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Pond management and fish polyculture technique in lalmonirhat of Bangladesh

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Abstract
The present study was undertaken with a view to finding out the carp's polyculture technique, pond management and cost analysis of Kaliganj upazila under Lalmonirhat District. The study was conducted for a period of six months (September 2017 to February 2018). It provides an overview on the guiding principles, aspects and tasks, and presents the applicable production techniques and patterns of carp polyculture. For further reading and more in-depth information on the suggested techniques and technologies. It is expected that this publication will help identify resources and contribute to the successful planning and realization of fish production by those fish pond owners and operators who need to strengthen and improve their knowledge on the subject.

Keywords: carps, polyculture, pond management, Farmer

1. Introduction
The concept of polyculture of fish is based on the concept of total utilization of different trophic and spatial niches of a pond in order to obtain maximum fish production per unit area. Different compatible species of fish of different trophic and spatial niches are raised together in the same pond to utilize all sorts of natural food available in the pond. In general, undrainable pond is characterized by its diversified spatio-trophic environment comprising of various natural fish food organisms (Phytoplankton, Zooplankton, Periphyton, Macrophytes, Benthos and detritus) at different strata of pond water column as well as in the bottom. Selection of species in polyculture is thus very important. There should be a compatible combination of species with diversified feeding habit that should include planktivorous surface/column feeders to benthic/ detritivorous bottom feeders as well as omnivorous to macrovegetation feeding fish species.
The possibilities of increasing fish production per unit area, through polyculture, is considerable, when compared with monoculture system of fish. Different species combination in polyculture system effectively contribute also to improve the pond environment. Algal blooming is common in most tropical manure fed ponds. By stocking phytoplanktophagus Silver carp in appropriate density certain algal blooming can be controlled. Grass carp on the other hand keeps the macrophyte abundance under control due to its macro vegetation feeding habit and it adds increased amount of partially digested excreta which becomes the feed for the bottom dweller coprofagous common carp. The bottom dwelling mrigal, common/mirror carp help re-suspension of bottom nutrients to water while stirring the bottom mud in search of food. Such an exercise of bottom dwellers also aerates the bottom sediment. All these facts suggest that polyculture is the most suitable proposition for fish culture in undrainable tropical ponds.
Actually the development of aquaculture production technology is a continuous process. System approach should be addressed in education and research process so that we can find the need or problem of rural farmers and thereby suggest for appropriate aquaculture technology.

2. Materials and Method
2.1. Study area: The present study was conducted in Kaliganj Upazilla under the Lalmonirhat district of Bangladesh.
2.2 Study period: The present study was conducted for a period of four months (September 2017 to February 2018).

2.3 Data collection method
During the study data are collected by applying following methods, which are
1. Survey method: From the selected pond, data is collected through the direct inspection of this pond using part II questionnaires.
2. Interview method: During the study data are collected by direct interviewing method using parts (part-I, part - III and part-IV) of the questionnaires.

2.4 Cost-benefit analysis
The total expenditure during the culture period (includes fixed and variable costs are summation) and the total income from fish productions are recorded, finally the total expenditure was subtracting from the total incomes and got the benefit.

$$\text{Specific Growth Rate (SGR \%)} = \frac{\text{Log}W_2 - \text{Log}W_1}{T_2 - T_1} \times 100$$

Where, W_2 = Weight of fish at time T_2
W_1 = Weight of fish at time T_1
$T_2 – T_1$ = Culture period

3. Result and Discussion
3.1 Pond management
The pond management steps followed in different stages by the farmer of the selected pond was observed and data were recorded which are given below:

3.1.1 Pre-stocking management

The selected pond was in good condition where communication access, water supply and other aquaculture facilities were available. In the study pond, the dyke was found in good condition. There are less aquatic weeds are found; generally three types of aquatic weeds were found in the study pond including *Colocasia esculenta, Enhydras sp.*, and *Marsileaquadri folia.* The farmer removed the aquatic weeds manually. The farmer removed predatory and unwanted fish species by frequent netting and used plant origin chemical origin poison i.e. Rotenon and Phostoxin tablet respectively. Total amount of poison is 6 Kg. for 100 decimal. In the study pond, the used limes mainly lime stone at the time of the pond preparation. Application rate is 1 kg/decimal. Total amount of limestone is 100 Kg. The method of lime application was in diluted form**.** The farmer used both organic (cow dung) and inorganic (Urea and T.S.P.) fertilizers. The application method of fertilizer; inorganic fertilizer (in diluted form) is applied by throwing and organic fertilizer is transferred into sacks and placed them under the pond water with the help of bamboo poles or in diluted form.

3.1.2 Stocking management

Generally poly culture system was practiced in the study pond. The farmer selected those fish species, which have faster growth, good market demand and more social acceptability. The selected fish species and namely; Rui (*Lebeo rohita*), Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*), as native species and Silver carp (*Hypophthalmichthys molitrix*), Common carp (*Cyprinus carpio var. communis*), Grass carp (*Ctenopharynogodon idella*), Rajputi *(Puntius gonionotus)* and Monosex telapia (*Oreochromis mossambicus*) as exotic species. The farmer collected fish seeds from two major sources for culture. These are govt. and private hatchery. Size of the stocked species found to be varied form50g to 100g. During the release of fry, the farmer did not consider the quality of fry, proper technique of fry release and the rate of stocking density is 68 fishes/1deci. And the total number of stocked fish is 6750 (for 100 decimal).

3.1.3 Post-stocking management

The farmer in the study pond monitored his pond regularly. He monitored his pond to observe the watercolor, abundance of food, growth performance of the fry and to prevent pouching. The farmer did not applied lime at the time of post-stocking management but applied both organic and inorganic fertilizers into his pond to increase the primary productivity. The farmer practiced regular feeding for his cultured species and used mainly high cost fish feeds and low cost feeds also used as supplementary feeds like mustard oil cake. The farmer in the study pond practiced Sampling. Partial harvesting was found as most common harvesting technique in the study pond. The farmer used kheplajal (Cast net) and angling to partial harvest for his household consumption. In the study area there are less stealing tendency although to protect fishes from stealing the operator used bamboo poles. At the end of the culture period, the farmer did final harvesting. Final harvesting was carried out by using seine net. After four months the total production of the pond is 2207.5 kg.

3.2 Cost-benefit analysis

Cost benefit analysis of the study pond is shown in following table. The total cost, benefit and CBR (%) was found as 1:0.50, respectively

3.2.1 Cost analysis

Cost benefit analysis of the studied pond (100 decimal) duration (October, 2017 to February, 2018)

3.2.1.1 Pre-stocking management cost

Table 1

Sl. No.	Inputs	Amount (kg/ 100 deci.)	Unit price (Tk.)	Cost (Tk.)
1	Pond leased value		30000 (Per yr. /100 deci.)	15000
2	Poisoning	6	340	2000
3	Liming	100	10	1000
4	Fertilizers			
	I. Cow dung	300	1	300
	II. Urea	50	12	600
	III. T.S.P.	25	24	600
Total				19,500

3.2.1.2 Stocking management cost

Table 2

Sl. No.	Inputs	Amount (No.) (for 100 deci.)	Unit price (Tk.)	Cost (Tk.)
1	Fish seed stocking			
	I. Silver carp	400	4	1600
	II. Catla	200	6	1200
	III. Grass carp	50	7	350
	IV. Mrigal	300	5	1500
	V. Carpio	200	7	1400
	VI. Rui	500	6	3000
	VII. Raj puti	100	8	800
	VIII. Monosextelapia	5000	1	5000
	Fry transportation			1000
	Total			15850

[**Seed size:** Mono sex telapia 10-30g and others 50-100 g]

3.2.1.3 Post-stocking management cost

Table 3

Sl. No.	Inputs	Amount (Kg./100 deci. /4 months)	Unit price (Tk.)	Cost (Tk.)
01	Feeding			
	I. Fish feed	3000	24	72000
	II. Mustard oil cake	1800	25	45000
02	Fertilizers			
	I. Cow dung	6400	1	6400
	II. Urea	80	10	800

	III. T.S.P.	40	22	880
03	Netting for harvesting for marketing (10 times)			2000
04	Transpiration for marketing (10 times)			1500
05	Labour (1 person)			3000
06	Others			2000
Total 1,33,580				
Grand total 1,68,930				

3.2.2 Total income
3.2.2.1 Fish sale

Table 4

Sl. No.	Inputs	Amount (Kg.)	Unit price (Tk.)	Income (Tk.)
01	Silver carp	160 (400g/fish)	70	11200
02	Catla	150 (750g/fish)	120	18000
03	Grass carp	37.5 (750g/fish)	90	3375
04	Mrigal	75 (250g/fish)	100	7500
05	Caripo	150 (750g/fish)	120	18000
06	Rui	125 (250g/fish)	120	15000
07	Rajputi	10 (100g/fish)	100	1000
08	Monosextelapia	1500 (300g/fish)	120	1,80,000
Total 2,54,075				

Benefit = Total income-Total cost
= 254075-168930
= 85145
∴Cost benefit Ratio (CBR %) = Total cost: Benefit
= 168930: 85145
= 1: 0.50
CBR (%) = 1:0.50 Tk. that means, 0.50 Tk. came from per 1.00 Tk.

4. Conclusion
Fisheries sector has great contribution in livelihood development and nutrition for rural people of Bangladesh. But the immense potential of this sector has remained largely unutilized due to ignorance of such potential resources and lack of technical knowledge in this respect in Bangladesh, aquaculture was developed mainly as a rural, act integrated into existing farming system. The farmer in the study pond followed more or less semi-intensive fish culture system. The fish production of carp culture could be increased in sustainable way, if the fish farmer follow the proper semi-intensive fish culture management techniques and provide with better culture technique in need based approach. The farmer took necessary steps in the pre-stocking, stocking and post-stocking stage. The pond fish culture was reported mainly with three native and five exotic species. Due to high growth rate and suitable environment, exotic fishes like monosex tilapia, silver carp and common carp occupied the major culture species the study pond. No native small species was cultured due to its less growth and seed unavailability. Water quality of the study pond was found as suitable for fish culture. The natural fish food organisms were observed in sufficient level that's why the production of the study pond was desired to the farmer.

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6. References
1. Boyd CE. Water quality management for pond fish culture. Elsevier Sci. Publishers B.V., 1000 AH. Amsterdam-Oxford-New York, 1982, 318.
2. Do F. Matshaw Pakkho Sankolon, Department of Fisheries, Bangladesh, Ministry of Fisheries and Livestock, Government of Peoples Republic of Bangladesh, 2005, 35-81.
3. Do F. Matshaw Pakkho Sankolon, Department of Fisheries, Bangladesh, Ministry of Fisheries and Livestock, Government of Peoples Republic of Bangladesh. 2010; 14:102-104.
4. DoF. Matshaw Shampad Unnayon Ovizan. Department of Fisheries, Bangladesh, Ministry of Fisheries and Livestock, Government of Peoples Republic of Bangladesh, 2008, 11-12.
5. FAO. Management for freshwater fish culture ponds & water practice, v, 144.
6. Menon KKG. Baisc approach for higher aquaculture productivity. In aquaculture productivity. Oxford and IBH publishing Co. Pvt, 1991, 418-428.