Content list available at http://epubs.icar.org.in, www.kiran.nic.in; ISSN: 0970-6429

Indian Journal of Hill Farming

2018, Special Issue, Page 87-91

Economics of fish farming in Tripura

Chandan Debnath[1*]. Lopamudra Sahoo[1]. Biswajit Debnath[2]. S.K. Das[3]. S.V. Ngachan[3]

[1]ICAR Research Complex for NEH Region, Tripura Centre, Lembucherra, West Tripura, IN-799210

[2]KVK (ICAR), Birchandra Manu, South Tripura-799144, Meghalaya

[3]ICAR Research Complex for NEH Region, Umiam-793103, Meghalaya

ARTICLE INFO

Article history:
Received 1 December 2016
Revision Received 19 August 2017
Accepted 20 October 2017

Key words:
Fish farming, profit, benefit-cost ratio

ABSTRACT

Fisheries occupy a unique place in the economy and livelihood of Tripura. More than 95% people of Tripura are eating fish as an important source of protein. Fish here is a high-valued commodity and models of fish farming are highly dynamic. There is no systematic approach to account the profitability of fish farming. Unless the economics and scale of economy of farming are assessed, fisheries will not sustain. In this paper, the economics of nursing, rearing and culture Indian major carps in a kani of pond (0.16 ha) were assessed. Net profit obtained was Rs. 27,680/- in nursery phase, Rs. 16,110/- in rearing phase and Rs. 54,250/- in grow-out phase. Benefit cost ratio was highest in nursery (1.85), followed by in culture (1.82) and rearing phase (1.40). This suggests for opting fish farming as profitable livelihood enterprise.

1. Introduction

Fish being one of the most favorite food items of the people of Tripura, fishery activities are being carried out in Tripura from ancient time. Fishery is the livelihood for >1,70,000 people of Tripura. More than ninety-five percent people of Tripura are eating fish and fish farmed in 25,338 hectare area with a production of 61,259 metric tonnes (DoF, Govt. of Tripura, 2016). The fishery resources of Tripura are diverse in the form of ponds, lakes, mini-barrages, reservoir, rivers *etc. but main production comes from.* ponds and mini-barrages. Large number of ponds, mini-barrages *etc.* are stocked every year with fry and fingerlings. Despite of an impressive growth of 6.6% in fishery during the last three decades, there is still shortage in fish supply due to unscientific practices, high consumption and population growth. Fish consumption at the rate of 20 kg/capita/annum is necessitating this sector more challenging to attain self-sufficiency in fish production. The actual demand for fish in the state is 80,153 metric tonnes (Debnath *et al.,* 2012) and presently there is a gap of 18,894 MT in supply.

Use of scientific methods and proper management offers immense scope for improvement in the productivity and profitability of fisheries. Fish culture involves some important cost elements. Annual non-recurring costs include cost of construction of pond, lease, cost of pond preparation and maintenance. Recurring costs are cost of weed clearance, unwanted fish eradication, insect removal, labour, organic and inorganic fertilizers, fish seed, harvesting, netting, transportation *etc*. The other costs are depreciation of equipment, interest on loan *etc.* Unfortunately the data assessment in fishery in Tripura is not organized and authentic for annual growth analysis and entrepreneurship development. Business planning and market assessment based on hoary data are not effective because of rapidly changing aquaculture scenario. Inflation rate and cost of inputs has also been increased gradually in the recent years which affected the cost of production or profit margin in fish farming. There are very limited information on economics of fish seed rearing and farming. Therefore, in the present study the production and economics of fish farming under scientific management is accounted.

*Corresponding author: chandannath23@gmail.com

2. Materials and Methods

The study was conducted in ICAR Research Complex for NEH Region, Tripura during 2015-16. The cost and management involved at different stages of farming was recorded for economic analysis. The cost of construction of the pond was calculated as per the rates of Public Works Department (PWD), Tripura for 2015-16. Manure required for pond fertilization was procured from the livestock farm of the institute. Kerosene required for insects removal in nursery phase was procured from local market. Lime was procured from local vendor. Inorganic fertilizers (urea and SSP) were procured from Dept. of Agriculture, Tripura at Govt. approval rate. Urea was applied @100 kg N/ha and single super phosphate @ 50 kg P/ha after seven days of liming. Fish released when water turns to greenish in colour. Mixed spawns of catla, rohu, mrigal in equal proportions were nursed at a stocking density of 5 million/ha. Finely powdered mixture of rice bran and mustard oil cake, procured from local markets, were used for supplementary feeding at 1:1 ratio. Feeding rate was 6 kg/million spawn/day on 1st 5 days and 12 kg/million spawn/day on 6th day onwards. Total 200 kg feed was required in nursery phase of 20 days. At the end of 20 days, fries were harvested and shifted for rearing. Fries were reared over a period of 3 months at a stocking density of 2.5 lakh/ha. They were fed with powdered rice bran and mustard oil cake in equal proportion. Feeding rate was 8% on 1st month and 6% in the next 2 months. A total of 500 kg feed was used in the rearing phase that lasted for 60 days. The grow-out fish was produced at a stocking density of 10000 fingerlings/ha. Species composition was 40% catla, 30% rohu and 30% mrigal. The size of fingerlings during stocking was 4-10 cm and 4-9 g. Mustard oil cake and rice bran-1:1 was fed to the fishes at 1-2% on assumption of 80% survival of biomass. 1000 kg feed were used in the culture phase. Fish were harvested at the end of eight months. Then they were counted and weighed for calculation of production economics. Pond preparation, removal of weeds, netting for eradication of predatory and weed fishes, clearance of insects, transportation of inputs, aeration, feeding, netting, harvesting and other maintenances, prophylaxis, watch and ward, water and soil samples collection, intermittent liming and fertilization *etc.* were done manually using ICAR approved labour rate.

3. Results and Discussion

Fish farming requires some important cost elements. The most important fixed cost is the cost of construction of pond. The cost of construction of one kani pond as per the rate of PWD under MNREGA scheme in Tripura is Rs. 3,00,000/-. Shiva kumar *et al.* (2014) reported Rs. 22,400/ha in Karnataka.

Table 1. Profitability of raising fry from one kani pond

Particulars	Qty./ha	Unit cost (Rs.)	Total cost (Rs.)
A. Fixed cost (Pond construction)	0.16	187.5/m^2	**300000.00**
B. Operational cost			
Labour (Clearance of weeds, predatory and weed fishes, feeding, harvesting and other maintenances)	10 man-days	262/man-day	2620.00
Kerosene (insects removal)	20 litre	40/lit.	800.00
Lime	40 kg	20/kg	800.00
Fish spawn (catla, rohu and mrigal)	800000	0.02/spawn	16000.00
Feed(Rice bran and oil cake- 1:1)	200 kg	15/kg; 30/kg	4500.00
Cattle manure	1000 kg	1/kg	1000.00
Urea	40 kg	10/kg	400.00
SSP	80 kg	15/kg	1200.00
Miscellaneous (transportation of inputs, prophylaxis, watch and ward *etc.*)			5000.00
Total			**32320.00**
C. Income			
@30% survival	240000	0.25/ fry	60000.00
D. Net profit [C-(A+B)]			27680.00
E. Benefit cost ratio			1.85

This is depending upon the rates fixed as per the region and soil type. Transport, labour, and other basic requirements for pond digging are advantageous in plain lands compared to NE India. Farming can also be practiced in leased pond on annual rent basis if construction of new pond is not feasible. The lease value in Tripura varies from Rs. 5000 to 10000/kani. Dandapat and Islam (2009) reported lease value of Rs. 1000/bigha pond in West Bengal. Pond preparation was done manually engaging labour. The labour charge as per the rate of ICAR was Rs. 262/man-day. Cow dung applied for manuring was procured from farm itself at the rate of Rs. 1000/truck (1000 kg manure/truck). It cost Rs. 1500/truck if purchased from outsides due to involvement of freight charges. Kerosene was purchased at Rs. 40/liter. It may be procured at much lower price (Rs. 20-25/L) from ration shop. The price of lime was also found varying depending on quality. Lime used in this study was of fine grade quality and procured at Rs. 240/bag (12 kg lime/bag). The price of urea as per the approval rate of Govt. of Tripura was Rs. 10/kg and SSP Rs. 15/kg. Lime and fertilizers are costlier in local markets and of compromising quality, hence may be avoided for fish farming. The success of fish farming depends on the quality and quantity of seeds stocked. Price of the seeds varies depending on season and availability. It is better to procure seeds early with the commencement of breeding season when seeds are available at cheaper price

. Price of seeds is higher in private farms. Spawns are sold in the unit of *bati.* A *bati* of about 100 ml contains approx. 40,000 spawns. Price of spawn in government farms is Rs. 400-500/*bati* whereas it varies from Rs. 600 to 800 in private farms. Price of fry in government farms is Rs. 0.25/piece, whereas, in private farm it is Rs. 0.35-0.50/-. Price of fingerlings varies widely depending on size and species. Fingerlings of Indian major carps are costlier than exotic carps. Fingerling cost Rs. 2.0/- a piece in government farm, whereas, in private farm, it is Rs. 3-5/piece. Off-season fingerlings prices much higher. Local vendor sells quality fingerlings but prices are very higher (Rs. 10-15/- a piece). Seeds should be procured from government farms where stock replacement and managements are properly followed to ensure quality. Feed is another critical input which accounts 50-60% of total operational expenses in fish farming. Protein content of the feeds must be ensured before using. We used farm-made feed instead of commercial feed so that the cost of feeding is minimized. Commercial feed, available at Rs. 35-40/kg in Tripura, is not affordable by farmers; therefore emphasis has been given on farm-made feed use. Farm-made feed was prepared by mixing mustard oil cake and rice bran at 1:1. The ingredients were procured from the local markets. Rice bran was procured @ Rs. 15/kg and mustard oil cake @ Rs. 30/kg. Total

Table 2. Profitability of raising fingerlings from rearing pond

Particulars	Qty./ha	Unit cost (Rs.)	Total cost (Rs.)
A. Fixed cost (Pond construction)	0.16	187.5/m^2	300000.00
B. Operational cost			
Labour (Clearance of weeds, predatory and weed fishes, feeding, harvesting and other maintenance)	20 man-days	262/man-day	5240.00
Lime	40 kg	20/kg	800.00
Fry	40000	0.25/fry	10000.00
Feed (Rice bran and oil cake- 1:1)	500 kg	15/kg; 30/kg	11250.00
Cattle manure	1000 kg	1/kg	1000.00
Urea	40 kg	10/kg	400.00
SSP	80 kg	15/kg	1200.00
Miscellaneous (transportation of inputs, prophylaxis, watch and ward *etc.*)			10000.00
Total			**39890.00**
C. Income			
@ 70% survival	28000	2/fingerling	56000.00
D. Net profit [C-(A+B)]			16110.00
E. Benefit cost ratio			1.40

1000 kg feed was used for supplementary feeding, remaining requirement was fulfilled through pond fertilization and plankton production. The ponds were found very responsive to improvised management under scientific farming. Water and soil quality showed normal variations. Input quality and its' use was adequate as no evidence of blooming and piping was visible in ponds. Growth and survival of fish was satisfactory. Spawn grew to fry (8-25 mm) over a period of 20 days with 30% survival and fry grew to fingerlings (40-100 mm) over a period of 60 days with 65% survival. In grow-out phase (600 kg fish production), catla dominated size (650 g) followed by rohu (500 g) and mrigal (350g). Survival was 65% in catla, 75% in rohu and 85% in mrigal. Stocking stunted fingerlings or yearlings (7500/ha) can give higher production; however, it cost higher (Rs. 5-10/- a piece). The operational expense was Rs. 32,320/- in nursery phase, Rs. 39,890/- in rearing phase and Rs. 65,750/- in the culture phase. CIFA (2004) recorded the same in a hectare, Rs. 59,000/- in nursery phase, Rs. 83,000/- in rearing phase and Rs. 80,000/- in culture phase. It reveals that, variable costs have been increased over the years. The difference in the variable costs is due to the increase in basic inputs of the production systems. CIFA (2004) reported a profit of Rs. 46,000/- in nursing, Rs. 22,000/- in rearing and Rs. 40,450/- in culture in a hectare of pond. We recorded a profit Rs. 27,680/- in nursery phase, Rs. 16,110/- in rearing phase and Rs. 54,250/- in grow-out phase in one kani of pond, *i.e.* much higher than CIFA. This is probably due to high fish demand in Tripura as assumed from the per capita fish consumption, which is highest among the Inland states of the country. Tripura and other NE states are the places where fishes of any sizes and any species are readily sale out. Benefit-cost ratio was highest in nursery phase (1.85), followed by in culture phase (1.40) and then in rearing phase (1.82). Shiva kumar *et al.* (2014) reported BCR 1.59-3.40 in seed rearing and 0.47-1.05 in culture phase of carps. From this study, it is clear that fish farming is profitable and sustainable in Tripura if adopted properly. But, region specific studies on economics and variation in price of basic inputs of fish farming need to be conducted. In earlier days, rice bran, oil cake, cow dung, inorganic fertilizers *etc.* were available at cheaper rate but its prices has now increased. Mustard oil cake which was available at Rs. 10-15/kg ten years back, now it costs Rs. 30-35/kg. Similarly, cost of rice bran has increased from Rs 5-8/kg to Rs. 12-15/kg in a span of 10 years. This shows that the cost of inputs has been increasing over the time but there is no remarkable increase in production and price of fish. This study also reveals that among variable costs, cost of feed and seed are the most important which determines the yield and profit. The variation of net income over the years is due to variation in the price rate of basic inputs and market price of fish. Therefore, it is necessary to calculate the economics of aquaculture on annual basis for sustainable fish production. Finally, it is concluded that the fish seed rearing and farming are profitable though margins are narrow. stocking and multiple harvesting. Market survey

Table 3. Profitability of raising table size fish from grow-out pond

Particulars	Qty./ha	Unit cost (Rs.)	Total cost (Rs.)
A. Fixed cost (Pond construction)	0.16	187.5/m^2	**300000.00**
B. Operational cost			
Labour (Clearance of weeds, predatory and weed fishes, feeding, harvesting and other maintenance)	75 man-days	262/man-day	19650.00
Lime	40 kg	20/kg	800.00
Fingerling	1600	2/fingerling	3200.00
Feed (rice bran and oil cake- 1:1)	1000 kg	15/kg; 30/kg	22500.00
Cattle manure	1000 kg	1/kg	1000.00
Urea	40 kg	10/kg	400.00
SSP	80 kg	15/kg	1200.00
Transportation of inputs			2000.00
Miscellaneous (transportation of inputs, watch and ward, prophylaxis *etc.*)			15000.00
Total			**65750.00**
C. Income			
@ 75% survival, avg. weight 500g	600 kg	200/kg	120000.00
D. Net profit [C-(A+B)]			54250.00
E. Benefit cost ratio			1.82

However, it can be improved through multiple need to be conducted before selling fish and special occasions like puja, New Year *etc.* needs to be targeted for higher price. As the input and labor cost are increasing significantly over the years, one must quantify the available resources, capital and projected profit before starting fish farming as livelihood option.

Acknowledgements

The authors are thankful to Mr. Kanu Laskar, Technical (T5), Mr. Ponirm Debbarma, TSM, Mr. Abhijit Singha, SRF (NICRA) for their active involvement in this study.

References

CIFA (2004) CIFA Technologies (Ed. by Sarangi S, Jena JK, Das BK, Sahoo PK and BC Mohapatra). Central Institute of Freshwater Aquaculture, Bhubaneswar, pp. 1-57.

Debnath B., Biradar R.S, Anathan P.S, and S.K Pandey (2012). Estimation of demand for different fish groups in Tripura', Agricultural Economics Research Review 25(2): 255-266

Debnath C, Yadav GS, Sahoo L, Datta M, Das A, Dube K and SV Ngachan (2015) Fish farming with pond dyke utilization in Dhalai district of Tripura- A case study. Journal of Indian Fisheries Association 42: 31-38

Dandapat D and S Islam (2009) A study of production, productivity and profitability of Fisheries in the district of North 24-Parganas, West Bengal. Journal of Business and Economic 1(1): 92-101

DoF, Govt. of Tripura (2016). Fisheries Statistics (2013-14), published online, www.fisheries. tripura. gov.in/ statistics.htm [assessed on 26/11/2016]

Shivakumar M, Seema Bala, Rajanna C and BT Naveen Kumar (2014) Economics of seed rearing and farming of carps. *International* Journal of Fisheries and Aquatic Studies 2(1): 42-45