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Techno-economic analysis of Shrimp farming in Coastal districts of Tamilnadu

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Abstract
The present study was taken up to carry out the techno-economic analysis of the shrimp farming practices in the coastal districts of Tamilnadu. Efforts were made to study the socio-personal characters of aquafarmers, farm details, technical details, component wise cost of shrimp farming and economics of shrimp farming. The study revealed that 45.33 % shrimp farmers belonged to middle age group, 44.67 % were educated up to higher secondary level, 78.67 % of the farmers were engaged in aquaculture alone for their livelihood and 48.67 % respondents had farming experience between 5-10 years. Majority of the respondents (82 %) belonged to the marginal (54.67 %) and small (27.33 %) category of farmers. The results indicate that feed (42.94 %), electricity (10.10 %), medicines (8.97 %) and seed (8.26%) were the major costs in shrimp farming activity. Shrimp farmers earned a net profit of 11.47 lakh/ha with BCR of 1.85. On a whole Shrimp farming in coastal districts of Tamilnadu was observed to be economically viable.

Keywords: Shrimp farming, techno-economics, coastal districts, socio-personal

Introduction
Aquaculture, farming of aquatic animals, plants and other organisms, continued to grow more rapidly than any other animal food-producing sector and it has the potential to meet the growing demand for aquatic food in the coming years [1]. Aquaculture represents the most efficient and sustainable way to promise that there is adequate protein to feed a world whose population is increasing continuously, for which it requires high capital inputs, technical knowhow and ownership of or access to land/water resources [2]. Worldwide, the aquaculture sector has grown at an average rate of 5.3 percent per year during 2001-2018, aquaculture production reaching up to 82.1 million tonnes in 2018 from a production of less than 1.0 million tonnes in the early 1950s. Globally, India ranks second in the aquaculture production next only to China [3].

Aquaculture in India has demonstrated a six and a half fold growth over the last three decades although only 40 % and 15 % of the potential freshwater (2.36 million hectares of ponds and tanks) and brackishwater resources (1.2 million hectares) respectively alone have been utilized so far [4]. Traditionally brackishwater aquaculture has been practiced as tide fed 'trap, hold and harvest' activity without any external inputs as a livelihood by the coastal people. Shrimp is an important farmed aquatic crustacean species in the world and plays a great role in human nutritional needs due to its high protein, balanced amino acids profile, unsaturated fatty acids, vitamins and minerals [5]. Development of shrimp farming from a traditional activity to a highly commercial farming enterprise in a span of about three decades has been one of the most spectacular achievements of aquaculture in India. This was mainly possible due to the technological advancements in shrimp seed production and culture technologies. Indian brackishwater aquaculture sector is synonymous with shrimp farming.

Improvements in farming productivity come from adoption of latest technologies and increase in the production efficiency [6]. It has been well established that the improvements in efficiency are more cost-effective than introducing new technology if the producers are not efficient in the use of the existing technology [7, 8]. If the producers are reasonably efficient, then new inputs and technology would be required to shift the production frontier upward [9, 10]. As Tamilnadu has the second longest coastline in the country with shrimp farming growing considerably over an area of 5075 ha [11], the present study was undertaken to study the socio-economic profile of shrimp farmers and to analyze the techno-economic viability of shrimp farming in coastal districts of Tamilnadu.

Materials and Methods

The study was carried out during March to August 2019 in the coastal districts of Tamilnadu predominantly undertaking shrimp farming viz., Thiruvallur, Kancheepuram, Villupuram, Cuddalore and Nagapattinam. These five districts play a very important role in brackish water farming in Tamilnadu, as they are situated in the coast of Bay of Bengal and have plenty of brackish water resources. An expost-facto research design was employed in the present study. A total of 150 aqua farmers at the rate of 30 aqua farmers from each district were selected randomly. A well structured and pre-tested interview schedule was used for data collection.

Results and Discussions

Socio-personal profile of shrimp farmers

The socio-economic profile of shrimp farmers in Tamilnadu is presented in Table 1. Age reveals the mental maturity of the aqua farmers while making decisions regarding their farming activities. Majority of the shrimp farmer respondents belonged to middle age group (45.33 %), followed by old (39.33 %) and young (15.33 %) age groups. Similar finding were reported in the past [12, 13]. Educational status of the respondent farmers revealed that majority of the farmers were literate with nearly half of the respondents (44.67 %) were educated up to higher secondary level followed by graduation and above level (22.67 %), middle school level (12.00 %), primary school level (14.00%). On a whole, 93.33 % farmer respondents were educated. The studies on adoption of shrimp culture techniques [14], information utilization of shrimp farmers [15] and information seeking behavior of aqua farmers [13] reported similar findings.

About three-fourth (78.67 %) of the farmers in the present study were engaged in aquaculture alone for their livelihood and rest (21.33 %) had other occupations as well in addition to aquaculture. It was apparent that shrimp aquaculture being a relatively risky farming activity, it requires the farmer's full time involvement and attention [13, 14, 16]. With respect to the experience of farmer in shrimp farming activity, nearly half of the respondents (48.67 %) had farming experience between 5-10 years and 27.33% farmer respondents had experience up to 5 years, while 24.00 % farmers were found to be with more than 10 years of experience. It could be observed that farmers had considerable level of farming experience.

Table 1: Socio-personal profile of shrimp farmers

S. No.	Category	Frequency (N = 150)	Percentage
I	**Age**		
1	Young (up to 34 years)	23	15.33
2	Middle (35 to 44 years)	59	39.33
3	Old (45 years and above)	68	45.33
II	**Educational status**		
1	Illiterate	10	6.67
2	Primary education	21	14.00
3	Middle education	18	12.00
4	Higher secondary education	67	44.67
5	Collegiate and above	34	22.67
III	**Occupational status**		
1	Aquaculture as primary occupational activity	118	78.67
2	Aquaculture as secondary occupational activity	32	21.33
IV	**Farming experience**		
1	Up to 5 years	41	27.33
2	5 - 10 years	73	48.67
4	More than 10 years	36	24.00

Shrimp farm details

The distribution of farmers according to farm size indicated that about 82 % of the respondents belonged to the marginal (54.67 %) and small (27.33 %) category of farmers (Table 2). Big farmers holding more than 5 ha of shrimp farm were constituted 18 % of respondents. With respect to number of ponds hold by the farmers, it was observed that more than half of the respondents (52.00 %) had ponds up to 5 numbers. 31.33 Per cent farmers were holding 5 to 10 numbers of ponds while 16.67 per cent farmers were holding more than 10 numbers of ponds. The findings are in conformity with the reports of MPEDA that majority of the shrimp farmers in the country are belonged to the category of small and marginal farmers [17, 18].

Table 2: Details of shrimp farms

S. No.	Category	Frequency (N = 150)	Percentage
I	**Farm size**		
1	Marginal farmers (up to 2 ha)	82	54.67
2	Small farmers (2 – 5 ha)	41	27.33
3	Big farmers (more than 5 ha)	27	18.00
II	**No. of Ponds**		
1	Upto 5 nos.	78	52.00
2	5 to 10 nos.	47	31.33
3	More than 10 nos.	25	16.67

Technical details and characteristics of shrimp farming

Exotic shrimp species *Litopenaeus vannamei*, white-leg shrimp is the only species being unanimously cultivated by all the farmers owing to availability of Specific Pathogen Free (SPF) seed and revenue due to significant contribution in marine products exports and foreign exchange earnings.

Majority of the farmers (85.00%) depend on creeks as water source for their farming activity. Nearly three-fourth (72.00%) of the farmers practice semi-intensive farming followed by extensive (23%) and intensive (5%) farming system with an average culture period of about 4 months (120 days). Farmers stocked shrimp postlarvae of PL10 at stocking density of 30 nos./m^2 and recorded survival rate of 73% on an average. Farmers used commercial shrimp feed (granules type) (100%) and administration of probiotics (100%). In the shrimp pond, farmers used three types of aerators namely, paddle wheel (88%), air injector (9%) and sludge motor (3%) for aeration. Majority of the farmers adopted the good management practices and Bio-security measures viz., pond preparation, seed selection-stocking and post stocking management, Biosecurity measures likely foot bath, Crab fence, bird fence, etc. Majority of the farmers were adopting complete harvest of shrimps at average body weight (ABW) of 25 grams, on an average.

Component wise cost of shrimp farming

The total cost of shrimp farming in the sample farms was estimated to be over Rs. 13.00 lakh per hectare per crop out of which 87.99 percent was accounted by variable cost and balance 12.01 percent was by fixed cost (Table 3). Component wise analysis of cost indicated that, cost of feed was the major component accounting nearly half of the total cost (42.94 %) which was followed by electricity charges (10.10 %), Probiotics, medicines and chemicals (8.97 %), cost of seed (8.26%) and others. The results clearly indicate that feed, electricity, medicines and seed were the major costs accounting to about 70 percent in shrimp farming activity. Similar findings were also reported earlier that feed, seed and electricity were the major costs incurred in shrimp farming [19, 20, 21].

Table 3: Component wise cost of shrimp farming (per ha)

S. No.	Particulars	Amount (in Rs.)	Share (%)
I	**Variable Cost**		
1	Pond preparation (Earth work, Biosecurity measures, Bleaching, etc.)	44,285	3.29
2	Seed cost	1,11,000	8.26
3	Feed cost	5,77,600	42.97
4	Probiotics, Medicines and chemicals	1,20,570	8.97
5	Electricity	1,35,714	10.10
6	Fuel	57,142	4.25
7	Labour	85,700	6.38
8	Harvest handling	25,710	1.91
9	Miscellaneous	25,000	1.86
	Total Variable cost	**11,82,721**	**87.99**
II	**Fixed cost**		
1	Lease rent	75,000	5.58
2	Depreciation	36,126	2.69
3	Annual Repair and Maintenance	24,700	1.84
4	Interest on capital cost	25,663	1.91
	Total Fixed cost	**1,61,489**	**12.01**
	Total cost	**13,44,210**	**100.00**

Economics of shrimp farming

The economics of the shrimp farming per hectare in Tamilnadu is illustrated in Table 4. The analysis revealed that average yield was 6,077 kg per hectare. The average expenditure i.e., total cost was Rs. 13,44,210 per ha. The average cost of production worked out to be Rs. 221.19 kg/ ha. The average gross income earned by the respondents was Rs.24,91,570/ ha at average shrimp selling price of Rs.410/ kg. Shrimp farming in coastal districts of Tamilnadu was observed to be economically viable as the Benefit Cost Ratio (BCR) was more than unity (1.85).

Table 4: Economics of shrimp farming (per ha)

S. No.	Particulars	Cost/ Return (Rs./ ha)
1	Total cost	13,44,210
2	Yield (Kg/ha)	6,077
3	Cost of Production (Rs./Kg)	221.19
4	Average Price (Rs/Kg)	410.00
5	Gross income	24,91,570
6	Net income	11,47,360
7	BCR	1.85

Conclusion and Recommendation

The present study conducted in the coastal districts of Tamilnadu, aimed to analyse the socio economic structure of shrimp aquaculture and to examine the productivity and economic feasibility for the long term sustainability of system. All the farmers were unanimously culturing white legged shrimp with 72 percent of farmers practicing the semi intensive culture system. Analysis revealed that shrimp farming practice was economically profitable. The feed cost accounts for about 42 per cent of the total cost. There is a need to develop low cost feed, harnessing the indigenous technical knowledge. The failures in shrimp culture in mid 1990s and 2008 due to disease outbreak and also the success and failures of other developing countries demands update and review of shrimp production technologies. Government could link-up with private extension service providers to increase the efficiency of aquaculture extension service. There should be regular extension programmes to increase

awareness about innovative practices in shrimp farming to make the shrimp aquaculture sustainable with more viable and economic benefits.

References

1. FAO. Fish for Future, 2015. http://www.fao.org/3/a-i5089e.pdf
2. Huong NV, Cuong TH. Freshwater aquacultures contribution to food security in Vietnam: A case study of Freshwater Tilapia Aquaculture in Hai Duong Province. Journal of International Society for Southeast Asian Agricultural Sciences. 2012; 18(1):6-17.
3. FAO. The State of World Fisheries and Aquaculture. Sustainability in action. Rome, 2020. https://doi.org/10.4060/ca9229en
4. Ayyappan S, Usha M, Gopalakrishnan A, Meenakumari B, Jena JK, Pandey AK. Handbook of Fisheries and Aquaculture. Indian Council of Agricultural Research, New Delhi, 2013, p1081.
5. Salehi H. Investigation in Nutritionists tendency of the shrimp consumed in Iran. Iranian Journal of Natural Resources. 2010; 63(4):301-313.
6. Anjani Kumar, Pratap SB, Badruddin. Technical Efficiency in Shrimp Farming in India: Estimation and Implications. Indian Journal of Agricultural Economics. 2004; 59(3):413-420.
7. Shapiro KH. Efficiency Differentials in Peasant Agriculture and their Implications for Development Policies. Journal of Development Studies. 1983; 19(2):179-190.
8. Dey MM, Paraguas FJ, Srichantuk N, Yuan X, Bhatta R, Le Thi Chau Dung. Technical efficiency of freshwater pond polyculture production in selected asian countries: estimation and implication. Aquaculture economics and management. 2005; 9(1-2):39-63.
9. Ali M, Chaudhry MA. Inter-Regional Farm Efficiency in Pakistan's Punjab: A Frontier Production Function Study. Journal of Agricultural Economics. 1990; 41(1):62-74.
10. Ali M, Byerlee D. Economic Efficiency of Small Farmers in a Changing World: A Survey of Recent Evidence. Journal of International Development. 1991; 3:1-27.
11. MPEDA. Species-wise fish production. Marine Products Development Authority, 2016. www.mpeda.org.in.
12. Kumaran M, Ponnusamy K, Kalaimani N. Diffusion and adoption of shrimp farming technologies. Aquaculture Asia Magazine. 2003; 8(2):20-23.
13. Alagappan M, Kumaran M. A study on the information sources and influence of socio-personal attributes on information seeking behavior of aqua farmers. International Journal of Farm Sciences. 2020; 10(2):5-12.
14. Swathilekshmi PS, Chandrakandan K, Kumaran M, Balasubramanian N. Socio-economic profile of shrimp farmers and its influence on the extent of adoption of shrimp culture technologies. Fishery Technology. 2005; 42(2):225-230.
15. Kumaran M, Ponnusamy K, Krishnan M. Utilization of information sources by shrimp farmers. Indian Journal of Extension Education. 2004; 40(1-2):63-66.
16. Kumaran M, Ravisankar T, Anand PR, Deboral Vimala D, Balasubramanian CP. Knowledge level of shrimp farmers on better management practices (BMPs) of *Penaeus vannamei* farming: a comparative assessment of east and west coasts of India. Indian Journal of Fish. 2017; 64(3):93-99.
17. Yadava YS. Shrimp farming in India-lessons and challenges in sustainable development. Aquaculture Authority News. 2002; 1(1):1-4.
18. MPEDA. Action plan for development of export oriented aquaculture in maritime states of India. Marine Products Export Development Authority, Cochin, 2006, 72 p.
19. Raghunanda R. Economic Analysis of Shrimp Aquaculture in West Godavari District of Andhra Pradesh. Journal of Fisheries Economics and Development. 1999; 2:1-23.
20. Sadafule N, Salim SS, Pandey S. Economic analysis of shrimp farming in the Coastal Districts of Maharashtra. Journal of Fisheries. 2013; 1:42-54.
21. Navghan M Kumar NR Prakash S, Ghadkar D, Yunus S. Economics of shrimp aquaculture and factors associated with shrimp aquaculture in Navsari District of Gujarat, India. Ecology, Environment and Conservation. 2015; 21(4):247-253.