An analysis of profitability of freshwater ornamental fish, grown in cement tanks and mud ponds

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Abstract

This paper reviews the profitability of fresh water ornamental fish, outgrowing in Kalutara District. Data were collected using structured questionnaire from 45 out growers in 2012. The analysis was conducted by calculating operational cost, revenue, gross profit, financial profit and rate of return on the investment (ROI). In terms of unit investment cost and variable cost, cement tanks are costly compared to mud ponds. In addition, revenue and gross profit per surface feet^2 of a mud pond show better off situation. Moreover, economic indicators such as rate of ROI and payback period (PBP) were more favourable for mud ponds. Though, economic indicators for cement tanks were far below compared to that of mud ponds, which were above average compared to the returns in the financial market prevailed. Hence, growing out in a cement tank is more suitable for small scale growers while mud ponds method is suitable for medium and large scale entrepreneurs. As the initial investment cost for mud ponds is higher despite of its superiority in all the economic indicators, the new entrants to mud pond grow outs may be limited. To overcome such entry barriers, soft bank loan facilities shall be facilitated to out growers, who are willing to start mud ponds grow out. Moreover, high variable cost is the prime factor which affects the long term sustainability of the industry in which feeding cost incurs about 44%. Therefore, innovations in local feed alternatives are vital for the increased economic viability of the industry.

Keywords: Ornamental fish, Profitability, Return on investment, Cement tank, Mud pond

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Introduction

'Ornamental fish' is often used as a generic term to describe aquatic animals kept in aquarium hobby, including fishes, invertebrates such as corals, crustaceans, mollusks and also liverock (Livengood and Chapman, 2009). The ornamental fish became a tradable commodity in the international market, especially in developed countries due to demand from increasing number of aquarium hobbyists. The various studies have shown that the indoor aquaria maintained by hobbyists in USA, UK, Belgium, Italy and Holland households are 10, 13, 4, 4 and 20% respectively (Oliver, 2001; Devenport, 1996; Andrews, 1990).

The development of breeder/out grower system of freshwater ornamental fish in mid 80's was directed towards fish breeding in captivity by exporters. It resulted in generation of self employment to unemployed rural youth (Weerakoon and Senarathne, 2005). This breeder/out grower system enabled exporters to provide continuous supply to their importers abroad and maintain reliable business relations with them.

Most of the early studies were paid attention to principles of ornamental fish production with technical details than socio-economic considerations. Brown and Gratzek (1980) examined ornamental fish culture methods with special reference to important technical aspects of fish culture in the United States of America and estimated the farm value. Mhasawade (1982) provided a detailed list of input requirements and costs for the breeding of selected varieties of aquarium fish culture. Basic economic concepts and tools for undertaking economics of various aquaculture systems was done by Shang (1981) and presented the basic framework to analyze economic viability. Raju (1997) studied on the economic analysis of different aquaculture systems in Kerala using production function approach and cost-return analysis. Shyma and Thomson (2002) studied the ornamental fish production in granite quarries in Kerala with special reference to pre and post management practices, social organization, ownership patterns and economics of operation.

Kalutara and Polonnaruwa Districts are among the fast growing ornamental fish producing centres of the country. The popular captive breeding method of ornamental fish in Polonnaruwa District is mud ponds, while in Kalutara District cement/glass tank

and mud ponds are used for the production of ornamental fish. There were about 183 ornamental fish producers are registered with the National Aquaculture Development Authority (NAQDA), Kalutara District. This paper reviews the profitability and economic viability of fresh water ornamental fish out growing in Kalutara District.

Materials and Methods

Structured questionnaire survey was conducted among current breeders/out growers, during January to October, 2012 in the Kalutara District. The list of registered ornamental fish producers was obtained from NAQDA Kalutara District Extension Office. The total number of registered breeders/out growers was 183. They were grouped according to Divisional Secretariats in the district and 25% of them were selected randomly using one-step stratified sampling method providing them equal opportunity to be selected. In total, 45 ornamental fish producers were selected for sampling and 41 used for analysis. The data analysis was done using SPSS statistical package. The unit of analysis was square foot. The investment cost, production, revenue, variable cost and gross profit were calculated in LKR per foot^2. Mean, Range and Standard Deviation for above mentioned variables were calculated using SPSS statistical package. Economic indicators were calculated and compared to assess the economic viability of ornamental fish growing in cement tanks and mud ponds.

Results and Discussion

Investment cost/Capital investment

Investments on breeding or growing depend on the scale of activity. Basically, a new entrant to the sector needs capital for infrastructure and services, which includes preparation of cement tanks or mud ponds, buildings, fencing, protective-nets, equipment and apparatus, power supply, air blowers, etc. When operation commences current capital requirements arises for maintenance of brooders, breedings, feeds, medicines, packing materials and transportation.

Table 1 shows the investment calculated per foot^2 of cement tank and mud pond surface area. The mean investment needed for the cement made tank per square foot was LKR 389 and the same for the mud pond was LKR 182. However, the initial investment

required for mud ponds is comparatively higher than that of cement tanks as land and land preparation incur additional cost.

Table 1. Investment cost/foot^2 and tank/pond area per out grower

Item	Investment cost/foot^2 (LKR)		Tank/pond area per out grower (foot^2)	
	Mud pond	Cement tank	Mud pond	Cement tank
Mean	182	389	1,044	28
Range	777	1,632	3,744	97
Standard deviation	233	377	1,446	24

Mean surface area of cement tanks and mud ponds owned by ornamental fish producers were 28 and 1,044 per foot^2 respectively. Initial investment cost borne by the ornamental fish producers in the Kalutara District, who operates cement tank and mud ponds were LKR 20,892 and 190,008 respectively. These estimates are similar to the field data. In general, majority of cement tank users are small scale and mud ponds users are in the range of medium to large scale.

Production

The number of pairs of fish produced per foot^2 per month is given in the Table 2. The mean number of pairs produced in mud ponds and cement tanks were 1.7 and 2.8 respectively. The higher productivity has shown in the cement tanks grow out in comparison with the mud ponds. The mortality of fish in the mud ponds generally higher due to predator reactions and the cement tank environment is fairly controlled environment compared to the mud ponds. That may be the reason for higher productivity of the cement tanks.

Table 2. Production and revenue per foot^2

Parameter	Production/foot^2 (pairs)		Revenue/ foot^2 (LKR)	
	Mud pond	Cement tank	Mud pond	Cement tank
Mean	1.7	2.8	19.9	43.9
Range	2.7	16.5	45.2	91.3
Standard deviation	0.9	3.9	13.5	32.9

Revenue

Revenue is the gross income, earned by the producer selling number of fish at the producer price. Mean revenue/foot^2/month were LKR 20 and 44 for the mud pond and the cement tank grow outs respectively. Range of revenue for the mud pond and cement tank were LKR 45 and 91 respectively. The revenue is not by selling a single variety alone, as a practice out growers grow a mix of varieties with higher and lower market price. In terms of revenue, cement tanks yields higher profits than that of mud ponds.

Variable cost

Variable or operational cost of breeding and growing consists of number of intermediary inputs. Brood stock, breeding (or fingerlings), feed, medicine, electricity, water, wages and packing materials are main operational cost items. These input costs vary according to the type of grow out (mud pond or cement tank), varieties bread or grow out, length of grow out cycle and price of inputs. The mean operational cost/foot^2/month for the mud pond and cement tank grow out were LKR 5 and 20 respectively. It shows that the unit operational cost for the mud ponds was remarkably lower compared to the cement tanks. The stocking density of fingerlings higher in mud ponds compared to that in cement tanks. On the other hand feed requirement is lower in the mud ponds. The main component of the variable cost specially for outgrowing in cement was feed cost, the feed incurs 44% of the total variable cost (Fig. 1.).

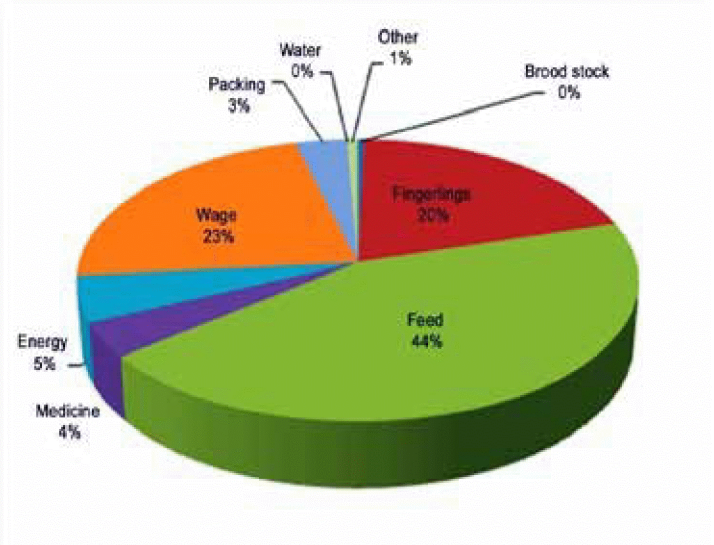

Fig. 1. Composition of the variable cost of cement tank based outgrowing

Gross profit or Gross margin

Gross profit is derived by deduction of variable cost from the revenue. The gross profit/ month/foot^2 of mud ponds and cement tank were LKR 17 and 15 respectively. Range of values was LKR 48 and 60 for the mud ponds and the cement tanks respectively.

Table 3. Variable cost and gross profit/foot^2

Parameter	Variable cost/foot^2 (LKR)		Gross profit/foot^2 (LKR)	
	Mud pond	Cement tank	Mud pond	Cement tank
Mean	5.4	19.5	17.3	15.0
Range	9.3	43.2	47.9	59.9
Standard deviation	3.4	21.1	13.2	22.7

Economic viability

Gross profit was obtained by deducting variable cost from the revenue, while financial profit refers to revenue net of financial costs. The gross profit is used to determine the close down point of the economic activity in the short run. As long as variable cost is recovered the breeding/growing can continue in the short run.

Table 4. Economic indicators of the ornamental fish outgrowing

Indicator	Mud ponds	Cement tanks
Financial profit to variable cost ratio	3.1	0.6
Financial profit to revenue ratio	0.8	0.3
Rate of return to total financial cost	2.4	0.5
Payback period (PBP) of financial cost (years)	0.4	1.9
Rate of return on investment (ROI)	1.02	0.36
Payback period of investment (years)	0.97	2.8

Financial profit on the other hand, indicates the long run profitability of ornamental fish breeding/growing venture. Rate of return is a profit on an investment over a period of time, expressed as a proportion of the original investment. The time period is typically a year, in which case the rate of return is referred to as annual return. If the rate of return on investment is higher, the initial investment could be recovered within a shorter period. The rate of return on the investment for mud ponds and cement tanks were 1.02 and

0.36, while payback periods were 0.97 and 2.8 years respectively. It implies that the mud ponds would be able to recover its investment in shorter period than that of cement tanks. Thus, capital invested by loans could be paid back within a shorter period by the mud ponds–growouters. Another indicator of the profitability is the ratio of financial profit to total revenue. It explains the amount of revenue, which is accounted for profit. The ratio of financial profit to total revenue for the mud ponds and the cement tanks were 0.8 and 0.3 respectively. In every aspect of economic indicators, the mud pond shows greater economic viability compared to the cement tank. Despite the disparities in profit and earnings, the rate of return on the investment for cement tank was higher comparable with agricultural farming.

Conclusions

Initial investment cost is higher for mud ponds. In particular, investment on land and land preparations are higher in mud ponds than that of cement tanks. Hence, most of the potential out-growers may shift to cement tanks. In respect of mud ponds, the unit cost of investment and variable cost are comparatively lower than that of the cement tanks, however gross profits are higher in mud ponds. On the other hand, the unit production, revenue and gross profit are higher for the cement tanks. In terms of economic indicators such as the return on investment and the payback period mud ponds shows better off situation than that of cement tanks. The mud ponds recorded 102% ROI and the PBP was less than one year. Despite these disparities, the cement tanks too able to secure 36% ROI and the PBP was 2.8 years. Therefore, both mud ponds and cement tank grow outs show positive profits. However, mud ponds are superior in all the economic aspects (except production and revenue). Promotion of mud ponds is vital for more competitive export oriented freshwater ornamental fish industry. Therefore, soft bank loan facilities should be arranged to outgrowers, who are willing to enter into mud ponds based growouts. Moreover, higher feed cost is the critical factor of profit determination, especially for cement tank growouts. Thus, induction of local feed manufacturing is essential to optimize profits in the fresh water ornamental fish industry.

References

Andrews, C. (1990). The ornamental fish trade and fish conservation. *Journal of fish biology* **37**: pp 53-59.

Brown, E.E. and Gratzek, J.B. (1980). Fish farming handbook, p 391. AVI Publishing Company, Inc., Westport, Connecticut.

Davenport, K.E. (1996). Characteristics of current international trade in ornamental fish, with special reference European Union. *Reveu Sceintifique Et Technique De L Office International Des Epizooties* **15(2)**: pp 435-443.

Livengood, E.J. and Chapman, F.A. (2009). Ornamental fish trade: An introduction with perspective for responsible aquarium co-operative extension service, p 7. Institute of Food and Agricultural Science, University of Florida, Gainesville FL32611.

Mhasawade, D.H. (1982). Economic feasibility of aquarium fish culture, In: Proceedings of the seminar on prospects of ornamental fish export from (10^{th} February 1982, Bombay), MPEDA, Cochin: pp 127-146.

Oliver, K. (2001). The ornamental fish market. FAO/GLOBFISH Research Programme, Vol. 67, p 91. United Nations Food and Agriculture Organization, Rome, Italy.

Raju, M.S. (1997). Economic analysis of different aquaculture systems in Kerala: A production function approach, PhD Thesis, Cochin University of Science and Technology, Cochin, p 278.

Shang, Y.C. (1981). Aquaculture economics, Basic concepts and methods of analysis, p 153.West view press, Boulder, Colorado.

Shyma, J. and Thomson, K.T. (2002). Ornamental fish production in granite quarries in Kerala, In: Riverine and reservoir fisheries in India, ed. Boopendranath, M.R., Meenakumari, B., Joseph, L., Sankar, T.V., Praveen, P. and Edwin, L., pp 378-383. Society of fisheries technologists (India), Cochin.

Weerakoon, D.E.M. and Senarathne, A. (2005). Prospects for ornamental fish and aquatic plants exports from Sri Lanka, Daily News online edition, http://www.dailynews.lk/2005/05/27/fea08.htm, Date accessed 12/02/2013.