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RESEARCH ARTICLE

ASSESSMENT OF MAJOR CONSTRAINTS AND INCOME LOSS IN ORNAMENTAL FISH FARMS OF MADURAI DISTRICT, TAMIL NADU

T.Umamaheswari[1], *P. Chidambaram[2] and M.Rajakumar[3]

1. Assistant Professor, Department of Fisheries Economics, Fisheries College and Research Institute, Tamil Nadu Fisheries University, Thoothukkudi, Tamil Nadu, India.
2. Associate Professor and Head, Tilapia Research Centre, Tamil Nadu Fisheries University, Pungampatti, Krishnagiri District, Tamil Nadu, India.
3. Professor and Head, Department of Fisheries Economics, Fisheries College and Research Institute, Tamil Nadu Fisheries University, Thoothukkudi, Tamil Nadu, India.

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Corresponding Author

P. Chidambaram.

Abstract

India provides enormous potential for the development of the ornamental fish business. Although the country has conducive environmental and climatic conditions for export production of ornamental fishes, India's share in global export is less than one percent. To cope with this, the constraints prevailing in ornamental fish farming need to be addressed in order to have a sustainable growth. In the same line, the study was carried out among 44 respondents focusing ornamental fish farms in Madurai district, Tamil Nadu by adopting random sampling technique. The selected farms were classified into small (<0.5 ha) and medium farms (0.5-2 ha) and the data were collected by personally interviewing the fish farmers. The study attempted to analyze the socio-economic characteristics of respondents, existing supply chain, constraints involved in ornamental fish farming, annual revenue loss due to major constraint, treatment cost and expected profit margin. The various constraints observed were classified as production, marketing and others and was ranked using Garrett Ranking Technique. Tabular and percentage analyses were used to estimate the cost of treatment, revenue loss and expected profit margin. Four types of marketing channels were observed in the study area. Disease outbreak was found to be the major constraint faced by the farmers and hence the revenue loss was estimated for the same. The annual revenue loss was found to be higher for the small ornamental units when compared to medium farms. The medium farms showed higher profit margin than small ornamental fish farms.

Introduction:-

Indian ornamental fisheries sector is small, but it constitutes one of the vibrant sub-sectors of fisheries and aquaculture. Therefore, more people are entering this lucrative business of culturing and breeding of ornamental fishes. It is a promising alternative for employment and income generation in the domestic and export markets. Dey (2012) reported that from a mere handful in the 1970s, the number of ornamental fish farms in India has now increased to over 1750, covering a water spread area of more than 170 ha, providing employment to over 20,000 people. A total of 100 million fish of over 130 varieties under five major groups is now being produced in the country. The overall domestic trade in this field crosses Rs. 1,000 lakhs and is reportedly growing at the rate of 20% per annum (NABARD). About 80% of ornamental fishes from India to International markets are being exported from Kolkata which are from North eastern region, that too mainly from natural collection. It is necessary to shift

focus from capture to culture based export (Prathvi Rani et al, 2013). Development of ornamental fish culture is hindered mainly by disease incidence due to parasitic, bacterial and viral infection. Also, many entrepreneurs hesitate to invest in this sector for want of information on the cost involved, income expected, breeding techniques, constraints, development assistance etc.

An attempt has been made to study the economics of production and marketing of ornamental fishes in Madurai district with the following objectives:

1. To study the constraints faced by the ornamental fish farmers in Madurai district.
2. To estimate the revenue loss due to major constraint in ornamental fish culture sector.
3. To evaluate the treatment cost of deceased ornamental fishes and expected profit margin in ornamental fish culture.

Materials and methods:-

In Tamil Nadu, Madurai district was purposively selected owing to its importance in the contribution towards ornamental fish production, next to Kolathur (Chennai), an ornamental hub in Tamil Nadu. The ornamental fish units were classified into small farms (Backyard) and medium farms. The sample size was fixed as 30% for each category and hence 26 small farms (0.5ha) and 18 medium farms (0.5-2 ha) were randomly selected out of 87 small farms and 60 medium farms, respectively. A structured survey schedule was prepared based on the objectives of the study, and pre-tested by conducting a pilot survey. The farmers were interviewed individually to draw a meaningful conclusion over the factors influencing the profitability of ornamental fish farming. The general characteristics of farmers, average annual revenue loss due to disease incidence, treatment cost and expected profit margin were documented with respect to each farming unit.

Garrett ranking technique was employed to identify the preference of the constraints associated with the ornamental fish farming as expressed by the ornamental fish farmers. For converting the scores assigned by the ornamental fish farmers towards the particular constraint, percent position for each rank was worked out using the following formula.

$$\text{Percent Position} = \frac{100\,(Rij - 0.05)}{Nj}$$

whereas,

Rij = Rank given for the i^{th} constraint by j^{th} individual

Nj = Number of constraints ranked by j^{th} individual

By referring to Garrett's table, the percent positions estimated were converted into scores. The scores of various respondents were added and the mean values were calculated. The mean values were arranged in descending order. The factors with the highest mean value was considered to be the most important, followed by second, third and so on.

Simple tools of analysis like percentage analysis were used in the study. Tabular analysis of costs and returns was made to estimate the economics of aquariculture and to analyze the data. The expected profit margin and the revenue loss due to disease was calculated by using the formula

1. Expected profit margin = (Expected returns + Total returns) – Total cost
2. Revenue loss due to disease = Expected profit margin – Actual profit

Results and Discussion:-

General Characteristics:-

A total of 44 ornamental fish farmers were interviewed and data regarding their age, experience in ornamental fish farming, educational status, occupational status and farm size was recorded. It was found that about 38% of the small farmers and 39% of medium farmers were aged above 40 years. About 46% of small farmers and 50% of medium farmers had 6-10 years of experience in ornamental fish culture activities. All the farmers were literates. While 62% of the small farmers had ornamental fish culture as their primary occupation, 56% of medium farmers had ornamental fish culture as their primary income source. The average farm size was 0.42ha and 1.40ha for small and medium farms, respectively.

Supply chain:-

In Madurai district, four types of marketing channels were observed among the respondent farmers, in which Channel I was followed more frequently among small and medium ornamental fish farmers.

Channel I : Producer → Retailer → Consumer
Channel II : Producer cum Wholesaler → Retailer → Consumer
Channel III : Producer cum Rearer → Retailer → Consumer
Channel IV : Producer → Wholesaler → Retailer → Consumer

Constraints faced during ornamental fish culture – Garrett Ranking Technique:-

The constraints ranked by small and medium farmers were converted to scores and the order of priority with reference to production, marketing and other constraints are furnished in Tables 1, 2 and 3, respectively.

Table 1: Analysis of production constraints encountered in ornamental fish farming

Sl. No.	Production Constraints	Small farmers (n=26)			Medium farmers (n=18)		
		Sum of scores	Mean score	Order of merit	Sum of scores	Mean score	Order of merit
1	Disease outbreak due to environmental factors	1929	74.19	I	1367	75.94	I
2	Disease outbreak due to poor water quality management	1806	69.46	II	1220	67.78	II
3	Absence of technically skilled personnel and labour	1238	47.62	IV	912	50.67	IV
4	Risks in breeding egg layers	1213	46.65	V	833	46.28	V
5	Poor facilities for genetic improvement and research in farms	875	33.65	IX	647	35.94	VIII
6	Lack of brood fish resource	1064	40.92	VI	735	40.83	VII
7	Restrictions in providing license for brooders import	938	36.08	VIII	602	33.44	IX
8	Mortality during transport	1002	38.54	VII	829	46.06	VI
9	Insufficient credit facility from institutional sources	1347	51.81	III	983	54.61	III

Table 2: Analysis of marketing constraints encountered in ornamental fish farming

Sl. No.	Marketing Constraints	Small farmers (n=26)			Medium farmers (n=18)		
		Sum of scores	Mean score	Order of merit	Sum of scores	Mean score	Order of merit
1	Tough competition	1700	65.38	I	1125	62.50	I
2	Uncertainty in demand	1485	57.12	II	930	51.67	II
3	Absence of government market locally	1100	42.31	IV	855	47.50	III
4	Absence of marketing organization for development	980	37.69	V	820	45.56	IV
5	Inadequate facilities for marketing	1180	45.38	III	815	45.28	V

Table 3: Analysis of other constraints encountered in ornamental fish farming

Sl. No.	Other Constraints	Small farmers (n=26)			Medium farmers (n=18)		
		Sum of scores	Mean score	Order of merit	Sum of scores	Mean score	Order of merit
1	Pilferage	1170	45.00	IV	872	48.44	III
2	Predation of ornamental fishes by birds & animals	1385	53.27	II	880	48.89	II
3	Existence of gap in acquiring advanced technologies on farming practices	1545	59.42	I	1105	61.39	I
4	Live feed collection from far areas	1245	47.88	III	810	45.00	V
5	Inadequate water supply and farm area	1145	44.04	V	845	46.94	IV

Production constraints:-

It could be inferred from the Table 1 that disease outbreak due to environmental factors and poor water quality management was the most prominent problem associated with the ornamental fish culture which occupied the first and second with a mean score of 74.19 and 69.46 for small and 75.94 and 67.78 for medium farms, respectively. This was followed by insufficient credit facility from institutional sources, absence of technically skilled personnel and labour and risks in breeding egg layers which ranked third, fourth and fifth with a mean score of 51.81, 47.62, and 46.65, and 54.61, 50.67 and 46.28 for small and medium farmers, respectively. The study revealed that poor facilities for genetic improvement and research in farms was ranked the least (mean score –33.65) for small farmers whereas restrictions in providing license for brooders import was considered the least (mean score – 33.44) by medium farmers.

Marketing constraints:-

From the study, it could be inferred that tough competition and uncertainty in demand were found to occupy the first and second rank of marketing constraints with a mean score of 65.38 and 57.12 and 62.50 and 51.67 for small and medium farmers, respectively. Absence of government local market, marketing organization for development and inadequate facilities for marketing were also considered as marketing constraints by the respondent farmers with different ranks.

Other constraints:-

Table 3 depicted the other constraints that are faced by the ornamental fish farmers. From the study, it was found that there exist gap between farmers and technical institutions in transfer of advanced technologies on ornamental culture practices. It was reported as the top most constraint by both small and medium farmers with a mean score of 59.42 and 61.39, respectively. The next rank was backed by predation of ornamental fishes by birds and animals. Other constraints reported by farmers were pilferage, collection of live feed from far areas and inadequate supply of water and farm area.

Study on annual revenue loss due to disease incidence:-

In the present study, it was found that the revenue loss in both small and medium farms were due to mortality of fishes. Estimation on the loss due to different mortality factors showed that 80% mortality in fish was due to disease which was caused by environmental factors (47%) and of poor water quality management (33%). The remaining mortality was because of transportation (11%) and handling (9%) as shown in Figure 1. The estimate clearly indicated that major revenue loss in ornamental fish farms were due to disease incidence accompanied by environmental factors and poor water quality management. The loss (80%) due to disease incidence in fish was lower than that reported (90%) by Umamaheswari (2003).The major reason for death of fish as reported in the study could be due to lack of knowledge on scientific farming methods and the same could be evidenced by the study made by Verma (2003), where 48% of fisherwomen lack skill and knowledge on scientific practices of aquaculture in Orissa state. Water quality management is the main factor for the survival of young ones, which otherwise, poor water quality leads to disease infection of death of fish. Swain et al (2003) reported that lack of scientific knowledge on water quality management for rearing and breeding of ornamental fishes as a major constraint in ornamental fish farming.

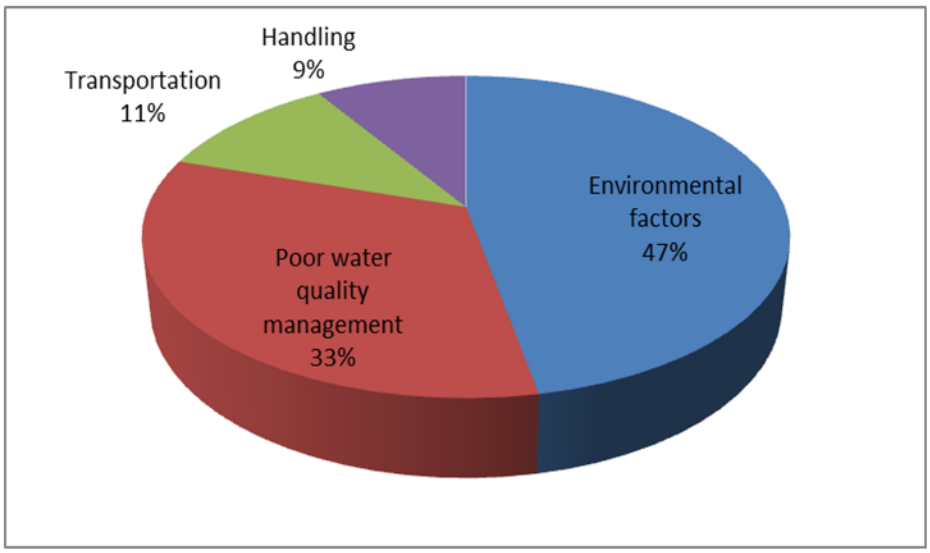

Fig 1:- Mortality of ornamental fishes due to various factors

The percentage distribution of revenue loss for all the farms is given in Table 4, whereas the total and mean annual revenue loss for major constraint i.e. disease outbreak as reported by both small and medium farmers was documented and the results are depicted in Table 5.

Table 4: Percentage distribution of revenue loss due to disease in farms

Sl. No	Loss range (Rs.)	No. of small farms	Percentage (%)	No. of medium farms	Percentage (%)
1	5001 – 10000	6	23.08	7	38.89
2	10001- 15000	12	46.15	5	27.78
3	15001 – 20000	8	30.77	6	33.33
	Total	26	100.00	18	100.00

Table 5: Estimation of revenue loss due to disease incidence in ornamental fish farms(in lakhs)

Particulars		TC	TR	AP	MC+TMC	STF	EP	RLD
Small farms	Total	30.86	39.68	8.81	0.81	4.08	12.11	32.94
	Mean	1.18	15.26	0.34	0.03	0.16	0.46	0.13
Medium farms	Total	127.30	150.39	230.81	2.23.	43.52	25.20	21.19
	Mean	7.07	8.35	12.82	0.12	0.24	1.40	0.12

(TC – Total Cost; TR – Total Revenue; AP – Actual Profit; MC – Maintenance Cost; TMC – Treatment Cost; STF – Sale Value of Treated Fish; EP – Expected Profit, RLD – Revenue Loss due to Disease incidence)

Revenue loss in small farms:-

Out of 26 farms surveyed, 6 farms (23.08%) showed revenue loss between Rs. 5001 to Rs. 10,000 per year (Table 4). Twelve farms (46.15%) reported loss range of Rs. 10,001 to Rs. 15,000/year. In small farm units, the fish tanks are subjected to various environmental conditions and also poor management and hence the disease incidence is at a higher level due to poor understanding of disease, making the treatment complicate and leading to death of fish in turn the revenue loss. Asaduzzaman et al (2006) reported that lack of technical knowledge of farmers on farm management is the main reason for disease occurrence and revenue loss. The small scale farmers culture only low and medium value fishes like live bearers, gold, koi carp and to certain extent cichlids and the revenue loss due to disease incidence was found to fall around 50%. Observation on small farms revealed that many of the fish death and disease incidences were due to poor knowledge of the farmer on water quality, feeding and disease management, which was also reported by Elamparithy (1999). The variation in locality, season and infection also plays a major role. The above seasonal variation was also confirmed by Banu et al (1993), who reported highest disease prevalence which varies with season and the type of fish. The above observation clearly indicates that disease prevalence varies with seasons, locality and the type of fish.

Revenue loss in medium farms:-

In medium farms, the minimum annual revenue loss was Rs.15, 220 and the maximum annual revenue loss was Rs.22, 000. Out of 18 farms surveyed, seven farms (38.89%) reported loss with a range between Rs. 5,001 to Rs. 10,000 and five farms (27.78%) incurred a revenue loss of amount ranging between Rs. 10,001 and Rs. 15,000 (Table 4). The variability of revenue loss was due to variable management factors and the type of fish handled and the area in which the farms are located. Similar variation in loss with respect to location, management, size of farm was reported by Faruk et al (2004). The farmers handle low and medium value fishes like gold fish, koi carp, guppy, barb and cichlids where the revenue loss ranges between Rs. 15,001 and Rs. 20,000. The medium farms which experienced high revenue loss of above Rs. 20,000, handle fishes of high value and imported varieties like flowerhorn and arowana varieties. Hence, death of high cost fish in addition to other varieties reduce the revenue and increases the loss. It was also observed that, in some of the medium farms, even after proper management, disease occurrence took place which might be due to the transfer of seedlings from the infected farms.

Estimation of expected profit margin:-

The actual profit for all the farms were calculated by finding out the difference between the total returns and total cost incurred. The study clearly indicated that the mean annual actual profit was higher for medium farms (Rs. 1.28 lakhs) when compared to small farms (Rs. 0.34 lakhs) as shown in Table 4. The expected annual returns was calculated by determining the difference between the summation of maintenance and treatment cost for deceased ornamental fishes and the sale value of treated/recovered fishes at current market price.

It has been observed that mean annual maintenance and treatment cost was Rs.0.03 lakhs for small farms, whereas for medium farms, it was Rs. 0.12 lakhs. In the same way, the mean annual expected profit margin was on higher side for medium farms (Rs. 1.45 lakhs) as compared to the small farms (0.47 lakhs). On contrary to this, the mean annual revenue loss due to disease for small farms was found to be Rs.0.13 lakhs, which was greater than the medium farms with a value of Rs. 0.11 lakhs. It clearly showed that the small ornamental fish farms in Madurai district were struggling in generating more revenue when they face disease outbreak in farms and some of the medium farms having bio secured system like installation of biofilters were able to generate more revenue.

Conclusion and Recommendations:-

The study on the economics of production of ornamental fishes in Madurai district generated some useful conclusions. It has been found that the income loss due to disease prevalence was higher in small farms and the expected profit margin towards selling the disease treated ornamental fishes was predominant in medium scale farms of Madurai district. It has been noticed that the discrepancy depends on various factors like farm size, type and size of ornamental fish farm, establishment of bio-security systems, technical knowledge in ornamental fish farming methods, disease diagnostics, management practices, investment cost etc. Moreover, the constraints faced by the small and medium ornamental fish farmers are numerous and need to be effectively addressed by government and policy makers particularly in case of dissemination of advanced technologies, establishment of brood bank for ornamental fishes and providing license for importing brooders as expressed by the ornamental fish farmers.

In general, the ornamental fish farming sector could be developed and promoted in a sustainable manner through adoption of various strategies as listed below.

1. The State Government shall encourage the small scale ornamental fish farmers and interested entrepreneurs to take up farming of highly priced aquarium fishes by extending easy credit facilities and subsidy through bank and other financial institutions to a greater extent so that they could be upgraded to medium scale farmers.
2. Toll free mobile services could be provided to ornamental fish farmers and traders in disseminating advanced breeding techniques, government schemes, demand data, markets and market price, brooders and seed availability.
3. Fish pathology laboratories need to be set up at least in major breeding centres to overcome possible disease outbreaks. Mobile fish health units with qualified professionals could be pressed into service to the farmers, who are in need.
4. Regular follow up of extension services with training programmes need to be provided on latest technologies in breeding, farming and rearing of the required species for mass production, health management, packing & transportation and bio-security measures.
5. Ornamental fish farming and trade industry needs to be provided with similar facilities and concessions as given to the agriculture sector. If possible co-operatives and Self Help Groups (SHG's) could be formed to facilitate production and marketing of ornamental fishes.

6. Multi-faceted strategies like improvements in logistics, simplifying export/import and quarantine procedures, dissemination of market information to stakeholders, standardization of fish size and handling, adoption of latest post-harvest technology to improve survival could be adopted.
7. Regular techno-economic studies on the aspects of farming and marketing may be taken up by Fisheries Research Institutes in the study areas.

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