

# PROBLEMS AND PROSPECTS OF SHRIMP CULTURE IN CUDDALORE DISTRICT, TAMIL NADU

S.NAVEEN NIVAS

B.F.Sc Student, Center of Advanced Studies in Marine Biology, Annamalai University

Dr. I.Sundar,

Associate Professor of Economics, Directorate of Distance Education, Annamalai University

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**Abstract-**A shrimp farm is an aquaculture business for the cultivation of marine shrimp or prawns for human consumption. Shrimp farming offers significant employment opportunities, which may help alleviate the poverty of the local coastal populations in many areas. This paper deals with problems and prospects of shrimp culture in Cuddalore district, Tamil Nadu. It outlines the various indicators on problems and prospects of shrimp culture and measures to improve the shrimp culture in the study area. This paper concludes with some interesting findings along with policy suggestions.

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## Introduction

India does indeed have substantial capacity to continue to expand shrimp production. There are new areas to develop for shrimp farming in every state, including the main production areas in Andhra Pradesh, and Tamil Nadu. The west coast, in particular, has many untapped hectares which can be committed to shrimp farming; in the north, the West Bengal region can become an even larger producer; and there are also options in the southern part of India, where three harvests per year are possible.

Shrimp farming has changed from traditional, small-scale businesses in Southeast Asia into a global industry. Technological advances have led to growing shrimp at ever higher densities, and brood stock is shipped worldwide. Virtually all farmed shrimp are of the family Penaeidae, and just two species – *Penaeus vannamei* (Pacific white shrimp) and *Penaeus monodon* (giant tiger prawn) – account for roughly 80% of all farmed shrimp. These industrial monocultures are very susceptible to diseases, which have caused several regional wipe-outs of farm shrimp populations. Increasing ecological problems, repeated disease outbreaks, and pressure and criticism from both NGOs and consumer countries led to changes in the industry in the late 1990s and generally stronger regulation by governments. In 1999, a program aimed at developing and promoting more sustainable farming practices was initiated, including governmental bodies, industry representatives, and environmental organizations.

## Review on the subject

The review of literature is very important aspect of any research towards identification of research areas and research gap. Here some of the works done in the area of shrimp culture have been reviewed. Pham Thi Anh, Carolien Kroeze, Simon R. Bush and Arthur P.J. Mol (2010)<sup>1</sup> have focused on both the environmental impact of intensive shrimp farming in the coastal region of Vietnam and the identification of options for cleaner production. Poulomi Bhattacharya (2009)<sup>2</sup> has identified various determinants of shrimp yield in scientific and traditional farming systems in West Bengal. Camilla Andersson, Erik Holmgren, James MacGregor and Jesper Stage (2008)<sup>3</sup> have examined the effectiveness of formal microcredit schemes as compared to the traditional informal credit sources in a rural shrimp farming district of Bangladesh. They compared the two types of credit by studying the technical and allocative efficiencies of the two groups of borrowers. Sharon D. Hutchinson (2008)<sup>4</sup> has examined the economic factors that influence output in the Trinidad and Tobago shrimp fishery using a Generalized Leontief production function.

[Daniel V. Gordon](#), Trond Bjorndal, Madan Mohan Dey and Rezaul Karim Talukder (2008)<sup>5</sup> have reported that the production characteristics of shrimp farming in Bangladesh are based on a panel of farms for the period 1998 to 2002. K. Uma Devi and Y. Eswara Prasad (2007)<sup>6</sup> have examined the production characteristics and efficiency of resource use in coastal Andhra shrimp farming. L. Umamaheswari et. Al (2006)<sup>7</sup> have estimated the external cost of shrimp-induced salinity on crop production by comparing two villages in southern India: Poovam, which is affected by salinity, with Thiruvettakudy, which is not.

Yony Sampaio, Ecio de Farias Costa, Erica Albuquerque and Breno Ramos Sampaio (2006)<sup>8</sup> have analyzed the impact of farmed shrimp on the economy of ten municipalities. Randall a. Bluffstone, Dararatt Anantan Asuwong and Ivan Ruzicka (2006)<sup>9</sup> explored possibilities with reference to intensive shrimp aquaculture, which dominates shrimp farming and is an important economic sector in Thailand. Md. Arif Chowdhury, Ganesh P. Shivakoti and Md. Salequzzaman (2006)<sup>10</sup> have analysed the contexts of sustainability in relation to the coastal shrimp aquaculture industry and identifies the relevant sustainable factors or indicators for coastal Bangladesh.

It could be noted that above reviewed studies have not done in Cuddalore district in Tamil Nadu, India with respect to shrimp farming.

## Methods and materials

This study deals with prospects and problems in conducting shrimp culture in Cuddalore district in Tamil Nadu, India. This study has been conducted in five shrimp culture areas viz., Parangipettai, Cuddalore, Pichavaram, Killai and Mudasal Odai. From each area 10 shrimp farmers are selected as sample under simple random sampling method. The relevant data are collected from them with the help of interview schedule method. The collected qualitative data under 5 point rating scale are quantified. The collected data are classified and tabulated with the help of computer programming. Cross tabulation has been done by putting independent variables and dependent variables. The data analysis has been done with the help of mean, ANOVA two way test and ranking method.

### Prospects of Shrimp Farming

This section deals with respondents' rating on prospects of shrimp farming. It can be assessed with the help of 23 factors on a 5 point rating scale. These include export market potential, alternative to agriculture farming, government credit, shrimp tolerance to a wide range of pond condition, availability of subsidy, easy availability of backwater in the coastal area, easy access to shrimp seed, local employment generation, high market price, well developed marketing channel, low capital output ratio, low risk, availability of low cost manure, availability of low cost power, suitability of coastal environment, easy availability of seed, less business competition, easy process of supervision, short cropping cycle, mangrove vegetation protects the young one, household employment generation, growing market demand and nutritious food supply.

**Table 1 Area Wise Respondents' Rating on Prospects of Shrimp Farming**

Variables	Parangipettai	Cuddalore	Pichavaram	Killai	Mudasal Odai	Mean
Suitability of coastal environment	3.04	3.25	2.88	2.56	2.26	2.80
Growing market demand	2.28	2.29	2.12	1.80	1.70	2.04
Local employment generation	3.80	4.01	3.64	3.32	3.02	3.56
Low capital output ratio	3.41	3.62	3.25	2.93	2.63	3.17
Easy availability of seed	2.97	3.18	2.81	2.49	2.19	2.73
Government credit	4.15	4.21	4.14	4.02	3.77	4.06
Short cropping cycle	2.62	2.83	2.46	2.14	1.84	2.38
High market price	3.66	3.87	3.50	3.18	2.88	3.42
Shrimp tolerance to a wide range of pond condition	4.07	4.14	4.03	3.95	3.75	3.99
Well developed marketing channel	3.52	3.73	3.36	3.04	2.74	3.28
Export market potential	4.23	4.25	4.23	4.11	4.03	4.15
Nutritious food supply	2.05	2.26	1.99	1.67	1.57	1.91
Low risk	3.32	3.53	3.16	2.84	2.54	3.08
Availability of low cost power	3.13	3.34	2.97	2.65	2.35	2.89
Household employment generation	2.30	2.58	2.21	1.89	1.65	2.13
Easy access to shrimp seed	3.88	4.09	3.72	3.40	3.10	3.64
Availability of subsidy	4.03	4.14	3.97	3.75	3.65	3.89
Alternative to agriculture farming	4.15	4.26	4.18	4.08	3.87	4.11
Mangrove vegetation protects the young one	2.51	2.72	2.35	2.03	1.73	2.27
Easy availability of backwater in the coastal area	4.02	4.13	3.86	3.54	3.34	3.78
Easy process of supervision	2.73	2.94	2.57	2.25	1.95	2.49
Availability of low cost manure	3.21	3.42	3.05	2.73	2.43	2.97
Less business competition	2.86	3.07	2.70	2.38	2.08	2.62
Average	3.30	3.47	3.18	2.90	2.66	3.10

Source: Computed from the primary data

ANOVA					
Source of Variation	SS	df	MS	F	F crit
Variation due to prospects of shrimp farming	56.13267	22	2.551485	228.0155	1.664489
Variation due to areas	9.720283	4	2.430071	217.1653	2.475277
Error	0.984717	88	0.01119		
Total	66.83767	114			

Data presented in table 1 indicate the area wise respondents' rating on prospects of practicing shrimp farming. It could be noted that out of the 23 prospects of shrimp farming, the respondents rate the export market potential is the first level prospect of shrimp farming and it is evident from their secured a mean score of 4.15 on a 5 point rating scale. Alternative to agriculture farming is rated at second level prospect of shrimp farming and it is estimated from the respondents' secured a mean score of 4.11 on a 5 point rating scale. The respondents rate the availability of government credit is the third level prospect of shrimp farming'. It is evident from their secured a mean score of 4.06 on a 5 point rating scale. The respondents rank the fourth level prospect of shrimp farming by citing the fact that shrimp tolerance to a wide range of pond condition and it is observed from the respondents' secured a mean score of 3.99 on a 5 point rating scale. Availability of subsidy is rated at fifth level prospect of shrimp farming and it could be known from the respondents' secured a mean score of 3.89 on a 5 point rating scale.

The respondents' rate the easy availability of backwater in the coastal area is the sixth level prospect of shrimp farming and it is revealed from their secured a mean score of 3.78 on a 5 point rating scale. Easy access to shrimp seed is rated at seventh level prospect and it observed from the respondents' secured a mean score of 3.64 on a 5 point rating scale. The respondents' rate the local employment generation and it is their eighth level ranking. It is evident from their secured a mean score of 3.56 on a 5 point rating scale. The respondents rank the ninth level prospect of shrimp farming by citing the fact that availability of high market price for harvested shrimps as per their secured a mean score of 3.42 on a 5 point rating scale. Well developed marketing channel is rated at tenth level prospect of shrimp farming and it is evident from the respondents' secured a mean score of 3.28 on a 5 point rating scale. The respondents' rate the low capital output ratio is the eleventh level prospect of shrimp farming and it could be known from their secured a mean score of 3.17 on a 5 point rating scale. Low risk is rated at twelfth level prospect of shrimp farming and it is reflected from the respondents' secured a mean score of 3.08 on a 5 point rating scale. The respondents rank the thirteenth level prospect of shrimp farming by citing the fact that easy availability of low cost manure. It is evident from their secured a mean score of 2.97 on a 5 point rating scale. The respondents rank the fourteenth level prospect of shrimp farming by citing the situation that easy availability of low cost power and it is clear from their secured a mean score of 2.89 on a 5 point rating scale. Suitability of coastal environment is rated at fifteenth level prospect of shrimp farming as per the respondents' secured a mean score of 2.80 on a 5 point rating scale. The respondents' rate the easy availability of seed is the sixteenth level prospect of shrimp farming and it could be known from their secured a mean score of 2.73 on a 5 point rating scale.

**Table 2 Farm Wise Respondents' Rating on Prospects of Shrimp Farming**

Variables	Ma rgi nal	Sm all	me diu m	Lat ge	Mean
Suitability of coastal environment	2.28	2.51	3.09	3.32	2.80
Growing market demand	1.62	1.75	2.33	2.46	2.04
Local employment generation	3.04	3.27	3.85	4.08	3.56
Low capital output ratio	2.65	2.88	3.46	3.69	3.17
Easy availability of seed	2.21	2.44	3.02	3.25	2.73
Government credit	3.64	4.07	4.25	4.28	4.06
Short cropping cycle	1.86	2.09	2.67	2.90	2.38
High market price	2.90	3.13	3.71	3.94	3.42
Shrimp tolerance to a wide range of pond condition	3.57	4.00	4.18	4.21	3.99
Well developed marketing channel	2.76	2.99	3.57	3.80	3.28
Export market potential	3.93	4.12	4.24	4.25	4.15
Nutritious food supply	1.59	1.62	2.20	2.23	1.91
Low risk	2.56	2.79	3.37	3.60	3.08
Availability of low cost power	2.37	2.60	3.18	3.41	2.89
Household employment generation	1.61	1.84	2.42	2.65	2.13
Easy access to shrimp seed	3.12	3.35	3.93	4.16	3.64
Availability of subsidy	3.47	3.70	4.18	4.21	3.89
Alternative to agriculture farming	3.79	4.04	4.21	4.23	4.11
Mangrove vegetation protects the young one	1.75	1.98	2.56	2.79	2.27
Easy availability of backwater in the coastal area	3.26	3.59	4.07	4.20	3.78
Easy process of supervision	1.97	2.20	2.78	3.01	2.49
Availability of low cost manure	2.45	2.68	3.26	3.49	2.97
Less business competition	2.10	2.33	2.91	3.14	2.62
Average	2.63	2.87	3.37	3.53	3.10

Source: Computed from the primary data

Less business competition is rated at seventeenth level prospect and it observed from the respondents' secured a mean score of 2.62 on a 5 point rating scale. The respondents' rate the easy process of supervision is their eighteenth level ranking. It is evident from their secured a mean score of 2.49 on a 5 point rating scale. The respondents rank the nineteenth level prospect of shrimp farming by citing the fact that short cropping cycle nature of shrimp culture as per their secured a mean score of 2.38 on a 5 point rating scale. Mangrove vegetation protects the young one is rated at twentieth level prospect of shrimp farming and it is evident from the respondents' secured a mean score of 2.27 on a 5 point rating scale. The respondents' rate the Household employment generation is the twenty first level prospect of shrimp farming and it could be known from their secured a mean score of 2.13 on a 5 point rating scale. Growing market demand is rated at twenty second level prospect of shrimp farming and it is reflected from the respondents' secured a mean score of 2.04 on a 5 point rating scale. The respondents rank the twenty third level prospect of shrimp farming by citing the fact that availability of nutritious food supply. It is evident from their secured a mean score of 1.91 on a 5 point rating scale.

The respondents' of Cuddalore area rank the first position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.47 on a 5 point rating scale. The respondents' of Parangaipeetai area record the second position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.30 on a 5 point rating scale. The respondents' of Pichavaram area hold the third position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.18 on a 5 point rating scale. The respondents' of Killai area register the fourth position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.90 on a 5 point rating scale. The Mudasal Odai area respondents turn down to the last position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.66 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 228.01 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the prospects of shrimp farming is statistically identified as significant. In another point, the computed anova value 217.16 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the areas of shrimp culture is statistically identified as significant as per the respondents rated prospects of shrimp farming.

ANOVA					
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>F crit</i>
Variation due to prospects of shrimp farming	44.11632	22	2.005287	144.7128	1.705676
Variation due to farm size	12.29341	3	4.097804	295.7205	2.743711
Error	0.914563	66	0.013857		
Total	57.3243	91			

Table 2 shows data on the farm size wise respondents' rating on prospects of practicing shrimp farming'. The large farm size group respondents rank the first position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.53 on a 5 point rating scale. The medium farm size group respondents record the second position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.37 on a 5 point rating scale. The small farm size group respondents hold the third position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.87 on a 5 point rating scale. The marginal farm size group respondents turn down to the last position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.63 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 144.71 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the prospects of shrimp farming is statistically identified as significant. In another point, the computed anova value 295.72 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the farm size groups is statistically identified as significant as per the respondents rated prospects of shrimp farming'.

Table 3 shows data on the caste wise respondents' rating on prospects of practicing shrimp farming'. The backward caste respondents rank the first position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.64 on a 5 point rating scale. The most backward caste respondents record the second position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.92 on a 5 point rating scale. The scheduled caste respondents turn down to the last position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.75 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 51.63 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the prospects of shrimp farming is statistically identified as significant. In another point, the computed anova value 177.81 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the caste groups is statistically identified as significant as per the respondents rated prospects of shrimp farming'.

**Table 3 Caste Wise Respondents' Rating on Prospects of Shrimp Farming**

Variables	Backward caste	Most Backward caste	Scheduled caste	Mean
Suitability of coastal environment	3.48	2.55	2.37	2.80
Growing market demand	2.62	1.79	1.71	2.04
Local employment generation	4.14	3.41	3.13	3.56
Low capital output ratio	3.85	2.92	2.74	3.17
Easy availability of seed	3.41	2.48	2.30	2.73
Government credit	4.24	4.01	3.93	4.06
Short cropping cycle	3.06	2.13	1.95	2.38
High market price	4.10	3.17	2.99	3.42
Shrimp tolerance to a wide range of pond condition	4.27	3.94	3.76	3.99
Well developed marketing channel	3.96	3.03	2.85	3.28
Export market potential	4.23	4.21	4.00	4.15
Nutritious food supply	2.49	1.71	1.63	1.91
Low risk	3.76	2.83	2.65	3.08
Availability of low cost power	3.57	2.64	2.46	2.89
Household employment generation	2.71	1.88	1.80	2.13
Easy access to shrimp seed	4.12	3.49	3.31	3.64
Availability of subsidy	4.27	3.84	3.56	3.89
Alternative to agriculture farming	4.29	4.06	3.98	4.11
Mangrove vegetation protects the young one	2.95	2.02	1.84	2.27
Easy availability of backwater in the coastal area	4.16	3.73	3.45	3.78
Easy process of supervision	3.17	2.24	2.06	2.49
Availability of low cost manure	3.65	2.72	2.54	2.97
Less business competition	3.30	2.37	2.19	2.62
Average	3.64	2.92	2.75	3.10

Source: Computed from the primary data

ANOVA					
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>F crit</i>
Variation due to prospects of shrimp farming	33.17651	22	1.508023	51.63263	1.788887
Variation due to caste status	10.38663	2	5.193317	177.812	3.209278
Error	1.285099	44	0.029207		
Total	44.84824	68			

Table 4 indicates data on the education wise respondents' rating on prospects of shrimp farming'. The under graduate level educated respondents rank the first position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.61 on a 5 point rating scale. The higher secondary level educated respondents record the second position in their overall rated prospects of shrimp farming as per their secured a mean score of 3.44 on a 5 point rating scale.

**Table 4 Education Wise Respondents' Rating on Prospects of Shrimp Farming**

Variables	Primary	Secondary	Higher Secondary	Under Graduate	Mean
Suitability of coastal environment	2.19	2.38	3.22	3.41	2.80
Growing market demand	1.60	1.65	2.26	2.65	2.04
Local employment generation	2.95	3.14	3.98	4.17	3.56
Low capital output ratio	2.56	2.75	3.59	3.78	3.17
Easy availability of seed	2.12	2.31	3.15	3.34	2.73
Government credit	3.75	4.04	4.18	4.27	4.06
Short cropping cycle	1.77	1.96	2.80	2.99	2.38
High market price	2.81	3.00	3.84	4.03	3.42
Shrimp tolerance to a wide range of pond condition	3.68	3.97	4.11	4.20	3.99
Well developed marketing channel	2.67	2.86	3.70	3.89	3.28
Export market potential	3.81	4.23	4.25	4.26	4.15
Nutritious food supply	1.50	1.59	2.13	2.42	1.91
Low risk	2.47	2.66	3.50	3.69	3.08
Availability of low cost power	2.28	2.47	3.31	3.50	2.89
Household employment generation	1.52	1.71	2.55	2.74	2.13
Easy access to shrimp seed	3.03	3.32	4.06	4.15	3.64
Availability of subsidy	3.28	3.67	4.11	4.15	3.89
Alternative to agriculture farming	3.76	4.19	4.23	4.26	4.11
Mangrove vegetation protects the young one	1.76	1.85	2.59	2.88	2.27
Easy availability of backwater in the coastal area	3.17	3.50	4.20	4.25	3.78
Easy process of supervision	1.88	2.07	2.91	3.10	2.49
Availability of low cost manure	2.36	2.55	3.39	3.58	2.97
Less business competition	2.01	2.20	3.04	3.23	2.62
Average	2.56	2.79	3.44	3.61	3.10

Source: Computed from the primary data

ANOVA					
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>F crit</i>
Variation due to prospects of shrimp farming	43.95057	22	1.997753	67.97478	1.705676
Variation due to educational status	17.46143	3	5.820478	198.0453	2.743711
Error	1.939715	66	0.02939		
Total	63.35172	91			

The secondary level educated respondents hold the third position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.79 on a 5 point rating scale. The primary level educated respondents turn down to the last position in their overall rated prospects of shrimp farming as per their secured a mean score of 2.56 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 67.97 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the prospects of shrimp farming is statistically identified as significant. In another point, the computed anova value 198.04 is greater than its tabulated value at 5 percent level significance.

Hence, the variation among the educational status is statistically identified as significant as per the respondents rated prospects of shrimp farming'.

### Problems of Shrimp Farming

This section deals with respondents' rating on problems of shrimp farming. It can be assessed with the help of 30 factors on a 5 point rating scale. These include bacterial disease on shrimps, poor co operation among farmers, malpractice, high transport cost, lack of adequate capital, labour shortage, lack of adequate drainage, shortage of ice, damage of infrastructure, estimation of grading, mishandling and delay process, low price for shrimps, decomposition of shrimp, inadequate government support, carrying by bamboo basket to distance market, unusual situation, inadequate shrimp ice ratio, lack of mechanical weighing, use of unhygienic water, market distance, Possession of inadequate equipments, Insufficient supply of shrimps, dirty floor, nonshed market place, poor pond condition, under weighing, mechanical injury caused by crushed ice, difficult to get full payment of cash, bound to sell at a lower price and suffering from risk and uncertainty.

**Table 5 Area Wise Respondents' Rating on Problems in Shrimp Farming**

Variables	Parangipettai	Cuddalore	Pichavaram	Killai	Mudasal Odai	Mean
Bound to sell at a lower price	1.99	1.07	2.20	2.33	2.62	1.88
Market distance	2.70	1.78	2.91	3.04	3.33	2.59
Low price for shrimps	3.45	2.53	3.66	3.79	4.08	3.34
Damage of infrastructure	3.67	2.80	3.98	4.01	4.15	3.56
Suffering from risk and uncertainty	1.83	1.51	2.14	2.17	2.26	1.82
Lack of mechanical weighing	2.84	1.92	3.05	3.18	3.47	2.73
Possession of inadequate equipments	2.63	1.71	2.84	2.97	3.26	2.52
Unusual situation	2.98	2.06	3.19	3.32	3.61	2.87
Estimation of grading	3.71	2.69	3.82	3.95	4.14	3.50
High transport cost	4.05	3.67	4.26	4.26	4.28	3.94
Shortage of ice	3.74	2.82	3.95	4.18	4.27	3.63
Difficult to get full payment of cash	2.05	1.13	2.26	2.39	2.68	1.94
Lack of adequate capital	3.99	3.47	4.20	4.22	4.13	3.88
Dirty floor	2.49	1.57	2.70	2.83	3.12	2.38
Decomposition of shrimp	3.32	2.40	3.53	3.66	3.95	3.21
Use of unhygienic water	2.77	1.85	2.98	3.11	3.40	2.66
Mechanical injury caused by crushed ice	2.13	1.21	2.34	2.47	2.76	2.02
Inadequate shrimp ice ratio	2.91	1.99	3.12	3.25	3.54	2.80
Carrying by bamboo basket to distance market	3.14	2.22	3.35	3.48	3.77	3.03
Mishandling and delay process	3.53	2.61	3.74	3.87	4.16	3.42
Nonshed market place	2.43	1.71	2.64	2.77	3.96	2.32
Lack of adequate drainage	3.83	3.11	4.08	4.17	4.22	3.72
Labour shortage	4.02	3.30	4.13	4.16	4.25	3.81
Under weighing	2.28	1.36	2.49	2.62	2.91	2.17
Insufficient supply of shrimps	2.56	1.64	2.77	2.90	3.19	2.45
Inadequate government support	3.23	2.31	3.44	3.57	3.86	3.12
Mal practice	4.20	3.85	4.18	4.20	4.23	3.99
Poor pond condition	2.37	1.65	2.48	2.81	3.00	2.26
Bacterial disease on shrimps	4.05	3.99	4.07	4.08	4.11	4.10
Poor co operation among farmers	3.94	3.91	4.10	4.07	4.13	4.03
Average	3.09	2.33	3.29	3.39	3.63	2.99

Source: Computed from the primary data

ANOVA					
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>F crit</i>
Variation due to problems of shrimp farming	61.89177	29	2.134199	82.25718	1.597822
Variation due to areas	20.8647	3	6.954899	268.0586	2.709402
Error	2.257253	87	0.025945		
Total	85.01372	119			

Data presented in table 5 indicate the area wise respondents' rating on problems in shrimp farming. It could be noted that out of the 30 problems of shrimp farming, the respondents rate the bacterial disease on shrimps is the first level problem and it is evident from their secured a mean score of 4.10 on a 5 point rating scale. Poor co operation among farmers is rated at second level problem in shrimp farming and it is estimated from the respondents' secured a mean score of 4.03 on a 5 point rating scale. The respondents rate the mal practice in shrimp marketing is the third level problem in shrimp farming'. It is evident from their secured a mean score of 3.99 on a 5 point rating scale. The respondents rank the fourth level problem in shrimp farming by citing the fact of high transport cost of shrimp marketing and it is observed from the respondents' secured a mean score of 3.94 on a 5 point rating scale. Lack of adequate capital is rated at fifth level problem in shrimp farming and it could be known from the respondents' secured a mean score of 3.88 on a 5 point rating scale. The respondents' rate the labour shortage is the sixth level problem in shrimp farming and it is revealed from their secured a mean score of 3.81 on a 5 point rating scale. Lack of adequate drainage is rated at seventh level problem and it observed from the respondents' secured a mean score of 3.72 on a 5 point rating scale. The respondents' rate the shortage of ice is their eighth level ranking. It is evident from their secured a mean score of 3.63 on a 5 point rating scale. The respondents rank the ninth level problem in shrimp farming by citing the fact of damage to infrastructure as per their secured a mean score of 3.56 on a 5 point rating scale. Estimation of grading is rated at tenth level problem in shrimp farming and it is evident from the respondents' secured a mean score of 3.50 on a 5 point rating scale. The respondents' rate the mishandling and delay process is the eleventh level problem in shrimp farming and it could be known from their secured a mean score of 3.42 on a 5 point rating scale. Low price for shrimps is rated at twelfth level problem in shrimp farming and it is reflected from the respondents' secured a mean score of 3.34 on a 5 point rating scale. The respondents rank the thirteenth level problem in shrimp farming by citing the fact that decomposition of shrimps. It is evident from their secured a mean score of 3.21 on a 5 point rating scale. The respondents rank the fourteenth level problem in shrimp farming by citing the fact that inadequate government support and it is clear from their secured a mean score of 3.12 on a 5 point rating scale. Carrying by bamboo basket to distance market is rated at fifteenth level problem in shrimp farming as per the respondents' secured a mean score of 3.03 on a 5 point rating scale. The respondents' rate the unusual situation is the sixteenth level problem in shrimp farming and it could be known from their secured a mean score of 2.87 on a 5 point rating scale.

Inadequate shrimp ice ratio is rated at seventeenth level problem and it observed from the respondents' secured a mean score of 2.80 on a 5 point rating scale. The respondents' rate the lack of mechanical weighing and it is their eighteenth level problem. It is evident from their secured a mean score of 2.73 on a 5 point rating scale. The respondents rank the nineteenth level problem in shrimp farming by citing the fact that force to use unhygienic water in shrimp cultivation as per their secured a mean score of 2.66 on a 5 point rating scale. Market distance is rated at twentieth level problem in shrimp farming and it is evident from the respondents' secured a mean score of 2.59 on a 5 point rating scale. The respondents' rate the Possession of inadequate equipments is the twenty first level problem in shrimp farming and it could be known from their secured a mean score of 2.52 on a 5 point rating scale. Insufficient supply of shrimps is rated at twenty second level problem in shrimp farming and it is reflected from the respondents' secured a mean score of 2.45 on a 5 point rating scale. The respondents rank the twenty third level problem in shrimp farming by citing the fact that business done in dirty floor. It is evident from their secured a mean score of 2.38 on a 5 point rating scale.

Nonshed market place is rated at twenty fourth level problem in shrimp farming as per the respondents' secured a mean score of 2.32 on a 5 point rating scale. The respondents' rate the poor pond condition is the twenty fifth level problem in shrimp farming and it could be known from their secured a mean score of 2.26 on a 5 point rating scale. Under weighing is rated at twenty sixth level problem and it observed from the respondents' secured a mean score of 2.17 on a 5 point rating scale. The respondents' rate the mechanical injury caused by crushed ice and it is their twenty seventh level problem. It is evident from their secured a mean score of 2.02 on a 5 point rating scale. The respondents rank the twenty eighth level problem in shrimp farming by citing the fact that difficult to get full payment of cash while selling shrimps as per their secured a mean score of 1.94 on a 5 point rating scale. Bound to sell at a lower price is rated at twenty ninth level problem in shrimp farming and it is evident from the respondents' secured a mean score of 1.88 on a 5 point rating scale. The respondents' rate the suffering from risk and uncertainty is the thirtieth level problem in shrimp farming and it could be known from their secured a mean score of 1.82 on a 5 point rating scale.

The respondents' of Mudasal Odai area rank the first position in their overall rated problems in shrimp farming as per their secured a mean score of 3.63 on a 5 point rating scale. The respondents of Killai area record the second position in their overall rated problems in shrimp farming as per their secured a mean score of 3.39 on a 5 point rating scale. The respondents of Pichavaram area hold the third position in their overall rated problems in shrimp farming as per their secured a mean score of 3.29 on a 5 point rating scale. The respondents of Parangipettai area register the fourth position in their overall rated problems in shrimp farming as per their secured a mean score of 3.09 on a 5 point rating scale. The Cuddalore area respondents turn down to the last position in their overall rated problems in shrimp farming as per their secured a mean score of 2.33 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 82.25 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the problems in shrimp farming is statistically identified as



significant. In another point, the computed anova value 268.05 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the areas of shrimp culture is statistically identified as significant as per the respondents rated problems of shrimp farming.

**Table 6 Farm Wise Respondents' Rating on Problems in Shrimp Farming**

Variables	Marginal	Small	medium	Large	Mean
Bound to sell at a lower price	2.21	2.12	1.64	1.55	1.88
Market distance	3.22	2.83	2.35	1.96	2.59
Low price for shrimps	3.97	3.58	3.10	2.71	3.34
Damage of infrastructure	4.19	3.80	3.32	2.93	3.56
Suffering from risk and uncertainty	2.15	1.96	1.68	1.49	1.82
Lack of mechanical weighing	3.36	2.97	2.49	2.10	2.73
Possession of inadequate equipments	3.15	2.76	2.28	1.89	2.52
Unusual situation	3.50	3.11	2.63	2.24	2.87
Estimation of grading	4.13	3.74	3.26	2.87	3.50
High transport cost	4.27	4.18	4.00	3.31	3.94
Shortage of ice	4.26	3.87	3.39	3.00	3.63
Difficult to get full payment of cash	2.27	2.18	1.70	1.61	1.94
Lack of adequate capital	4.11	4.12	3.94	3.35	3.88
Dirty floor	3.01	2.62	2.14	1.75	2.38
Decomposition of shrimp	3.84	3.45	2.97	2.58	3.21
Use of unhygienic water	3.29	2.90	2.42	2.03	2.66
Mechanical injury caused by crushed ice	2.35	2.26	1.78	1.69	2.02
Inadequate shrimp ice ratio	3.43	3.04	2.56	2.17	2.80
Carrying by bamboo basket to distance market	3.66	3.27	2.79	2.40	3.03
Mishandling and delay process	4.05	3.66	3.18	2.79	3.42
Nonshed market place	2.85	2.56	2.08	1.79	2.32
Lack of adequate drainage	4.15	3.96	3.48	3.29	3.72
Labour shortage	4.24	4.05	3.77	3.18	3.81
Under weighing	2.60	2.41	1.93	1.74	2.17
Insufficient supply of shrimps	3.08	2.69	2.21	1.82	2.45
Inadequate government support	3.75	3.36	2.88	2.49	3.12
Mal practice	4.22	4.13	3.95	3.66	3.99
Poor pond condition	2.79	2.50	2.02	1.73	2.26
Bacterial disease on shrimps	4.23	4.14	4.06	3.67	4.10
Poor co operation among farmers	4.26	4.20	3.99	3.67	4.03
Average	3.49	3.21	2.80	2.45	2.99

Source: Computed from the primary data

ANOVA					
Source of Variation	SS	df	MS	F	F crit
Variation due to problems of shrimp farming	68.33117	29	2.356247	81.35228	1.565322
Variation due to farm size	28.62879	4	7.157198	247.1109	2.44988
Error	3.359767	116	0.028964		
Total	100.3197	149			

Table 6 shows data on the farm size wise respondents' rating on problems in shrimp farming'. The marginal farm size group respondents rank the first position in their overall rated problems in shrimp farming as per their secured a mean score of 3.49 on a 5 point rating scale. The small farm size group respondents record the second position in their overall rated problems in shrimp farming as per their secured a mean score of 3.21 on a 5 point rating scale. The medium farm size group respondents hold the third position in their overall rated problems in shrimp farming as per their secured a mean score of 2.80 on a 5 point rating scale. The

large farm size group respondents turn down to the last position in their overall rated problems in shrimp farming as per their secured a mean score of 2.45 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 81.35 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the problems in shrimp farming is statistically identified as significant. In another point, the computed anova value 247.11 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the farm size groups is statistically identified as significant as per the respondents rated problems in shrimp farming'.

**Table 7 Caste Wise Respondents' Rating on Problems in Shrimp Farming**

Variables	SC	BC	OC	Mean
Bound to sell at a lower price	1.53	1.65	2.41	1.88
Market distance	2.14	2.36	3.22	2.59
Low price for shrimps	2.89	3.11	3.97	3.34
Damage of infrastructure	3.11	3.33	4.19	3.56
Suffering from risk and uncertainty	1.57	1.69	2.15	1.82
Lack of mechanical weighing	2.28	2.50	3.36	2.73
Possession of inadequate equipments	2.07	2.29	3.15	2.52
Unusual situation	2.42	2.64	3.50	2.87
Estimation of grading	3.05	3.27	4.13	3.50
High transport cost	3.49	4.08	4.20	3.94
Shortage of ice	3.18	3.46	4.21	3.63
Difficult to get full payment of cash	1.69	1.78	2.30	1.94
Lack of adequate capital	3.53	3.85	4.21	3.88
Dirty floor	2.03	2.25	2.81	2.38
Decomposition of shrimp	2.76	2.98	3.84	3.21
Use of unhygienic water	2.21	2.43	3.29	2.66
Mechanical injury caused by crushed ice	1.67	1.89	2.45	2.02
Inadequate shrimp ice ratio	2.35	2.57	3.43	2.80
Carrying by bamboo basket to distance market	2.58	2.80	3.66	3.03
Mishandling and delay process	2.97	3.19	4.05	3.42
Nonshed market place	1.97	2.19	2.75	2.32
Lack of adequate drainage	3.37	3.59	4.15	3.72
Labour shortage	3.46	3.87	4.14	3.81
Under weighing	1.82	2.04	2.60	2.17
Insufficient supply of shrimps	2.00	2.22	3.08	2.45
Inadequate government support	2.67	2.89	3.75	3.12
Mal practice	3.74	3.96	4.22	3.99
Poor pond condition	1.81	2.03	2.89	2.26
Bacterial disease on shrimps	3.95	4.07	4.23	4.10
Poor co operation among farmers	3.78	4.00	4.26	4.03
Average	2.60	2.83	3.49	2.99

Source: Computed from the primary data

ANOVA					
Source of Variation	SS	df	MS	F	F crit
Variation due to problems of shrimp farming	45.62118	29	1.573144	74.28318	1.662901
Variation due to caste status	12.6133	2	6.306648	297.7972	3.155932
Error	1.228304	58	0.021178		
Total	59.46278	89			

Table 7 shows data on the caste wise respondents' rating on problems in shrimp farming'. The scheduled caste respondents rank the first position in their overall rated problems in shrimp farming as per their secured a mean score of 3.49 on a 5 point rating scale. The other backward caste respondents record the second position in their overall rated problems in shrimp farming as per their secured a mean score of 2.83 on a 5 point rating scale. The backward caste respondents turn down to the last position in their overall rated problems in shrimp farming and it is evident from their secured a mean score of 2.60 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 74.28 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the problems in shrimp farming is statistically identified as significant. In another point, the computed anova value 297.79 is greater than its tabulated value at 5 percent level significance.

Hence, the variation among the caste groups is statistically identified as significant as per the respondents rated problems in shrimp farming'.

**Table 8 Education Wise Respondents' Rating on Problems in Shrimp Farming**

Variables	Primary	Secondary	Higher Secondary	Under Graduate	Mean
Bound to sell at a lower price	2.15	2.01	1.65	1.51	1.88
Market distance	3.16	2.92	2.26	2.02	2.59
Low price for shrimps	3.91	3.67	3.01	2.77	3.34
Damage of infrastructure	4.13	3.89	3.23	2.99	3.56
Suffering from risk and uncertainty	2.19	1.85	1.79	1.45	1.82
Lack of mechanical weighing	3.30	3.06	2.40	2.16	2.73
Possession of inadequate equipments	3.09	2.85	2.19	1.95	2.52
Unusual situation	3.44	3.20	2.54	2.30	2.87
Estimation of grading	4.07	3.83	3.17	2.93	3.50
High transport cost	4.21	4.17	3.91	3.47	3.94
Shortage of ice	4.20	3.96	3.30	3.06	3.63
Difficult to get full payment of cash	2.21	2.20	1.72	1.62	1.94
Lack of adequate capital	4.20	4.11	3.70	3.41	3.88
Dirty floor	2.95	2.71	2.05	1.81	2.38
Decomposition of shrimp	3.78	3.54	2.88	2.64	3.21
Use of unhygienic water	3.23	2.99	2.33	2.09	2.66
Mechanical injury caused by crushed ice	2.49	2.25	1.69	1.65	2.02
Inadequate shrimp ice ratio	3.37	3.13	2.47	2.23	2.80
Carrying by bamboo basket to distance market	3.60	3.36	2.70	2.46	3.03
Mishandling and delay process	3.99	3.75	3.09	2.85	3.42
Nonshed market place	2.79	2.65	1.99	1.85	2.32
Lack of adequate drainage	4.19	4.05	3.39	3.25	3.72
Labour shortage	4.18	4.14	3.68	3.24	3.81
Under weighing	2.64	2.50	1.84	1.70	2.17
Insufficient supply of shrimps	3.02	2.78	2.12	1.88	2.45
Inadequate government support	3.69	3.45	2.79	2.55	3.12
Mal practice	4.26	4.12	3.96	3.52	3.99
Poor pond condition	2.83	2.59	1.93	1.69	2.26
Bacterial disease on shrimps	4.27	4.23	3.97	3.93	4.10
Poor co operation among farmers	4.22	4.16	4.12	3.62	4.03
Average	3.46	3.27	2.73	2.49	2.99

Source: Computed from the primary data

ANOVA					
Source of Variation	SS	df	MS	F	F crit
Variation due to problems of shrimp farming	60.71114	29	2.093488	124.7205	1.597822
Variation due to educational status	18.59494	3	6.198314	369.2675	2.709402
Error	1.460333	87	0.016785		
Total	80.76641	119			

Table 8 indicates data on the education wise respondents' rating on problems in shrimp farming'. The primary level educated respondents rank the first position in their overall rated problems in shrimp farming as per their secured a mean score of 3.46 on a 5 point rating scale. The secondary level educated respondents record the second position in their overall rated problems in shrimp farming as per their secured a mean score of 3.27 on a 5 point rating scale. The higher secondary level educated respondents hold the third position in their overall rated problems in shrimp farming as per their secured a mean score of 2.73 on a 5 point rating scale. The under graduate degree level educated respondents turn down to the last position in their overall rated problems in shrimp farming as per their secured a mean score of 2.49 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 124.72 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the problems in shrimp farming is statistically identified as

significant. In another point, the computed anova value 369.26 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the educational status is statistically identified as significant as per the respondents rated problems in shrimp farming?.

### Measures to Improve the Performance of Shrimp Culture

This section deals with respondents' rating on measures to improve the performance of shrimp culture. It can be assessed with the help of 16 factors on a 5 point rating scale. These include providing quality seed and proper maintenance management, provision of shrimp seed at subsidized rate, technical guidance, supply of electricity on nominal charge, imparting knowledge on sustainable practices in shrimp farming, imparting knowledge on scientific feeding practices, training and agriculture extension support, provision of timely information on market price and demand, control on feed rates, establishment of regulated marketing system for shrimp farmers, price information, periodic conducting training programme on shrimp disease management, disease prevention knowledge, construction of necessary shrimp processing industry, imparting knowledge on modern methods of shrimp production and provision of credit and insurance facilities.

Data presented in table 9 indicate the area wise respondents' rating on measures to improve the performance of shrimp culture. It could be noted that out of the 16 measures to improve the performance of shrimp culture, the respondents rate the provision of quality seed and proper maintenance management is the first level measure to improve the performance of shrimp culture and it is evident from their secured a mean score of 4.20 on a 5 point rating scale. Provision of shrimp seed at subsidized rate is rated at second level measure to improve the performance of shrimp culture and it is estimated from the respondents' secured a mean score of 4.11 on a 5 point rating scale. The respondents rate the provision of technical guidance is the third level measure to improve the performance of shrimp culture'. It is evident from their secured a mean score of 4.01 on a 5 point rating scale. The respondents rank the fourth level measure to improve the performance of shrimp culture by the way of supplying electricity on nominal charge and it is observed from the respondents' secured a mean score of 3.94 on a 5 point rating scale.

**Table 9 Area Wise Respondents' Rating on Measures to Improve the Performance of Shrimp Culture**

Variables	Parangipettai	Cuddalore	Pichavaram	Killai	Mudasal Odai	Mean
Control to feed rates	3.36	3.54	3.07	2.69	2.24	2.98
Credit and insurance	2.08	2.16	1.89	1.71	1.66	1.90
Price information	3.08	3.26	2.79	2.41	1.96	2.70
Technical guidance	4.19	4.27	4.10	3.92	3.57	4.01
Training and agriculture extension support	3.95	4.13	3.66	3.28	2.83	3.57
Electricity on nominal charge	4.12	4.20	4.13	3.75	3.50	3.94
Disease prevention knowledge	2.79	2.97	2.50	2.12	1.67	2.41
Construction of necessary shrimp processing industry	2.64	2.82	2.35	1.97	1.52	2.26
Provision of shrimp seed at subsidized rate	4.19	4.27	4.15	4.07	3.77	4.11
Imparting knowledge on modern methods of shrimp production	2.20	2.48	2.21	1.93	1.78	2.12
Establishment of regulated marketing system for shrimp farmers	3.21	3.39	2.92	2.54	2.09	2.83
Imparting knowledge on scientific feeding practices	4.07	4.25	3.78	3.40	2.95	3.69
Provision of timely information on market price and demand	3.77	3.95	3.48	3.10	2.65	3.39
Imparting knowledge on sustainable practices in shrimp farming	4.18	4.20	3.93	3.61	3.18	3.82
Providing quality seed and proper maintenance management	4.22	4.25	4.20	4.18	4.15	4.20
Periodic conducting training programme on shrimp disease management	2.80	3.08	2.61	2.23	1.88	2.52
Average	3.43	3.58	3.24	2.93	2.59	3.15

Source: Computed from the primary data

ANOVA					
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>F crit</i>
Variation due to measures to improve the performance of shrimp culture	45.09022	15	3.006015	109.2873	1.836437
Variation due to areas	10.08546	4	2.521366	91.66727	2.525215
Error	1.650337	60	0.027506		
Total	56.82602	79			

Imparting knowledge on sustainable practices in shrimp farming is rated at fifth level measure to improve the performance of shrimp culture and it could be known from the respondents' secured a mean score of 3.82 on a 5 point rating scale.

The respondents' rate the imparting knowledge on scientific feeding practices is the sixth level measure to improve the performance of shrimp culture and it is revealed from their secured a mean score of 3.69 on a 5 point rating scale. Training and agriculture extension support is rated at seventh level measure and it observed from the respondents' secured a mean score of 3.57 on a 5 point rating scale. The respondents' rate the provision of timely information on shrimp market price and demand and it is their eighth level measure. It is evident from their secured a mean score of 3.39 on a 5 point rating scale. The respondents rank the ninth level measure to improve the performance of shrimp culture by citing the need for controlling the feed rates as per their secured a mean score of 2.98 on a 5 point rating scale. Establishment of regulated marketing system for shrimp farmers is rated at tenth level measure to improve the performance of shrimp culture and it is evident from the respondents' secured a mean score of 2.83 on a 5 point rating scale. The respondents' rate the dissemination of price information is the eleventh level measure to improve the performance of shrimp culture and it could be known from their secured a mean score of 2.70 on a 5 point rating scale. Periodic conducting training programme on shrimp disease management is rated at twelfth level measure to improve the performance of shrimp culture and it is reflected from the respondents' secured a mean score of 2.52 on a 5 point rating scale. The respondents rank the thirteenth level measure to improve the performance of shrimp culture by citing the need for imparting disease prevention knowledge. It is evident from their secured a mean score of 2.41 on a 5 point rating scale. The respondents rank the fourteenth level measure to improve the performance of shrimp culture by citing the need for constructing necessary shrimp processing industry and it is clear from their secured a mean score of 2.26 on a 5 point rating scale. Imparting knowledge on modern methods of shrimp production is rated at fifteenth level measure to improve the performance of shrimp culture as per the respondents' secured a mean score of 2.12 on a 5 point rating scale. The respondents' rate the availability of credit and insurance is the sixteenth level measure to improve the performance of shrimp culture and it could be known from their secured a mean score of 1.90 on a 5 point rating scale.

The respondents' of Cuddalore area rank the first position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.58 on a 5 point rating scale. The respondents' of Paraigaipettai area record the second position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.43 on a 5 point rating scale. The respondents' of Pichavaram area hold the third position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.24 on a 5 point rating scale. The respondents' of Killai area register the fourth position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 2.93 on a 5 point rating scale. The Mudasal Odai area respondents turn down to the last position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 2.59 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 109.28 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the measures to improve the performance of shrimp culture is statistically identified as significant. In another point, the computed anova value 91.66 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the areas of shrimp culture is statistically identified as significant as per the respondents rated measures to improve the performance of shrimp culture.

Table 10 shows data on the farm size wise respondents' rating on measures to improve the performance of shrimp culture'. The large farm size group respondents rank the first position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.53 on a 5 point rating scale. The medium farm size group respondents record the second position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.38 on a 5 point rating scale. The small farm size group respondents hold the third position in their overall rated measure to improve the performance of shrimp culture as per their secured a mean score of 2.95 on a 5 point rating scale.

**Table 10 Farm Wise Respondents' Rating on Measures to Improve the Performance of Shrimp Culture**

Variables	Marginal	Small	Medium	Large	Mean
Control to feed rates	2.51	2.70	3.26	3.45	2.98
Credit and insurance	1.63	1.72	2.08	2.17	1.90
Price information	2.23	2.42	2.98	3.17	2.70
Technical guidance	3.64	3.93	4.19	4.28	4.01
Training and agriculture extension support	3.10	3.29	3.85	4.04	3.57
Electricity on nominal charge	3.51	3.86	4.18	4.21	3.94
Disease prevention knowledge	1.94	2.13	2.69	2.88	2.41
Construction of necessary shrimp processing industry	1.79	1.98	2.54	2.73	2.26
Provision of shrimp seed at subsidized rate	3.90	4.13	4.19	4.22	4.11
Imparting knowledge on modern methods of shrimp production	1.75	1.84	2.30	2.59	2.12
Establishment of regulated marketing system for shrimp farmers	2.36	2.55	3.11	3.30	2.83
Imparting knowledge on scientific feeding practices	3.22	3.41	3.97	4.16	3.69
Provision of timely information on market price and demand	2.92	3.11	3.67	3.86	3.39
Imparting knowledge on sustainable practices in shrimp farming	3.35	3.63	4.10	4.20	3.82
Providing quality seed and proper maintenance management	4.06	4.22	4.24	4.28	4.20
Periodic conducting training programme on shrimp disease management	2.05	2.24	2.80	2.99	2.52
Average	2.75	2.95	3.38	3.53	3.15

Source: Computed from the primary data

ANOVA					
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>F crit</i>
Variation due to measures to improve the performance of shrimp culture	36.22378	15	2.414918	148.3036	1.894875
Variation due to farm size	6.475038	3	2.158346	132.5471	2.811544
Error	0.732763	45	0.016284		
Total	43.43158	63			

The marginal farm size group respondents turn down to the last position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 2.75 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 148.30 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the measures to improve the performance of shrimp culture is statistically identified as significant. In another point, the computed anova value 132.54 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the farm size groups is statistically identified as significant as per the respondents rated measures to improve the performance of shrimp culture'.

**Table 11 Caste Wise Respondents' Rating on Measures to Improve the Performance of Shrimp Culture**

Variables	Backward caste	Most Backward caste	Scheduled caste	Mean
Control to feed rates	3.61	2.84	2.49	2.98
Credit and insurance	2.33	1.76	1.61	1.90
Price information	3.33	2.56	2.21	2.70
Technical guidance	4.24	3.94	3.82	4.01
Training and agriculture extension support	4.20	3.43	3.08	3.57
Electricity on nominal charge	4.17	4.10	3.55	3.94
Disease prevention knowledge	3.04	2.27	1.92	2.41
Construction of necessary shrimp processing industry	2.79	2.12	1.87	2.26
Provision of shrimp seed at subsidized rate	4.24	4.17	3.92	4.11
Imparting knowledge on modern methods of shrimp production	2.55	1.98	1.83	2.12
Establishment of regulated marketing system for shrimp farmers	3.46	2.69	2.34	2.83
Imparting knowledge on scientific feeding practices	4.12	3.55	3.40	3.69
Provision of timely information on market price and demand	4.02	3.25	2.90	3.39
Imparting knowledge on sustainable practices in shrimp farming	4.15	3.98	3.33	3.82
Providing quality seed and proper maintenance management	4.24	4.20	4.16	4.20
Periodic conducting training programme on shrimp disease management	3.15	2.38	2.03	2.52
Average	3.60	3.08	2.78	3.15

Source: Computed from the primary data

ANOVA					
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>F crit</i>
Variation due to measures to improve the performance of shrimp culture	27.1167	15	1.80778	49.07334	2.014804
Variation due to caste status	5.56805	2	2.784025	75.57413	3.31583
Error	1.10515	30	0.036838		
Total	33.7899	47			

Table 11 shows data on the caste wise respondents' rating on measures to improve the performance of shrimp culture'. The backward caste respondents rank the first position in their overall rated measures to improve the performance of shrimp culture

as per their secured a mean score of 3.60 on a 5 point rating scale. The other backward caste respondents record the second position in their overall rated measure to improve the performance of shrimp culture as per their secured a mean score of 3.08 on a 5 point rating scale. The scheduled caste respondents turn down to the last position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 2.78 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 49.07 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the measures to improve the performance of shrimp culture is statistically identified as significant. In another point, the computed anova value 75.57 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the caste groups is statistically identified as significant as per the respondents rated measures to improve the performance of shrimp culture'.

**Table 12 Education Wise Respondents' Rating on Measures to Improve the Performance of Shrimp Culture**

Variables	Primary	Secondary	Higher Secondary	Under Graduate	Mean
Control to feed rates	2.67	2.86	3.10	3.29	2.98
Credit and insurance	1.69	1.78	2.02	2.11	1.90
Price information	2.39	2.58	2.82	3.01	2.70
Technical guidance	3.70	3.99	4.13	4.22	4.01
Training and agriculture extension support	3.26	3.45	3.69	3.88	3.57
Electricity on nominal charge	3.73	3.82	4.06	4.15	3.94
Disease prevention knowledge	2.10	2.29	2.53	2.72	2.41
Construction of necessary shrimp processing industry	1.95	2.14	2.38	2.57	2.26
Provision of shrimp seed at subsidized rate	3.90	4.12	4.20	4.22	4.11
Imparting knowledge on modern methods of shrimp production	1.81	2.00	2.24	2.43	2.12
Establishment of regulated marketing system for shrimp farmers	2.52	2.71	2.95	3.14	2.83
Imparting knowledge on scientific feeding practices	3.38	3.57	3.81	4.00	3.69
Provision of timely information on market price and demand	3.08	3.27	3.51	3.70	3.39
Imparting knowledge on sustainable practices in shrimp farming	3.51	3.70	3.94	4.13	3.82
Providing quality seed and proper maintenance management	4.03	4.24	4.26	4.27	4.20
Periodic conducting training programme on shrimp disease management	2.21	2.40	2.64	2.83	2.52
Average	2.87	3.06	3.27	3.42	3.15

Source: Computed from the primary data

ANOVA					
Source of Variation	SS	df	MS	F	F crit
Variation due to measures to improve the performance of shrimp culture	36.22378	15	2.414918	610.985	1.894875
Variation due to educational status	2.745537	3	0.915179	231.5444	2.811544
Error	0.177863	45	0.003953		



Total	39.14718	63			
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Table 12 indicates data on the education wise respondents' rating on measures to improve the performance of shrimp culture'. The under graduate level educated respondents rank the first position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.42 on a 5 point rating scale. The higher secondary level educated respondents record the second position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.27 on a 5 point rating scale. The secondary level educated respondents hold the third position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 3.06 on a 5 point rating scale. The primary level educated respondents turn down to the last position in their overall rated measures to improve the performance of shrimp culture as per their secured a mean score of 2.87 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 610.98 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the measures to improve the performance of shrimp culture is statistically identified as significant. In another point, the computed anova value 231.54 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the educational status is statistically identified as significant as per the respondents rated measures to improve the performance of shrimp culture'.

### Conclusion

It could be seen clearly from the above discussion that the respondents' rate the high level prospects of shrimp farming by citing the indicators that export market potential, alternative to agriculture farming, availability of government credit, shrimp tolerance to a wide range of pond condition, availability of subsidy, easy availability of backwater in the coastal area, easy access to shrimp seed and local employment generation as per their secured a mean score above 3.50 on a 5 point rating scale. The respondents' rate the moderate level prospects of shrimp farming by stating the facts that availability of high market price for shrimps, well developed marketing channel, low capital output ratio, low risk, availability of low cost manure, availability of low cost power, suitability of coastal environment, easy availability of seed and prevalence of less business competition as per their secured a mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate the low level prospects of shrimp farming by indicating the facts that easy process of supervision, short cropping cycle, mangrove vegetation protects the young one, household employment generation, growing market demand and nutritious food supply as per their secured a mean score below 2.50 on a 5 point rating scale. It could be observed that the respondents of Cuddalore area rank the first position in their overall rated prospects of shrimp farming', respondents of Parangipettai area the second, respondents of Pichavaram area the third, respondents of Killai area the fourth and respondents of Mudasal Odai area the last.

The result of farm wise analysis reveals that the large farm size group respondents rank the first position in their overall rated prospects of shrimp farming', medium farm size group respondents the second, small farm size group respondents the third and marginal farm size group respondents the last. The result of caste wise analysis reveals that the backward caste respondents rank the first position in their overall rated prospects of shrimp farming', most backward caste respondents the second and scheduled caste respondents the last. The result of education wise analysis reveals that the under graduate level educated respondents rank the first position in their overall rated prospects of shrimp farming', higher secondary level educated respondents the second, secondary level educated respondents the third and primary level educated respondents the last.

The findings of respondents rating on problems in shrimp culture reveal the following facts. The respondents' rate the high level problems in shrimp farming by citing the indicators that bacterial disease on shrimps, poor co operation among farmers, malpractice in shrimp marketing, high transport cost of shrimp marketing, lack of adequate capital, labour shortage, lack of adequate drainage, shortage of ice, damage of infrastructure and estimation of grading as per their secured a mean score above 3.50 on a 5 point rating scale. The respondents' rate the moderate level problems in shrimp farming by stating the facts that mishandling and delay process, low price for shrimps, decomposition of shrimps, inadequate government support, carrying by bamboo basket to distance market, unusual situation, inadequate shrimp ice ratio, lack of mechanical weighing, use of unhygienic water in shrimp culture and market distance as per their secured a mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate the low level problems of shrimp farming by indicating the facts that possession of inadequate equipments, insufficient supply of shrimps, dirty floor, nonshed market place, poor shrimp culture pond condition, under weighing, mechanical injury caused by crushed ice, unable to receive full payment in cash, bound to sell at a lower price and suffering from risk and uncertainty as per their secured a mean score below 2.50 on a 5 point rating scale. It could be observed that the respondents of Mudasal Odai area rank the first position in their overall rated problems in shrimp farming', respondents of Killai area the second, respondents of Pichavaram area the third, respondents of Parangipettai area the fourth and respondents of Cuddalore area the last.

The result of farm wise analysis reveals that the marginal farm size group respondents rank the first position in their overall rated problems in shrimp farming', small farm size group respondents the second, medium farm size group respondents the third and large farm size group respondents the last. The result of caste wise analysis reveals that the scheduled caste respondents rank the first position in their overall rated problems in shrimp farming', most backward caste respondents the second and backward caste respondents the last. The result of education wise analysis reveals that the primary level educated respondents rank the first position in their overall rated problems in shrimp farming', secondary level educated respondents the second, higher secondary level educated respondents the third and under graduate level educated respondents the last.

The findings of respondents rating on measures to improve the performance of shrimp farming reveal the following facts. The respondents' rate the high level measures to improve the performance of shrimp culture by citing the indicators that providing quality shrimp seeds and imparting training on proper maintenance management, provision of shrimp seed at subsidized rate, technical guidance, supply of electricity on nominal charge, imparting knowledge on sustainable practices in shrimp farming, imparting knowledge on scientific feeding practices and training and agriculture extension support as per their secured a mean score above 3.50 on a 5 point rating scale. The respondents' rate the moderate level measures to improve the performance of shrimp

culture by stating the indicators that provision of timely information on shrimp market price and demand, control on feed rates, establishment of regulated marketing system for shrimp farmers, timely furnishing price information on price and demand and periodic conducting training programme on shrimp disease management as per their secured a mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate the low level measures to improve the performance of shrimp culture by indicating the facts that imparting training on disease prevention knowledge, construction of necessary shrimp processing industry, imparting knowledge on modern methods of shrimp production and access to credit and insurance as per their secured a mean score below 2.50 on a 5 point rating scale. It could be observed that the respondents of Cuddalore area rank the first position in their overall rated measures to improve the performance of shrimp culture', respondents of Parangipettai area the second, respondents of Pichavaram area the third, respondents of Killai area the fourth and respondents of Mudasal Odai area the last.

The result of farm wise analysis reveals that the large farm size group respondents rank the first position in their overall rated measures to improve the performance of shrimp culture', medium farm size group respondents the second, small farm size group respondents the third and marginal farm size group respondents the last. The result of caste wise analysis reveals that the backward caste respondents rank the first position in their overall rated measures to improve the performance of shrimp culture', other backward caste respondents the second and scheduled caste respondents the last. The result of education wise analysis reveals that the under graduate level educated respondents rank the first position in their overall rated measures to improve the performance of shrimp culture', higher secondary level educated respondents the second, secondary level educated respondents the third and primary level educated respondents the last.

### End Notes

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