written on the feed sack doesn't remain true and for the low quality feed fish yield doesn't reach up to the mark. The yield depends on the prevalent of disease, quality of water, size of pond, feed ratio as well. The productivity of fishponds of the surveyed farmer was high. The average annual *pangas* production per one-*bigha*-size pond was approximately 5 ton. During the interview period the average market price of *pangas* was Tk 64/kg whereas, the production cost per kg was on an average Tk 49. On an average 7.4 *bigha* land per farmer was devoted to fish farming in the surveyed

households. Every farmer on an average made a profit of Tk. 72,900/*bigha* at margin of 29.7 percent. Although the profit rate of alternative paddy cultivation is higher (91.04%) but profit in fish culture is many times higher. Our survey result shows that on an average profit/*bigha* in paddy cultivation is Tk. 4095.4 (average profit per harvest) $\times 2.47$ (average frequency of harvest) = Tk.10115.63. Profit (Tk.72,900) of same size of land engaged in fish cultivation is 7.20 times higher.

Market Pattern for Freshwater Fish

In the surveyed area it was found that the markets for freshwater fish involved primary, secondary, and retail markets. The whole market chain includes local fish traders and sales agent in primary level, wholesalers-distributors in the secondary level, and retailers. Depending on the transaction volumes, fish farmers usually sell their fish to local traders or fish collectors who then sell to wholesalers-distributors with or without the help of commission based sales agent. Small farmers and local traders also sell their fish at village markets to consumers. This type of transaction takes place normally for small quantity. Local traders-collectors usually sell their fish beyond their village at *upazila* markets to commission agents or to wholesalers, who transport the fish to urban fish markets by road, rail, or boat. Auction sales at villages and other markets are common. At urban fish markets, wholesalers also sell to other wholesalers who transport to far flung areas. The surveyed sellers reported that fish were carried to other districts as Sylhet, Dhaka, Kushtia. Retail sales are made at retail stalls in fish markets, roadside stands, and door-to-door to household customers. The physical conditions of fish markets are poor, they function efficiently and market intermediaries are competitive. Fish farmers' prices at farm gate are no less than 50% of the consumer retail prices, reflecting a short chain of intermediaries between primary suppliers and consumers. The duration between harvest and retail for local markets is usually less than 24 hours. The marketing chain for fish is short, with most of the farmers selling their fish locally, either in their own village or at an *upazila* market. Farmers sold their fish at the farm gate to collectors, wholesalers, and local agents, and at the village or *upazila* markets directly to consumers. Most of the surveyed farmers (75%) did not sell directly to consumers, but dealt with market intermediaries. None of the surveyed farmers sold fish beyond their *upazila* because of distances, inconvenience, transportation constraints, and risk of loss due to unexpected events.

Small-Scale Aquaculture Enterprises

Owner-operated small enterprises with intensive fishponds have rapidly increased since 1997 in Mymensingh. Most of the surveyed respondents reported about starting fresh water aquaculture after 2000 (Table 2).

Table 2: Year of inception of fish farming.

Year of starting	No of respondents	%
Before 2000	20	10
2000-2002	60	30
2003-2005	74	37
2006-2008	34	17
2009	2	1
	N=200	

Source: Field survey 2010.

Most of the farmers started fish farming as secondary occupation but due to its relative profitability they are now taking it as primary occupation. Only 20 percent of the respondents reported fish farming as their primary occupation. Those reporting fish farming as their secondary occupation were mainly engaged in teaching (10%), business (40%), grocery (6%), paddy farming (10%), studentship (4%), and service (10%). Current contribution to freshwater aquaculture production in the surveyed area is limited, although there is ample scope of future growth. A more intensive fish farming system has emerged in some small areas, in which paddy fields in low lying areas, especially in *Nama Trishal*, have been converted into ponds and existing ponds made more productive with the use of commercial feeds.

Employment Generation

Apart from direct self-employment opportunities from fish farming, freshwater aquaculture offers diverse livelihood opportunities for operators and employees of hatcheries and seed nurseries, and for seed traders and other intermediaries. Labor is needed for pond construction, repairs, and fish harvesting. The total number of people benefiting from direct employment in aquaculture is difficult to estimate because households are rarely engaged full time in fish farming. The average pond size of the surveyed households is 7.4 bigha and during the whole year the average labourer required is 2.3. Employment opportunity is much higher in fish farming compared to paddy farming as paddy farming requires more labor only in harvesting period. The study data reveal that for per bigha of paddy field one labourer is required, not all through the season. However, employment opportunity in fish farming is more

permanent than that in paddy farming. Fish farming in this region is generating commercial employment opportunities directly and indirectly. Indirectly much more employment opportunities are being generated as more transportation and labour is required to handle fish processing at various stages and in fish market. Much of the employment benefits accrue in rural areas and include the poor. Thus, the contribution of freshwater aquaculture to rural livelihoods is far reaching in Bangladesh.

Impact of Aquaculturing on Education

Expenditure on education is considered as investment in human capital as it has a close link to productivity thereby enhancing earnings. Increased productivity gained through investment in human capital contributes to GDP of any economy. Education has wide spread impact on other sectors as it has huge positive externality. The external benefit from education might include speaking a common language that facilitates communication with others; knowledge of laws and customs that facilitates in transactions with others; acceptance of a common set of values that improves the stability of system; and improved understanding of social processes that leads to better informed political decisions (Browning et.al). There is a close association between education and health and crime. To explore whether any improvement in educational status of children of fish farmers has been made, the study attempted to compare the educational status of children of fish farmer with that of paddy farmer's children. It was found that in educational attainment of children of fish farmer excelled the children of paddy farmer. The study findings suggest that 17 percent of paddy farmers' children don't go to school even they appeared at the school going age whereas this rate is only 1.4 percent for fish farmer. Fish farmers are reported to be able to bear the educational expenses of their college and university going children. Honours and degree level educational attainment rate 18% for fish farmer whereas this rate is only 3% for paddy farmer (Table 3). Among total surveyed fish farmers in the present study 186 farmers had either children or dependant currently pursuing education. Of total surveyed farmers, 53 percent farmers who had education-pursuing dependants reported that fish farming had brought positive impact on educational attainment. Farmers can provide better education sending their children to better educational institutions and spend more on educational instruments. Most of the farmers responded that they could keep house tutor for their children/dependants which was not possible prior to be engaged in fish farming.

Table 3: Educational status of children of fish farmer and paddy farmer

Educational status of children	Fish farming households		Paddy farming households	
	No. of children	%	No. of Children	%
Primary (class I-V)	48	32.6	40	33.9
Secondary(class VI-X)	51	34.7	39	33.1
Higher secondary (class XI-XII)	26	17.7	14	11.9
Under graduate: University/ University college	18	12.2	03	2.5
Graduate: University/ University college	02	1.4	02	1.7
No education	02	1.4	20	16.9
	N=147	100	N=118	100

Impacts on Health

Health is the key socio-economic factor to determine productivity and readiness to work. Health is an important form of human capital. It can enhance workers' productivity by increasing their physical capacities, such as strength and endurance, as well as their mental capacities, such as cognitive functioning and reasoning ability (Bloom et. al, 2005) A less healthy worker always contribute less to the total output. Many workers show up for work even when they do not feel well or are worried about a family member who is ill. In addition to creating a heightened risk of injury or spreading of infectious diseases, such "presenteeism" exacts an economic price as well, in reduced productivity or output (Davis et. al, 2005). Table 4 depicts the present condition of health care access of fish and paddy farming households. Both types of households have same type of access to health care service. Highest percent of households have access to government hospitals. Compared to paddy farming households, fish farming households clearly appreciated the benefits that aquaculture had brought to their welfare. Health services have improved immensely these days due to their surplus monetary support which they now can manage for themselves. In the in-depth interview with fish farmers, they reported improved condition of health because of nutrition intake and better health care as their income level had increased significantly after the engagement in fish farming. From the survey findings, the average household expenditures on health care are estimated to be Tk 15995 and Tk 9828.6 per year respectively for fish farmers and paddy farmers. Thus it is evident that fish farming households spend more on health and have better access to health care

services. In answer to the question whether fish farming brought any positive impact on health care, half (50%) of the respondents reported in affirmative.

Table 4: Access to health service of the respondents

Health Service Access	Number of fish farming households	%	No. of paddy farming households	%
Only Government Hospitals	62	31	30	30
Only Private clinics	34	17	14	14
Both government hospitals and private clinics	40	20	12	12
Government hospitals and Pharmacy/Quack	15	7.5	14	14
Pharmacy/quack	32	16	20	20
Others	17	8.5	10	10
	N=200	100	N=100	100

Financial Position

Almost two thirds (72%) of the respondents relied on their own financial resources for operating fishponds. The others obtained a small credit from various sources including moneylenders, relatives, friends, non-government organizations, Bangladesh agriculture bank, cooperatives, and government-sponsored programs. The survey reveals that the rate of borrowing is 31% but the district average rate of fishery loan receiving is only 2.6 Percent. Several factors remain active behind this low loan receiving rate. With regard to the reasons for not accessing financial assistance, few respondents mentioned that they did not need it. Others, however, mentioned the complex procedure as the main reason for not approaching credit. Since there is a close association between availability of capital and profitability, supply of more hassle-free credit is to be ensured.

Problems in Fish Farming

About 50 percent of the respondents believed that they could produce more fish mainly by improving pond management, using more inputs and better seed, and gathering further knowledge of fish farming. Supply of feed, labor availability, water quality and supply were in favour of the farmers but they reported fish diseases, fish predation and mortality, marketing, fall of fish price, increase of feed price, low quality of commercial feed as the obstacles. However, farmers faced constraints related to access to; ponds, credit, better quality food and to transportation, low-priced inorganic fertilizers, lack of fish fry and so on.

Table-5: Problems faced by farmers in fish farming (multiple responses).

Problems	No. of respondents	% of respondents	Rank
Fall of fish price	32	16	5
Increase of feed price	38	19	4
Marketing	4	2	7
Fish disease	78	39	1
Transportation	40	20	3
Lack of access to credit	22	11	6
Lack of capital	44	22	2
Inadequate supply of Fish fry	32	16	5

From the above table, it is palpable that fish disease is the top ranked problem and followed by lack of capital. Third problem is related to transportation as local infrastructure is not very improved. Farmers have to bear hassle to carry their produced fish to *upazila* or *zilla* fish market. Access to credit market is another severe problem in fish farming. Large scale farming is more profitable than small scale but as most of the small farmers don't have access to credit market they can't be more profitable. They reported administrative tangle in receiving loan from government bank and high interest rate for micro credit institutions as the main hindrances behind accessing loan. Most of the respondents (69%) mentioned that they didn't receive loan from any institution inspite of the fact that they needed it badly. Only 31 percent respondents received loan and most of them from Bangladesh Agricultural Bank. A few percent respondents received loan from micro credit lenders.

Facilities Wanted

Most of the respondents mentioned that if they were provided with some government facilities they would be able to produce more. Most of the (86%) respondents reported that they didn't get any kind of government facilities. Rest of the respondents (14%) mentioned that they received training and bank loan. They wanted facilities like training on fish farming (23%), hassle free low interest bank loan (79%). They wanted subsidy on feed, medicine and fish fry (16%). Infrastructural development (1%) and subsidized electricity (5%) are demanded by few respondents.

Conclusion

Fish play an important role in the economy of Bangladesh directly contributing to GDP and to employment generation. Its effect on poverty reduction in rural areas is pervasive. Along with the reduction of poverty

it paves the way of standard of living as a good chunk of income earned from fish cultivation is being spent on education and health. The survey finds the insufficient supply of credit and technical knowledge. Among the eight goals of Millennium Development Goals (MDG) targeted to be achieved by 2015, poverty reduction and attainment of nutrition are the two major goals. To attain these goals Bangladesh government has put emphasis on the fishery sub-sector that is very commendable initiative. In this regards the supply of capital through hassle-free micro credit and dissemination of technical knowledge have to be enhanced. Situated in the delta of the Brahmaputra, Meghna, and Ganges rivers, the climate, water, and soil conditions of Bangladesh are favorable for inland fisheries and aquaculture. To reap the complete benefit of this comparative advantage, government organizations and the NGOs have to come up with appropriate supplies, modern technology and policy measures.

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