Economic Feasibility of Tilapia Cage Culturein Pizhala,Cochin

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Abstract

This work was targeted to determine break-even point of tilapia cage farms. Study shows that all the selected farms are in profit. Once the cage culture practice is further expanded to many areas and farms, the cost will decline due to the economies of scale of operation. It is a viable alternative and economically and financially feasible mariculture operation for the farmers to make use of. Cage culture development must be sustained in future by research and development in genetics, nutrition, health management, production economy, product handling etc. In Pizhala, it is found that many people are willing to start and carry out cage farming of different species. Success story of the initial fish farmers are one of the major reason for this mindset. So, it is found that in Pizhala, cage culture is economically feasible and further development in this field is also possible, if available potential resources and technologies are logically distributed.

Key words: Cage culture, Tilapia, Break-even, Economic analysis, Profit.

Introduction

Fish are raised commercially in cages**.** Cage culture of fish utilizes existing water resources but encloses the fish in a cage or basket which allows water to pass freely between the fish and the pond. Capture-based aquaculture provides opportunity to reduce the risks associated with food safety (Brummett, 2007). The first true cages for producing fish were developed in Southeast Asia around the end of the last century. These early cages were constructed of wood or bamboo, and the fish were fed trash fish and food scraps. Modern cage culture began in the 1950s with the advent of synthetic materials for cage construction.

Today cage culture is receiving more attention by both researchers and commercial producers. Factors such as increasing consumption of fish, declining wild fish stocks, and a poor farm economy have produced a strong interest in fish production in cages. Cage culture also offers the farmer a chance to utilize existing water resources which in most cases have only limited use for other purposes. The selection of fish for cage culture should be based on biological criteria, such as physiological, behavioural characteristics and level of domestication; marketing criteria and environmental criteria, distribution and habitat of site (Kelly, 1973).

The cage culture of fish is not foolproof or simple. To the contrary, cage production can be more intensive in many ways than pond culture and should probably be considered as a commercial alternative only whereopen pond culture is not practical.The cage site to be selected should be of a suitable depth, have good

tidal flow with optimal conditions and ideally be protected from strong winds and rough weather and have sufficient water movements. In turbid water, silt will tend to accumulate in the cage preventing good water exchange (James et al.,1980). The presence of suspended solids also relates to some disease such as "fin-rot" caused by Mycobacteria (Herbert and Merkens, 1961). The depth of net ranging from 2 to 5 m is ideal. For open sea cage culture, predator net to prevent attack by predatory organisms is essential (Sugunan, 2011).

Latest version of open sea cage is a cost-effective GI cage designed for low investment farming operations (Rajalekshmi and Ravichandran,1980). Cages have been found to be successful in many maritime states along the Indian coast in demonstration trials. This study is an attempt to analyse economic feasibility of cage culture in Pizhala, Cochin.

Materials and methods

Study area

Pizhalais an island near Kochi surrounded by river Periyar (Coordinates: 10.04°N, 76.25°E).It is the central part of Kadamakkudy,Kanayannur Taluk, Ernakulam District inthe Indian state of Ke rala. Economic feasibility and break-even analysis of cage culturefarms in Pizhala,Cochin, Kerala were conducted during December 2016 to April 2017.

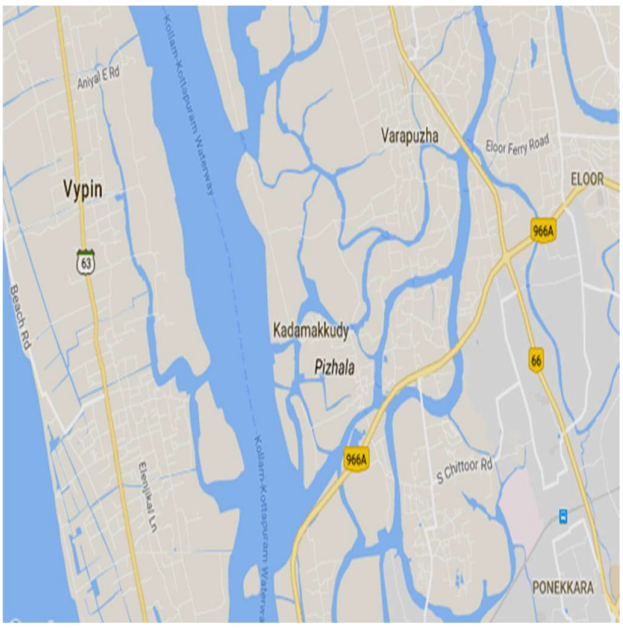

Figure 3Map of Pizhala – an aerial view

Data collection

Primary data has been obtained through personal discussions with fish farmers and villagers of Pizhala,Cochin.Secondary data's has been obtained from published reports of the annual reports of the FAO, CMFRI, Journals, and reports maintained by the different fisheries departments.

Data Analysis

Microsoft Excel 2010 and CalcXML-ONLINE SOFTWARE were the software used to analysis the obtained data and to

find out break even and margin of safety of that particular cage culture farm. Net profit ratio was also calculated using this software.

Economic Indicators

The success of adoption of any innovation or new technology lies in its economic performance. The rate of return per rupee invested is the economic indicator that guides the investor to choose a particular enterprise or practice. Indicators of economic performance of the cageculture enterprise includedInitial investment of the cage**,** Fixed cost (For crop duration), Depreciation**,** Interest on Fixed capital**,** Administrative cost**,** Operating costs**,** Yield of fish (in kg)**,** Cost of production (Rs. /kg) etc.

Break-Even Analysis

Break-even is the point at which total revenue and the total costs are equal. At this point the the business will not make any losses or any profits. It's important to know how much our product costs to manufacture or provide. This information helps us to decide what the selling price needs to be, How much products have to be sold to cover the cost and for avoiding making a loss.

Margin of Safety

The excess of actual or budgeted sales over the break even volume of sales is called **margin of safety**. With a high margin of safety business have low risk of not breaking even and with a low margin of safety business have high risk of not breaking even.The formula for the calculation of margin of safety is as follows:

Margin of Safety = Total Budgeted Or Actual Sale – Breakeven Sales

Net Profit Ratio

Net profit ratio is the ratio between net profit earned by a business and its net sales.It measures the overall profitability as well as efficiency of the business. The ideal net profit ratio is 5% - 10%.

$$\text{Net Profit ratio} = \frac{\text{Net Profit}}{\text{Net sales}} \times 100$$

Result and discussion

Tilapias are reared in 5m X 4m X 2m rectangular cage constructed with 6 cm diameter PVC pipe held with the help of bend pipe at corners. HDPE nettings of 20mm and 40mm were used as inner and outer netting,respectively.

Plate 1. a) Preparation of cagesusing HDPE nettings and PVC pipes b) Rectangular cages for rearing tilapia

Fingerlings of 5000 numbers at Rs.3 are collected from local farm at Mala, Thrissur.Stocking rate is125 no/m^3.Survival rate of this species in this farm is 80% of initial stock.Table 1 discloses,cost and earnings of one cage in tilapia farm.

In Pizhala,it is found that many people are willing to start and carry out cage farming of different species. Success story of the initial fish farmers are one of the major reason for this mindset. Through the break even chart ,it is found that, most of the farms are giving favourable results and farms which are going to shut down, are the result of non-scientific approaches and environmental problems. Now CMFRI,KVK, etc. are introducing their own plans with fish farmers. So, it is found that in Pizhala, cage culture is economically feasible and further development in this field is also possible, if available potential resources and technologies are logically distributed.

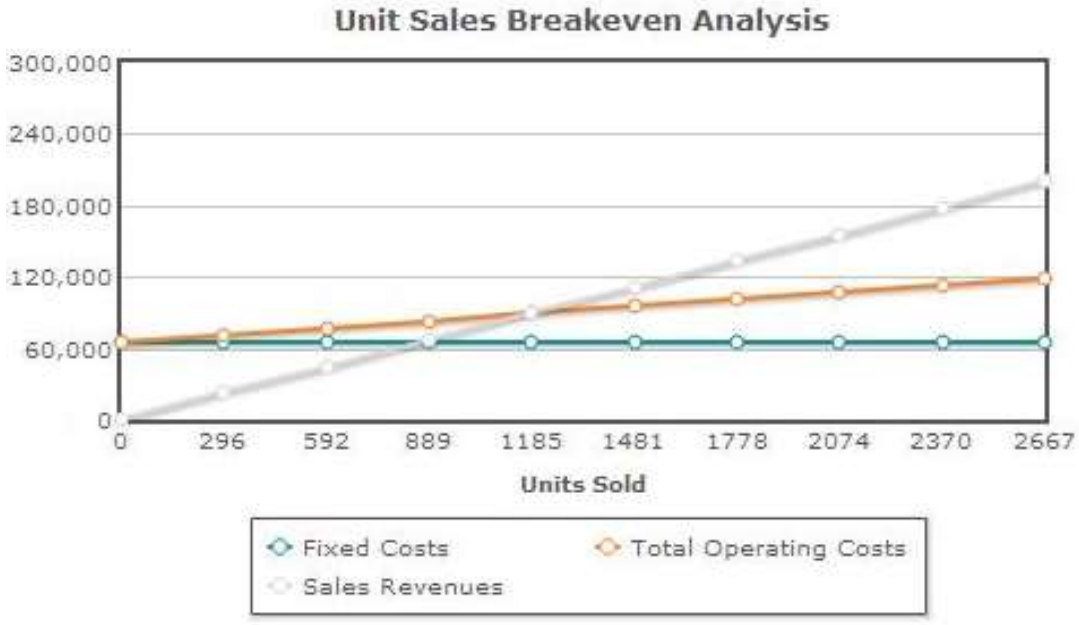

Figure 1.Break even analysis of tilapia cage culture

Sl.no	Items	Amount (Rs.)
I	Fixed cost	
1	Cage frame	9000
2	Cage net	3000
3	Charge for site lease(per year)	1250
4	Boat purchasing charge	25000
5	Bamboo charge	650
6	Watchmen shed	1000
A	Total fixed cost	39900
II	Variable cost	
1	Fish seed cost(per seed Rs.3 x5000 no.s)	15000
2	Artificial Feed (500 kg @ Rs.28/ Kg)	14000
3	Labour charge(Rs.2000 per month x 6)	12000
4	Harvest charge	5450
5	Electric power charge	720
6	waste management charge	1700
7	Net mending charge	800
8	Cage maintenance charge	500
9	Seed transpotation charge	20000
10	Fish marketing charge	1500
11	Watchmen charge	9000
B	Total variable cost	80670
C	TOTAL OPERATIONAL COST (A+B)	120570
III	Return	
D	Total return (1000 Kg @ Rs.300)	300000
	Net Return (D-C)	179430

Table 1. Fixed cost and variable cost incurred in tilapia cage culture

Units Sold	Sales Revenues	Variable Costs	Fixed Costs	Operating Profit
(no.s)	(In Rupees)	(In Rupees)	(In Rupees)	(In Rupees)
0	0	0	65,200	-65,200
297	22,292	5,992	65,200	-48,900
594	44,584	11,984	65,200	-32,600
891	66,876	17,976	65,200	-16,300
1188	89,168	23,968	65,200	0
1486	111,461	29,961	65,200	16,300
1783	133,753	35,953	65,200	32,600
2080	156,045	41,945	65,200	48,900
2377	178,337	47,937	65,200	65,200
2675	200,629	53,929	65,200	81,500

Table 9.cost –profit data sheet of Tilapia farm

Table 2. Cost-profit data sheet of Tilapia farm

Total fixed costs	Rs.65,200
Variable cost per unit	Rs.20
Sales price per unit	Rs.75
Anticipated unit sales	12000 no.s

Table 3.Summary of input tilapia farm

Problems faced by cage culture

Pond fish can make use of naturally occurring food, while cage grown fish only have a limited access natural food since they cannot forage on their own. Cage grown fish therefore needs to be fed by the farmer to a much higher extent. The food that is given to the cage grown fish also has to be nutritionally complete, e.g. Contain proper amounts of all necessary vitamins and minerals. When fish grown in cages instead of ponds, most farmers opt for a high stocking density. A high stocking density creates a stressful environment for the fish and stress damages the immune system. The risk of disease is therefore high. The risks will be increased further if the farmer fails to provide the fish with optimal water conditions and a satisfactory diet.

Cage culture can introduce or disrupt disease and parasite cycles, change the aquatic flora and fauna and alter the behaviour and distribution of local fauna. If proper water exchange is not there, the uneaten feed and metabolic waste released from cages will lead to eutrophication of the site. Predators can be attracted to the cages and for that additional protection has to be provided such as predator nets . Poaching is easy because fish are confined in a small area .Marine cages face problems like fouling and is more expensive. Heavy water current and stroms

can damage the cages. When cages are installed indiscriminately, its impact on environment and biodiversity is adverse and it will have influence on current flow and increase local sedimentation. Since cages occupy open water sources, it may affect navigation in the area, or reduce landscape value of that area and are vulnerable to pollution from any source.

Conclusion

Cage farming is a viable alternative and economically and financially feasible mariculture operation for the farmers to make use of. Cage culture development must be sustained in future by research and development in genetics, nutrition, health management, production economy, product handling *et*c.

Cage culture is largely attributed to peculiarity of operations, where there is a requirement for well-trained personnel, specialized equipment and conditioned boats for daily operations like feeding, monitoring etc. Although the investment costs are generally important,economic analyses are not sensitive to the initial costs of installation of the culture systems.Moreover, the initial costs do not always reflect the true costs of a given production system.

A comparative assessment of the costs of cage installation should also consider possible differences in durability, operation and maintenance costs, needs for auxiliary equipment and proper cage performance.Cage culture eliminates loss of stock due to flooding, seepage, evaporation losses and the resultant need for water replacement, dependence on soil characteristics, contamination of pond by agricultural chemicals and pressure on land resources. It also has the merits of easy and economical control of predators and diseases, complete harvest of fishproduction and cutting down on the costof preservation and transportation since they can be located in water ways and water areas near urban markets.

Reference

Brummett, R.E. (2007) Comparative analysis of the environmental costs of fish farming and crop production in arid areas. In: Comparative Assessment of the Environmental Costs of Aquaculture and other Food Production Sectors: Methods for Meaningful Comparisons (D.M. Bartley, C. Brugère, D. Soto, P. Gerber & B. Harvey eds). 221–228 pp. FAO/WFT Expert Workshop.24-28 April 2006, Vancouver, Canada.FAO Fisheries Proceedings.No. 10. FAO, Rome. Pp.140-157.

Herburt and Merkens, (1961,1963), Criteria for the site selection of fish farming,Vol 1,Vol 2 ,Frances Pinter Publishers ,London,pp 203-222

James.P, *et.al*, (1980), A Preliminary studies on culture of finfishes in cages in the coastal waters of Park Bay at Mandapam. Symp. Coastal Aquaculture, Abstract, pp. 121.

Kelly.J.R.(1973), An improved cage design for use in culturing channel cat fish Prog. Fish.Cult.)5: 167- 169.

Rajyalakshmi.T and P.Ravichandran,(1980). Prospects of pen and cage culture of prawns in brackishwater.In : Summer Institute on brackishwater capture and

culture fisheries, CIFRI, Barrackpore ,pp 35

Sugunan VV.(2011) Reservoir fisheries. Handbook of fisheries and aquaculture. ICAR, New Delhi,.pp.221 -235

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