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Contemporary aquaculture and management practices in abhaynagar upazila, jessore, Bangladesh

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Abstract
The study was conducted to assess the current situation of aquaculture practices in Abhaynagar upazila, Bangladesh. All data were collected from 50 fish farmers randomly for four months through personal interview and participatory rural appraisal (PRA). Results revealed that 70% farmers cultured Indian major carps (Polyculture), 26% Freshwater prawn with carps and 4% cultured tilapia (Monoculture). Average pond size was 0.8 ha and depth 2.5–3.0 feet. 20% of aquaculture land was leased at BDT 30,000/ha/yr. Doses of fertilizers (kg/ha) varied from 6,000-8,000 for cow dung, 75-100 urea, 50-70 TSP. Stocking season was May to June (average 30,000 fingerlings/ha). Dominated species were Rohu (14%), Mrigal (13%), Silver carp (16%), Mirror carp (12%) and Tilapia (11%). For supplemental feeding rice bran (2500 kg/ha), oilcake (450 kg/ha) and wheat bran (500 kg/ha) were used. November to January was the harvesting period (average production 1990 kg/ha/yr). Major constraints identified were high feed-labor-transportation cost, lack of capital and technical knowledge that are to be addressed to enhance fish production.

Keywords: Aquaculture, fish farmer, constraints, abhaynagar upazila

1. Introduction
Bangladeshi people are popularly known as “Mache Bhate-Bangali” or “fish and rice makes a Bengali”. Fish is the second most valuable agricultural crop in Bangladesh and its production contributes to the livelihoods and employment of millions of people. Fisheries and aquaculture sector have emerged as the second most important contributors in export earnings of Bangladesh. The culture and consumption of fish therefore has important implications for national income and food security. The contribution of fisheries sector in Bangladesh is 3.6% of Gross Domestic Product and 24.41% in agriculture [1]. The total production value of fish in our Gross National Product (GNP) is BDT. 20567.90 Crore [2] and Bangladesh is ranked 5th in world aquaculture with its estimated production of 41.34 lakh MT in 2017-18 [3].
The fisheries sector in Bangladesh is broadly divided into four sub-sectors- inland capture, inland culture, mariculture (artisanal fisheries) and marine industrial fisheries. Bangladesh is one of the world’s leading inland fisheries producers and has a huge water resource all over the country in the form of small ponds, ditches, lakes, canals, small and large rivers, and estuaries covering about 4.34 million hectares [4]. Freshwater aquaculture involves pond aquaculture (inland water body) especially the polyculture of native and exotic species such as carps, catfish, trout, tilapia etc. Carps and catfish are commercially cultured in inland water bodies. Polyculture is now the most common practice of carp culture as several species combinations and stocking rate has been developed [5]. Polyculture is the system in which fast growing compatible species of different feeding habitats are stocked in different proportion in the same ponds [6], which is an established popular way to raise fish production.
Finfish culture technology in Bangladesh is traditional, but popular practice. This culture method is based on the principle of stocking compatible species of carps in the same water body where no competition takes place. Growth and production of fish may be highest in polyculture than in monoculture due to the utilization of available natural food and provided interactions among species. In unbalanced condition, the system is affected in different ways according to the food chain level where the imbalance occurs [7]. Polyculture may produce an expected result if the fish with different feeding habits are stocked in proper ratios and Combinations [8].

Freshwater fisheries play a significant role in the livelihoods of rural and poor people of Bangladesh [9]. Fish farming has been proved a profitable and attractive business comparing to the rice or other agricultural cultivations. Therefore, many rice farmers are converting their fields into fish culture ponds [10, 11]. Now a days, considerable effort is being made through research and extension delivery system to increase fish production. But actual increase in fish production largely depends on the activities of the fish farmers. It is estimated that in Bangladesh fisheries and related activities support more than 7% of the country's population where 1.46 millions are fish farmers, 1.36 million inland fishermen and 0.08 million fry collectors [2]. The behavior of the farmers is influenced by his personal, economic, social and physiological circumstances. An understanding of the influence of characteristics of the fish farmers on their adoption of modern aquaculture practices is necessary to increase the yield of fish.

Jessore is one of the most important districts for aquaculture and fish propagation in the division of Khulna, Bangladesh. Abhaynagarupazila is one of the eight upazilas of Jessore district surrounded with the area of 247.21 km^2 and located in between 23°07´ and 23°15´ north latitudes and in 89°18´ and 89°34´ east longitudes. Based on the location it could be one of the ideal fish production areas of Bangladesh. Although the involvement of large numbers of people in fish farming with available huge fisheries resources surprisingly, no study of present fish farming status, available fisheries resources, and emerging problems in that area is reported yet. Therefore, the present study was carried out to assess the present fisheries resources, fish farming conditions, livelihood status of fish farmers and major constraints faced in the fisheries sector in the Abhaynagar upazila, Bangladesh.

2. Materials and Methods

2.1 Selection of the study area

The study was conducted at Abhaynagar upazila under the Jessore district in Bangladesh (Figure 01). About 50 ponds were taken under the survey and these ponds were situated at 8 Union and only one Nowapara municipal. More specifically, the village namely Gazipur, Sadarpara, Akterpur, Gramtala, Kadirpara, Payra, Vulapata, Sundali, praimbag, Siddipasha were selected. Finally data were collected from 50 farm owners living near the farm randomly covering the selected study area. This area was selected considering the following factors:

- Large number of ponds and finfish farms in this area.
- Fish culture is a rising trend in this area.
- There is an easy communication facility.
- No research was conducted before in this aspect.
- The study area was not far away and thus it was less expensive as well as easier for data collection for the researcher.
- Social norms and common believes were well known by the researcher.

Fig 1: Map showing the study area of Abhaynagar upazila, Jessore

2.2 Category of fish farmers as sample / target groups

The fish farmer communities were divided into two distinct groups such as:

a) Professional farmers
b) Subsistence farmers

Fifty interviewees were selected randomly from professional and subsistence farmers groups and relevant data were collected once weekly throughout the study period. Key informants were Fisheries Officers (UFO) in Abhaynagar upazila, Jessore.

2.3 Design of questionnaire

According to the objective of the study a draft questionnaire (consisting of two parts, one is for farm owners and another is for local people living near the part) was prepared to collect the relevant data. Some questionnaires that were used in such

types of study by other researchers were also studied to have some idea to make a well development questionnaire.
Initially prepared draft questionnaire was tested with 5 farmers by the researcher himself. In this pilot survey, much attention was given to any new information, which was not designed to be asked but was important and information towards the objectives of the study. Thus some parts of draft questionnaire was improved, re-arranged and modified according to the experiences gained from the pilot survey.

2.4 Types of data collected
Information on carp culture systems, socio-economic condition, educational background of the fish farmers and physical condition of ponds such as size of the pond, water depth and dike etc were collected. Data related to pond preparation such as drying, cleaning, liming and fertilization were collected from interviewing the farmer directly. Management data including stocking density of fry, species composition, size of fry, feeding, fertilization, disease control etc were collected. Production and cost of carp farming were recorded.

2.5 Collection of data
Data were collected by direct interviews. With a set of interview schedule designed for this study, each respondent was given a brief introduction about the nature and purpose of the study during the interview. Besides, the researcher asked the questions systematically in a very simple manner with explanations wherever needed.
For the present study, PRA (Participatory Rural Appraisal**)** tools such as FGD (Focus Group Discussion) was conducted with farmers, hatchery operators and informant to get an overview of the culture and management system of finfish species. FGD is a group meeting where fish farmers, hatchery operators and key informant from the target groups were discussed on selected on topics. A total of 5 FGD sessions were conducted in Abhaynagar Upazila under Jessore where each group size of FGD was 7 to 10 persons. FGD sessions were held on the front of the village shops, under the big trees, farmer's houses and tea stall wherever there was spontaneous gathering.
Having interviews with respondents, it is necessary to cheek the information for verifying the collection data. If there were such items, which had been contradictory, then information were collated from key informants. Cross-cheek interviews were conducted with key informants, such as school teachers, local leader, Upazila Fisheries officers (UFOs). Key informants interviews were conducted individually. The interviews of respondents were conducted in their offices and houses.

2.6 Problems encountered during data collection
During the period of data collection the researcher himself encountered the following methodological problems:

a. Most of the farmers in the study area had no idea about a research work and it was therefore, difficult to explain the purpose of this research to convince them.
b. Most of farm owners do not maintain written record of their farms. So, the collect data were completely dependent upon the memory of the farmers.
c. Many farm owners were unaware and illiterate so that they hesitated to answer the questions and also were to co-operate.
d. Most of the farm owners were not interested to give accurate cost, investment and production data.
e. Researchers also faced communication problems as unavailability of vehicles and roads.

2.7 Analysis of data
All the collected data were analyzed statistically using "R" software and "Duncan New Multiple Range Test". Analyzed data were presented in graphical and tabular forms.

3. Results and Discussion
3.1 Status of fish farmers
During the PRA, it was known that the culture of fish started at Jessore region by rich people in leased ponds. Observing the fast growth, high yield and net profit, many local farmers and young educated people became motivated and started fish farming. During the survey it was found that 14% farmers started finfish farming in 2012-2013 semi-intensively way and others traditional way, 26% farmers started in 2006-2007, 48% in 2001-2002 and 12% in 1996-1997. In the study area, out of the 50 fish farmers (randomly sampled), 82% were found practicing fish farming on commercial basis, whereas 18% was found as noncommercial. There were 70% farmers who were solely engaged in finfish farming and agriculture production, 10% took business as their main occupation, and rest 15% were service holder and other occupation. These observations are nearly similar with the findings of Quddus *et al.* (2000) [12] and Hussain *et al.* (1987) [13].
Knowledge of the age structure of fish farmers is important in estimating potential productive human resources. In the present study it was found that most of the farmers (44%) belong to the age group 31-40. [14] Kaiya *et al.* (1987) stated that fish culture efficiency varied with the age and number of owners' pond. Rana (1996) [15] found in his study in Sirajganj district that 70% ponds farmers were within 18-45 age groups which conforms the present findings.
Literacy level of pond farmers can play a vital role in efficient management and profitable fish production. From the study, it was found that 6% could not write their name and 4% were capable of doing this only. Besides, 64% had primary level of education, 16% had SSC (Secondary School Certificate), 10% had HSC (Higher Secondary Certificate), 2% had BA (Graduation) and above educational level was absent. The reported literacy rate was found higher than the national adult literacy level of 57.9% [16]. Although, Hossain (2001) [17] and Abdullah (2012) [18] reported similar observations.
In the present study, about 42% acquired fish farming experience from friend and neighbors and others 8% received short training from DoF (Department of Fisheries) although the majority of the (50%) farmers learnt by themselves. Rahman (2003) [19] and Saha (2006) [20] also stated that most of the fish farmers learnt by doing.
Ownership of pond is an essential factor making smooth decision regarding fish farming. During the survey, it was observed that lease value of land was BDT 30,000 /ha/yr which varied with the location, productivity and pond size. Results showed that 32% of farmers had own pond without partnership, 20% had leased ponds and 48% had owned and leased water bodies which is similar to the study of Quddus *et al.* (2000) [12].

3.2 Fish culture strategies
In the experimental area, farmers practiced fish farming in three different ways. Most of them follow polyculture (60%) of different finfish species, small portion of farmer practiced

crop-rotation (35%) and a very small portion of farmer practiced monoculture (5%).Similarly farmers of Maura (35%), Faridpur (20%) and Sariatpur (25%) upazila followed crop-rotation method in fish farming [21].

According to the interviewee, the best season of fish farming in the study area was February to May. Fish fingerlings are stocked in May to June and harvested from November to January. From the survey, it was found that 70% farmers cultured Indian major carps (polyculture), 26% freshwater prawn and carps mixed culture and Only 4% cultured Tilapia (Monoculture). These observations match with the conclusion of Ahmed (2003) [22] and Hossain (2001) [17].

Pond size is an important factor for fish culture because all management measures are planned considering the size of ponds. The observed average pond size was 200 decimal (0.8 ha). The pond size differed along the study area with a range from 25-2500 decimal (0.1 to 10 ha). Most of the ponds were rectangular in shape. These observations are nearly similar with the study of Rahman (2003) [19] and Hossain *et al.* (1992-94) [23]. The management of small size pond is easier than large size pond. Return from per pond had a direct and positive relation with input used, but on the basis of per unit area, pond efficiency was greater in medium size pond [24]. This had been reflected in the present survey, as among the ponds of the participant farmers, maximum (50%) ponds were within 150-250 decimal of individual pond size, 24% were 250-500 decimal, 12% were 500-1000 decimal, 10% were 25-150 decimal, whereas only 6% measured from 1000-2500 (Table 01).

Table 1: List of the finfish ponds according to area size in study area

Serial No.	Area of pond (decimal)	No. of pond	Percentage (%)
1	25-150	5	10
2	150-250	25	50
3	250-500	12	24
4	500-1000	6	12
5	1000-2500	2	4
Total		50	100

When water depth is concerned, it was varied from season to season. In dry season, the depth of pond water varied from 2 to 4 feet. In the rainy season, it was 5 to 7 feet. Most of the ponds (36%) had 2.5 to 3.0 feet water depth.

Success of traditional aquaculture depends on the supply of amount of good quality water. Supplies of water in the ponds were from two main sources rain water and ground water (Figure 02).

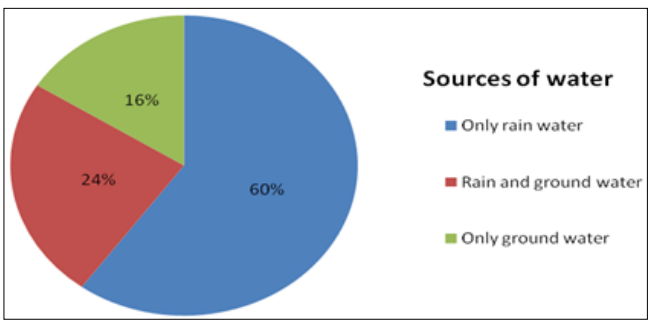

Fig 2: Sources of pond water in the study area

Fish fry and fingerlings for culture purpose were collected either from local hatcheries or from rivers as wild stock. It was found that about 90% fry collected from hatcheries and 10% fry collected from rivers. Prices of fingerlings were varied hatchery to hatchery. Maximum farmers collected fry and fingerlings of Rohu, Catla, Mirgal, Silver carp, Mirror carp, Grass carp and Bata at 3000 Tk./kg, 4000 Tk./kg, 3000 Tk./kg, 2400 Tk./kg, 4000 Tk./kg, 8000 Tk./kg and 2500 Tk./kg respectively. These observations are nearly similar with the study of Hossain *et al.* (1999) [25].

At the beginning of pond preparation bottom mud was removed by most of the farmers until the undesirable bottom black soil was completely removed, dike repairmen and aquatic weed and predator control were done by netting and rotenone. Most of the farmers had no idea about the dike construction. They had no idea about the slope of the dike. Whereas it is referred that, in case of sandy-loamy soil, the inner slop of a pond should be 3:1. For loamy soil it is 2:1 and for clay soil it is 1:1. The outer slope of a pond should be 1:2 and the width of dike crest should be 1.5 – 2.0 meter [26]. But in the study area farmers just repaired the dike and never maintained the slope ratio. However, most of the farmers dried their ponds every year; they started drying their ponds after harvesting and before start of culture. Although tilling is a necessary part for the pond preparation is it enhance natural productivity of pond [26], a large number of farmers (72%) did not practice tilling. Only small proportion of farmers (28%) tilled their pond during drying.

Almost all of the fish farmers, (85%) used lime especially at the time of pond preparation and throughout the culture period at an average dose of 0.94 kg /decimal in their pond. Lime directly regulates the p H of water and soil of fish ponds. Lime also acts on transparency and hardness of water. Liming increase ca^{++} in the water, remove the acidity of soil and water, increase decomposition of organic materials and productivity of ponds, decrease the turbidity of water, eradicate parasites and increase appetite of fish[26].

Fertilizer increases the natural productivity by promoting the growth of phytoplankton that serves as feed for finfish species. In the study area, 84% of fish farmers used fertilizer both inorganic and organic, inorganic fertilizers included triple super phosphate (TSP), Urea, murate of potash (MoP) whereas organic fertilizers included cow dung, poultry manure etc (Figure 03).

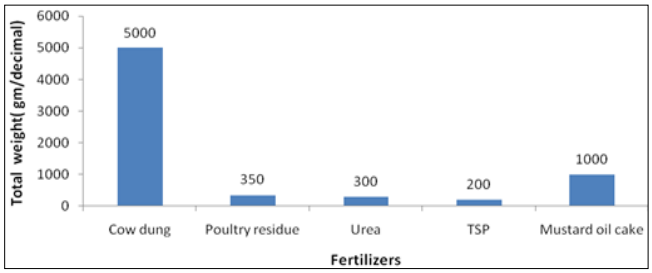

Fig 3: Average use of fertilizers in fish culture during the study period

Almost all farmers applied cow-dung in their pond, which was relatively cheap and available. It was recorded from the survey that 36% of farmers used all of the above fertilizers in their pond, 30% used urea and cow dung, 26% used only cow dung and remaining 8% did not use fertilizer.

3.3 Stocking density of Finfish pond

Fish production depends on the rates of proper stocking of fry and fingerlings. The stocking is very important with respect to better growth and proper utilization of feed.

It was found that the average stocking density in the study area was 30,000 fingerlings/ha. The percentage of Rohu Catla, Mrigal, Puti, Bata, Silver carp, Grass carp, Black carp, Bighead carp, Kalibaus, Mirror carp and Tilapia were 14%, 8%, 13%, 8%, 8%, 16%, 3%, 2%, 2%, 3%, 12% and 11% respectively (Figure 04). These observations are nearly similar with some previous studies [23, 27, 28, 29].

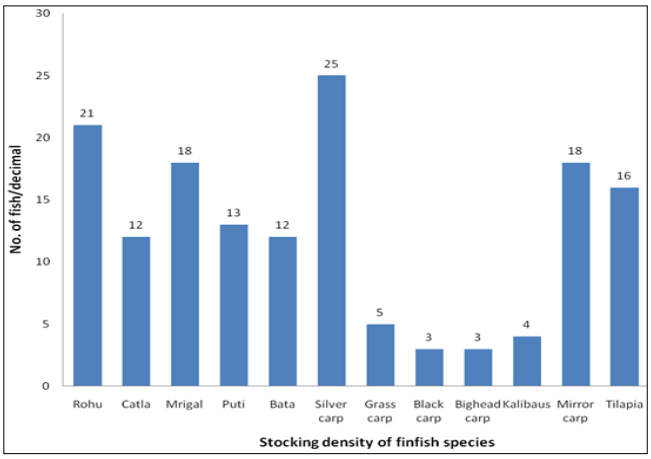

Fig 4: Stocking densities of different fish species in polyculture

3.4 Food and feeding management for fish farming

The production of aquaculture mostly depends on the availability of quality feed. Fish farmers under consideration, practiced mostly improved extensive and semi intensive culture systems therefore used supplemental feed to aid natural productivity of ponds for enhanced fish production. In the study area, it was observed that 90% of farmers used supplementary feed. Only 10% of farmers did not use feed in their pond. It was found that about 40% of farmers used rice bran only, 26% used both rice bran and mustard oilcake, 10% used rice bran, wheat bran and oilcake, 14% used pelleted feed and rest of farmers (10%) used homemade feed or kitchen leftover. The average usage of supplemental rice bran, oilcake and wheat bran were 2500 kg/ha, 450 kg/ha and 500 kg/ha respectively (Table 02). Generally farmers fed twice daily (morning and evening) at an average rate of 3% of the total body weight of fish and the observed average FCR value was around 2. These observations were quite similar to some earlier findings [19, 30, 31].

Table 2: Different types of feed supplements used in finfish pond by fish farmers

Serial No.	Types of feed	No. of ponds	Percentage (%)
1	Only rice bran	20	40
2	Rice bran + Oilcake	13	26
3	Rice bran, Wheat bran, Oilcake	5	10
4	Pelleted feed	7	14
5	Homemade feed or kitchen leftover	5	10

3.5 Chemical and drugs

Chemicals and drugs were not widely used in the study area for disease treatment. It was recorded that 18% fish farms were affected by disease prevalence in their farm and 82% farmers did not find any disease throughout the farming cycle. Major disease or clinical signs included ulcer disease (EUS; Epizootic Ulcerative Syndrome), tail and fin rot, cotton wool type lesion, malnutrition and lice infestation etc. Among the affected farmers, only 30% used different types of chemicals for disinfection and disease treatment of fish. These observations were nearly similar with the study of Chowdhury (1998) [32].

3.6 Harvesting and Marketing of Fish

Although fish was reported to be harvest throughout the year, the pick season of harvesting was from November to January. Farmers reported that 38% of them have done total harvesting whereas, 62% of the farmers did partial harvesting. Estimated average cost of netting was about Tk. 6000/yr and drying about was Tk. 4000/yr (Figure 05). These observations are nearly similar with this study of Rahman (2003) and Ahmed (2003) [19, 22]. The harvested fish was sold mostly in the local market and some were transported to the capital. Importantly, marketing facilities were very poor which includes lack of improved infrastructure, unavailability of ice for fish preservation, transport facilities etc.

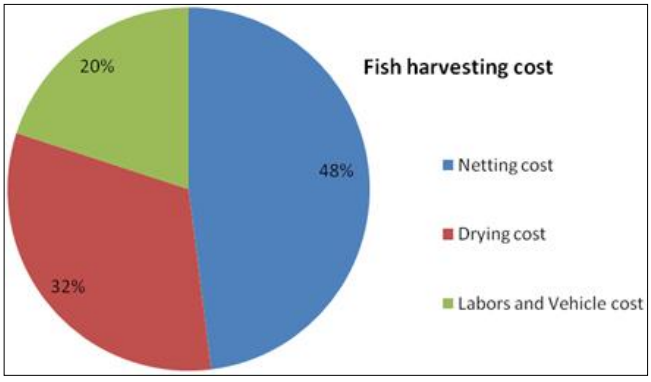

Fig 5: Fish harvesting cost per year

Fish marketing channels consist of a number of middlemen such as local agents, whole sellers, local fish traders and retailers in the study area.

3.7 Production ratio of different finfish pond

Production rate of finfish species is dependent on the stocking rate and stock size of fish. It was found that the average production of finfish species was 7.96 kg/decimal that is 795.50 kg/acre and 1990 kg/hectare per year. Production of finfish varied from farmer to farmer. The production ratio of different carp fishes pond had different. In aspect of the area of finfish pond, the significantly highest production was found in pond no. 7 (10.60 kg/ decimal) having 250 decimal of area (Table 03). These observations are nearly similar with the study of DoF (2004) [21] Hossain *et al.* (1997) [33] Awal *et al.* (1995) [34] and Rahman *et al.* (1992) [35].

Table 3: The area of various finfish Pond with their yearly production

Pond No.	Area of Pond (Decimal)	Total production /year (kg)	Production/Decimal/year (kg)
1	320	2900	9.06[a]
2	70	500	7.14[c]
3	60	500	8.33[b]
4	110	1050	9.50[a]
5	150	1000	6.67[d]
6	260	2000	7.69[c]
7	250	2650	10.60[a]
8	900	6750	7.50[c]
9	350	3100	8.86[b]
10	175	1400	8.00[b]
11	310	1950	6.29[d]
12	650	5100	7.85[c]
13	1325	10000	7.55[c]
14	280	2200	7.86[c]
15	420	2700	6.43[d]
Average			7.96

Values in a column having similar letters (s) or without letters do not differ significantly whereas values bearing the dissimilar letter (s) differ significantly as per DMRT (Duncan's New Multiple Range Test). $P \leq 0.01$.

3.8 Market Price of finfish Species

At the end of the culture period farmers completely harvested by draining out of the pond and hand picking the fish. According to farmers, almost all finfishes (90%) were sold in the markets of Nowapara Bazar, Jessore for Dhaka through agent of fish traders. The selling price of finfish varied according to size and qualities. It was found that the average selling price of Rui and Mirgal was BDT. 125/kg. The average selling price of Silver carp and Grass carp was BDT. 90/kg and BDT. 170/kg respectively. Saha (2006) [20] reported the average price was BDT 50 per kg that dissimilar to the study. This difference was might be due to increasing price of feed as well as demand of fish over the years.

3.9 Cost benefit analysis

Cost-benefit analysis is the analysis of total cost for the production and the profit from the production. Cost and analysis would provide the information necessary to determine the relative profitability of various production techniques, compare the utility of major inputs, such as land, labor and capital, with that of alternative production activities and improve the efficiency of the farm operation.

The production cost included purchasing fry of finfish's. It also included purchasing of lime and feed etc. Production cost is also based on labor management, house repairing, harvesting gears, basket, night guard and transport. The total production cost was found as BDT. 2, 64, 300/ha. The finfish production rate was 3355 kg/ha that obtained total income of BDT. 4, 14, 200/ha. Thus net profit was BDT. 1, 49, 900/ha (Table 04). This profit was calculated based on the result of ponds with good culture condition and the price of each item was taken from the farmer. The ratio of net benefit was 56.71%. So the production was satisfactory and income was good enough. These observations are nearly similar with the study of Samad *et al.* (2014) [38].

Table 4: Cost benefit analysis of a 1 ha pond in Abhaynagar upazila

Total expenditure in the finfish culture system			
Item			Total cost (Taka)
Pond repairing			16500
Fin fish species	Number	Price (Tk.)	
Rohu	2000	6	12000
Catla	1125	8	9000
Mrigal	1875	6	11250
Puti	1000	4	4000
Bata	900	4	3600
Silver carp	3000	3	9000
Grass carp	400	14	5600
Black carp	250	12	3000
Bighead carp	750	4	3000
Kalibaus	450	7	3150
Mirror carp	1250	8	10000
Tilapia	1100	3	3300
Item	Price (TK/kg)	Amount (kg)	Total cost (Taka)
Liming	20	180	3600
Disinfecting the pond by Rotenone and phostoxin		Rotenone 5 bottle and tabs phostoxin	1000
Fertilization			
TSP	23	450	10350
Urea	16	600	9600
Cow dung	2	5000	10000

Poultry residue	2	1000	2000
Feed			
Fish feed	30	600	18000
Rice bran	8	1250	10000
Wheat bran	35	500	17500
Oil cake	33	450	14850
Disease control by $KMnO_4$, Potash alam and other Medicine			2000
Labors cost			30000
Harvesting cost			12000
Leased cost			30000
Total expenditure			2,64,300
Total income from Finfish culture			
Species	Price (TK/kg)	Amount (kg)	Total Income(Taka)
Rohu	125	450	56250
Catla	175	300	52500
Mrigal	125	320	40000
Puti	100	150	15000
Bata	125	130	16250
Silver carp	90	800	72000
Grass carp	170	200	34000
Black carp	180	100	18000
Bighead carp	110	210	23100
Kalibaus	140	125	17500
Mirror carp	130	420	54600
Tilapia	100	150	15000
Total income			4,14,200
Net benefit			Taka/ha
		Total income	4,14,200
		Total cost	2,64,300
		Net profit	1,49,900

3.10 Problems of fish farming

The fish farmers in the present study reported a number of problems. The major problems were lack of capital, high price of quality feed and commercial feed, high labor cost, lack of quality feed, marketing problem, poor technical knowledge and transportation system etc. Disease is a primary constraint to the growth of many fish species. The present study identified some common disease problems as reported by the farmers which included EUS, tail and fin rot, dropsy, gill rot and malnutrition. These observations are similar with the study of Hossain (2006) [36], Rahman (2003) [19] and Akter (2000) [30].

3.11 Recommendations

The farmers of the Abhaynagar Upazila under the Jessore district in Bangladesh mainly practice poly culture system of finfish, a very small proportion practice monoculture. Modern technology should be implemented in all levels and aspects in fish culture such as pond preparation, liming, fertilizing, fry stocking, species ratio, feeding, disease control, harvesting etc. Though some farmers are trying to adopt scientific technology in fish culture but their number is very little. If it is possible to make awareness among the farmers about the advantage of scientific method and technologies, the level of production would be dramatically increased

The following recommendations are suggested in order to improve finfish culture system:

1. Updated training program should be availed for fish farmers, retailers, and processors with the help of government (DoF, BFRI etc.) and non government organizations (NGOs),
2. Promote the good aquaculture practice (GAP) at farm level,
3. Farmers should be facilitate and encourage with modern technologies.
4. Pond should be constructed in planned way and manage properly,
5. Quality fish seed should be stocked at optimum density,
6. Water quality should be maintained through proper management,
7. Fertilizer should be applied to increase natural productivity in polyculture,
8. Quality feed and feed ingredients should be assured,
9. For proper management large pond should be fragmented,
10. Government should make more specific policy and enforce implementation,
11. Aquaculture loan should be made available,

4. Conclusion

Aquaculture is being intensified day by day because of increasing demand. Local farmers are applying numerous strategies according to their existing knowledge in fish culture to optimize production. The present study was conducted to know the culture and management practices during pond based finfish culture using questionnaire interview with fish farmers in Abhaynagar upazila under Jessore district. Farmers of Abhaynagar upazila mostly practice poly culture of finfish rather mono culture due to higher profitability. In spite of several problems, the practice of finfish farming has offered an opportunity to increase incomes to the farmers and associated groups and subsequently contribute to their socio-economic development. Such research is needed to visualize the scenario of aquaculture practices at root level and take necessary actions accordingly.

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