Business Opportunity of Freshwater Ornamental Fish Breeding: A Case Study in Tripura, India

Apu Das[1]*, Neha W. Qureshi[1], Tanmoy G. Choudhury[2] and Arunjyoti Baruah[2]
[1] *Central Institute of Fisheries Education, Versova, Mumbai - 400 061, India*
[2] *College of Fisheries, Central Agricultural University, Lembucherra, Agartala - 799 210, India*

Abstract

The state of Tripura contributes to the bulk of ornamental fish exports from northeast, but remains unexplored for developing market opportunities. Several business opportunities can be explored through systematic collection and marketing of native ornamental fish as well as rearing of exotic ornamental fish species suitable in the state. In view of these, the present study has analysed the business opportunity of exotic ornamental fish breeding in Agartala, Tripura. The study also analysed constraints faced by the ornamental fish farms in the state *viz.*, inadequate infrastructural facilities (65.62%), heavy investment in the initial stage (60.12%), lack of government incentives (57.5%) and non availability of good quality brood fish (54.25%). The study revealed that some initiatives by the government like providing incentives to establish ornamental fish production unit and considerable private investment can be attracted to this industry, which would generate additional employment opportunities.

Introduction

India has enormous potential in ornamental fisheries owing to its species and ecosystem diversities. But ornamental fisheries in India is a neglected sector and remained untapped due to various reasons (Bojan, 2005). The entire supply of Indian ornamental fish is primarily dependent on wild catch (85%) and a few artificially bred varieties of exotic fish (15%). Northeast India is considered as one of the hot spots of freshwater fish biodiversity in the world (Kottelat & Whitten, 1996). Among the wild caught fishes exported from the country, West Bengal and the north-eastern states are the major contributors (Mahapatra et al., 2006). All the north-eastern states, *viz.*, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are gifted with vast aquatic resources which are harbouring diverse ornamental fishes with immense commercial importance (Mandal et al., 2007). Tripura contributes 123 fishes to the total 250 native ornamental fish species of north-eastern states (Mandal et al., 2007). Therefore, appropriate strategies are to be derived from relevant studies in Tripura so as to make the ornamental fish industry more vibrant, economically and financially viable. Ornamental fish keeping became an interesting activity for many, generating income for the unemployed youth and farmers (Venkataramani & Jayakumar, 2008). The concept of entrepreneurship development through ornamental fish farming is gaining popularity day-by-day. Therefore, more people are entering into this lucrative business. In view of these issues, the present study was undertaken to analyse the economic viabilities of breeding of ornamental fishes in Tripura.

Materials and Methods

The study was based on primary data collected from 15 ornamental fish farms and 15 ornamental retailers around Agartala, Tripura. A survey was conducted through personal interview method with the help of pre-tested and specially designed schedules. To study the existing marketing channel, discussion was held with the fish farmers, collectors, traders, local retail shop owners, exporters, fishery scientists and experts working in the area. The data pertaining to the agriculture year 2010-11 were collected. Farm budgeting analysis has been em-

ployed for analysing the data for 100 sq m size ornamental farm. The viability of the ornamental fishery units was assessed by employing discounted cash flow methods such as benefit cost ratio (BCR) and net present value (NPV) calculated using the formula given by Gittinger (1982). Payback period was calculated as per Kumar et al. (1999) to judge the feasibility of investment on ornamental fisheries in the study area. Various assumptions on technical parameters were considered for these analyses after reviewing the relevant literature (Arya et al., 1994; Nalatwadmath et al., 1997; Kumar et al., 1999; Trimpey & Engle, 2005 and Mandal et al., 2007). These are as listed below:

i. The economic life of fish farm was considered to be 10 years to have more realistic estimation.

ii. Eleven percent discount rate was considered, which is the maximum interest rate charged by the bankers for long term agricultural loan in the state. As the time value of money is not possible to measure exactly, borrowing interest rate charged by the bankers was taken as a proxy for the discount rate.

iii. Income stream from the business is uniform over its entire life for all the species.

iv. Other things being equal, fish culture technology was assumed to be constant at 2010-11 level.

Constraints in ornamental fish business were studied using Rank Based Quotient (RBQ). Based on the ranks given by the farmers, RBQ was calculated for each constraint. Preferential ranking technique was used to identify constraints faced by the farmers in ornamental fish production unit. The quantification of data was done by ranking the constraints from calculated RBQ as given by Sabarathnam (1988).

Results and Discussion

North-eastern states are endowed with vast aquatic resources with great diversity of ornamental fishes *viz.*, 37 families, 114 genera and 10 orders. Out of the total 274 fish species reported from the region, around 250 species (91%) possess ornamental value. The major species having a large number of ornamental fishes belong to the order Cypriniformes, followed by Siluriformes and Perciformes (Mandal et al., 2007). It is estimated that nearly 200 species of ornamental fishes are exported from India, out of which 85% are from north-eastern states (Nair,

2004). The market opportunities for the local ornamental fish and exotic species are rising gradually in both domestic and international markets.

The rearing of exotic ornamental fishes has several advantages like fetching of higher and steady returns due to better quality than wild caught fishes, lower risk of mortality during transportation, reduction of pressure on wild catch thereby complementing the conservation efforts of native ornamental fish species. Cost of ornamental fish production was computed for a 100 sq m farm unit and has been estimated that a sum of Rs. 26 702.7 was required as fixed cost/year/farm to rear the ornamental fish (Table 1). This estimation has been made considering multi-species culture comprising of three popular exotic ornamental fish species namely goldfish (*Carassius auratus*), platyfish (*Xiphophorus maculatus*) and angelfish (*Pterophyllum scalare*). The major fixed cost component is depreciation on fixed assets like cemented tank, shed house, electric pump, air pump, overhead tank and balance.

Table 1. Details of fixed cost required for establishing exotic ornamental fish-breeding unit (100 sq m farm size) at 2011 prices at Agartala

Particulars	Rs per annum
Depreciation on fixed assets	11 797.63
Repairing and maintenance	6 700.26
Rental value of land (Rs. 60/sq m)	6 000.00
Interest on working capital	2 204.81
Total fixed cost	26 702.7

Source: Primary survey

Other fixed costs were repairing and maintenance, rental value of land and interest on working capital which was calculated at 9% interest rate in discussion with fisheries scientists and subject matter experts working in the area. Annual variable cost for all the three species *viz.*, goldfish, angelfish and platyfish were calculated and presented in Table 2. While average annual variable cost incurred by farmers was worked out to be Rs. 39 984, it is Rs. 40 330 for goldfish rearing, Rs. 37 877 for rearing of angelfish and Rs. 41 747 for rearing platyfish. The comparison of variable costs for all the species indicated that rearing of platyfish is more costly. This study also corroborates Mandal et al. (2007)

who reported that rearing of platyfish was costly in north-eastern region of India. This may be due to less availability of brood stock, requirement of more labour and more disease proneness of this species.

The costs and returns of rearing multi-species (goldfish, platyfish & angelfish) ornamental fish farm revealed that the enterprise is a highly profitable business, the average net returns per year being Rs. 32 469 and combined profitability being Rs. 97 403 per year. Rearing of goldfish was observed to be most rewarding with annual net returns of Rs. 42 349, followed by angelfish (Rs. 32 202) and platyfish (Rs. 22 852) (Table 3). This indicates that breeding of exotic ornamental fish at Agartala is profitable as the farms were economically viable. Chapman & Livenghood (2007) stated that even though traditionally not recognized as a form of aquaculture, ornamental fishery is one of the major economically profitable areas among different fish farming activities.

Based on the estimated annual costs and returns, the financial viability criteria (NPV and BCR) were found to be favourable for investment on ornamental fish breeding (Table 4). The investment on individual fish species was observed to be quite favourable and encouraging. The payback period was calculated to be 1.58 years under goldfish unit, followed by angelfish (2.00 years) and platyfish (2.15 years). This is in conformity with the study of Mandal et al. (2007) where he also found that payback period of goldfish among these three species was less. The NPV was estimated to be highest (Rs. 1 17 880.80) under goldfish unit, followed by angelfish (Rs. 58 114.70) and platyfish (Rs. 30 435.20). Similarly, BC ratio was calculated to be higher for goldfish (1.82) than angel (1.57) and platyfish (1.46). The analysis indicated that establishment of such fishery unit was not only financially viable but a highly attractive proposition for entrepreneurial development. Ghosh & Sureshbabu (2006) discussed the financial viability of ornamental fish breeding cum rearing unit based on cost and return analysis in West Bengal and pointed out that small scale farmers were earning more profit and the business was found to be financially viable.

Despite having tremendous growth potential, the ornamental fish sector in Tripura remains untapped mainly due to lack of organized marketing, poor infrastructure, lack of government incentives and

Table 2. Annual variable cost (in Rs.) of exotic ornamental fish production for a 100 sq m farm size at 2011 prices at Agartala

Particulars	Goldfish	Angelfish	Platyfish	Average	Combined
Cost of brood fish (Rs. 300 pair[-1])	2100	3900	4500	3500	10500
Feed	12000	12000	10000	11333	34000
Electricity	500	500	500	500	1500
Charges for Labour	18000	14150	18300	16816	50450
Medicine	1200	800	1000	1000	3000
Maintenance	1000	1200	1500	1233	3700
Transportation cost	1000	1000	1000	1000	3000
Miscellaneous expenditure	1200	1200	1500	1300	3900
Interest on working capital	3330	3127	3447	3301	9904
Total variable cost	40330	37877	41747	39984	119954

Source: Primary survey

Table 3. Economic viability of ornamental fish breeding for a 100 sq m farm size

Particulars	Goldfish	Angelfish	Platyfish	Average	Combined
Gross income	91580	78980	73500	81353	244060
Net returns	42349	32202	22852	32469	97403
Net operating income	51250	41103	31753	41369	124106

Table 4. Financial viability of establishment of ornamental fish breeding

Investment criteria	Goldfish	Angelfish	Platyfish	Average
Payback period (Years)	1.58	2.00	2.15	2.06
Net Present Value (NPV, in Rs)	1 17 880.8	58 114.7	30 435.2	68 810
Benefit Cost Ratio (BCR)	1.82	1.57	1.46	1.62

lack of access to market information. It was also found that some deliberate and biased practices were being followed by wholesalers such as accepting fish from selected fish farmers or collectors only. The marketing system was highly unorganized and no direct export was being done. The most prevailing marketing channel of ornamental fish marketing was: collectors–unregistered small traders–wholesalers–exporters at various ports. This channel has also been identified for north-eastern ornamental fishes by Mandal et al. (2007). He inferred that exporter realized maximum profit out of it, followed by wholesalers, unorganized traders and a meagre share by fish collectors indicating that benefit of this industry was distributed unequally, depriving the farmers or collectors heavily. This could be improved by providing adequate training to the interested farmers on captive breeding and rearing of ornamental fishes and providing incentives and assistance to them to create basic infrastructure for a fishery unit.

The constraint analysis through preferential ranking technique delineated as many as ten constraints. Higher the RBQ value severe is the constraint, thus based on values the constraints were ranked accordingly and presented in Table 5. The constraints so identified were inadequate infrastructural facilities (65.62%) followed by heavy investment in the initial stage (60.12%), lack of government incentives (57.50%), non availability of good quality brood stock (55.25%), less demand in local market (54.25%), lack of transportation and marketing facilities (54.06%), labour non-availability and its high cost (52.43%), lack of good quality feed (52.37%), disease incidence (50.5%) and wide fluctuation in market price of inputs (47.87%). De & Ramachandran (2011) also found that infrastructural facilities and requirement of high investment in the initial stage were the major constraints in the development of ornamental fisheries in the state of West Bengal.

Government incentives can attract more private investment to this industry, which would generate

Table 5. Frequency distribution of RBQ values given by farmers for various constraints

Constraints	RBQ	Rank
Inadequate infrastructural facilities	65.62	I
Heavy investment in the initial stage	60.12	II
Non availability and costly labour	52.43	VII
Lack of transportation and marketing facilities	54.06	VI
Less demand in local market	54.25	V
Disease incidence	50.50	IX
Wide fluctuation in market price of inputs	47.87	X
Lack of Government incentives	57.50	III
Lack of good quality feed	52.37	VIII
Non availability of good quality brood fish	55.25	IV

additional employment opportunities for the unemployed youth. Public-private partnership can be encouraged through establishment of ornamental fish production units in the state to make ornamental fishery sector more vibrant and remunerative.

Acknowledgements

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