PERCEPTION OF FARMERS ABOUT DIFFERENT TYPESOF SHRIMP FEEDS

LIBRARY
Central Marine Fisheries Research Institute
Cochin-682 014, (India)

DISSERTATION SUBMITTED
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

MASTER OF FISHERIES SCIENCE (MARICULTURE)

OF THE
CENTRAL INSTITUTE OF FISHERIES EDUCATION
(DEEMED UNIVERSITY)

BY

PAUL PANDI

Library of the Central Marine Fisheries Research Institute
Date of receipt 22.9.2000
Accession No. D-251
Class No.

भाकृअनुप
ICAR

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
COCHIN - 682 014
INDIA.

JULY 2000

DEDICATED TO MY BELOVED PARENTS,
BROTHERS, SISTER AND SISTER IN LAW

CERTIFICATE

Certified that the dissertation entitled **Perception of farmers about different types of shrimp feeds** is a bona fide record of work done by **Mr. S.Paulpandi** under our guidance at the Central Marine Fisheries Research Institute during the tenure of his M.F.Sc (Mariculture) Programme of 1998-2000 and that it has not previously formed the basis for the award of any other degree, diploma or other similar titles or for any publication.

24/7/2000.

Mrs.Sheela Immanuel

Scientist,SEETTD

CMFRI,Cochin.

Chairperson & Major Advisor

Advisory committee.

Dr.(Mrs) .Manpal Sridhar

Scientist (SS) PNPD

CMFRI, Cochin.

Co-Chairperson

Advisory committee.

Dr.R.Narayanakumar

Scientist, SEETTD

CMFRI, Cochin.

Member,Advisory committee

DECLARATION

I hereby declare that this thesis entitled **Perception of farmers about different types of shrimp feeds** is based on my own research and has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles or recognitions.

S. PAULPANDI

Cochin

July-2000

ABSTRACT

Perception of farmers about different types of shrimp feeds

By

S. Paulpandi

Chairperson: Mrs. Sheela Immanuel, Scientist,
Socio Economic Evaluation &
Technology Transfer Division,CMFRI,
Cochin-14

This research study entitled **Perception of farmers about different types of shrimp feeds** was conducted in Ramanathapuram and Thoothukkudi districts. The objectives of the study were focussed on the profile characteristics of the target population, knowledge level of shrimp farmers about the different types of feeds, feeding schedule and management practices adopted by shrimp farmers, perception of the farmers towards the different types of shrimp feeds and problems faced by farmers regarding the feed.

Most of the respondents belonged to middle age group and had medium level of education with shrimp farming as their main occupation and had low experience. It is observed that more than thirty eight percent of the farmers had low level of income (below Rs. one lakh). Majority of the farmers had high level of extension agency contact and found to be members in one organization and had attended fisheries training programmes.

Most of the farmers using commercial feed had knowledge on the practices of decreasing feed during moulting time, effect of low dissolved oxygen and about the need for regular water exchange in time of over feeding. They also

possessed correct knowledge about the different measures adopted for checking the quality of feed. Majority does not have knowledge about the feed monitoring and important additives in the feed.

Majority of the farm made feed using farmers possessed knowledge about the method of checking excess feeding, important additives in the feed, and exchange of water during over feeding.

Commercial feed using farmers had adopted the correct method, type, frequency and timings of feeding. The farm made feed using farmers adopted the number of feeding locations per unit area, quantity of feed and providing starter feed after stocking. Majority of them is not adopting the suggested allocations of feed per day.

Farmers' preference to the commercial feed was due to its easy availability in the market, good attractibility, water stability and storage life of feed. In the case of farm made feed using farmers majority felt that texture of the feed was good when compared to commercial feed and the feed was affordable.

The important problems regarding commercial feed are fungal infection and over cooking.

The major problems of the farm made feed using farmers were the lack of availability of raw materials, low shelf life, poor water stability, and the less important problems faced by these farmers were hardness of the feed, fungal infection and over cooking.

सारांश

चिंगट खाद्यों के सम्बन्ध में मछुआरों का अभिमत
एस. पॉल पान्डी द्वारा लिखित

अध्यक्षाः श्रीमती शीला इम्मानुअल, वैज्ञानिक समाज आर्थिक मूल्यांकन और तकनोलजी तबादला प्रभाग, सी एम एफ आर आइ कोचीन - 14.

इस विषय पर अध्ययन रामनाथपुरम और तूत्तुकुडी के मछुआरों के बीच चलाया गया. इस क्षेत्र में चिंगट पालन करनेवाले मछुआरों और चिंगट पालन में खाद्यों के उपयोग की स्थिति को सकेंद्रित करते हुये यह अध्ययन किया गया था.

चिंगट पालन पर अभिमत प्रकट किए अधिकांश मछुआरे मध्यवयस्क और मध्यम स्तर की शिक्षा प्राप्त किए वाले थे. ये निम्न आय वर्ग के भी थे. इन्होंने धंधे के रूप में अभी अभी चिंगट पालन स्वीकार किए जानेवाले होने के कारण इस धंधे में कम अनुभवी थे. फिर भी इन्होंने इस विषय पर दिये जानेवाले किसी न किसी प्रकार प्रशिक्षण कार्यक्रम या सलाह के लाभभोगी रहे थे.

वाणिज्यिक खाद्य का उपयोग करनेवाले मछुआरों इसके ठीक उपचार जैसे मॉल्टिंग समय पर खाद्य कम करना, अधिक खिलाने पर ऑक्सिजन मात्रा उच्च रखना व नियमित पानी विनिमय बनाये रखना आदि बातें जानते थे. खाद्य की गुणवत्ता तथा जाँच करने की रीति वे अच्छी तरह जानते थे. पर अधिकांश को खाद्य में जोडे गए संघटक और फीड मोनटरन की जानकारी नहीं थे.

घरेलू खाद्यों का उपयोग करनेवाले मछुआरे इनके संघटक जानते थे, अधिक खद्य से खिलाने पर पानी विनिमय की आवश्यकता समझते थे और खाद्य की मात्रा कितना देना है यह भी समझते थे.

वाणिज्यिक खाद्य का उपयोग करनेवाले मछुआरों ने नियमित रीति व तरीकों और नियमित समय आवृत्तियों का पालन किया था. घरेलू खाद्यों का उपयोग करनेवालों ने नियमित स्थानों से नियमित मात्रा के खाद्य से खिलाया. इन्होंने संभरण के तुरन्त बाद स्टारटर फीड से खिलाया, अधिकांश मछुआरे खाद्य मात्रा में कोई पाबन्दी नहीं जताते हैं.

मछुआरे घरेलू खाद्यों की तुलना में वाणिज्यिक खाद्य ज्यादा पसंद करते हैं . बाजारों में आसान उपलब्धता, आकर्षकता, पानी में टिकाऊपन , लंबे अरसे तक की भंडारण क्षमता आदि इसके कारण हैं. फिर भी घरेलू खाद्य का संघटन आसान और कम खर्चीला है.

वाणिज्यिक खाद्य के मुख्य प्रश्न रोगबाधा, अधिक पाचन व भंडारण में विगलन आदि है तो घरेलू खाद्य के मुख्य प्रश्न कच्ची वस्तुओं का अभाव, पानी में आसान विगलन आदि है.

ACKNOWLEDGMENT

I feel proud in expressing my deep sense of gratitude to my guide **Mrs. Sheela Immanuel,** Scientist (SEETTD) CMFRI for her inexpressible guidance and priceless support throughout the dissertation work.

I am deeply obliged to Advisory Committee member **Dr. Manpal Sridhar,** Scientist (S.S) (PNPD) CMFRI for her expert guidance and her continuous encouragement throughout the research period.

I extend my ardent gratitude to Advisory committee member **Dr. R. Narayanakumar,** Scientist (SEETTD) for his guidance and encouragement.

I have the deepest gratitude to **Dr. M. Devaraj,** former Director, CMFRI and **Dr. V.Narayana Pillai**, Director, CMFRI for permitting me to avail the facilities in the Institute during the course this study.

I take this chance to thank **Dr. C. Suseelan**, Senior Scientist and former Officer-in-Charge, PGPM and **Dr. R. Paulraj**, Head, PNPD and Officer-in-Charge, PGPM, CMFRI, Cochin for their support rendered during the study period.

I also express my deepest thankfulness to **Dr. R. Sathiadhas**, Principal Scientist and Head ,SEETT Division, CMFRI, Cochin.

I am much obliged to **Mrs. S. Ashaletha**, Scientist, SEETTD, CMFRI, for her help and advice.

I am thankful to **Shri. Amal Xavier and Mrs. Rachael**, Assistant Directors, Tamil Nadu State Fisheries Department, Tamil Nadu.

I am thankful to the **Dean,** Tamil Nadu Agricultural University, **Mr. Jawahar** and **Mr. Chidambaram,** Associate professors, Fisheries College and Research Institute, Thoothukkudi

I wish to thank all the Technical staff in Socio Economic Evaluation and Technology Transfer Division, (**SEETTD**) CMFRI, Cochin.

I also express my deepest thankfulness to **Mr. John, Ms. Juliet, Ms. Maya** and **Mr. Yesudhason** for their constructive suggestions, support and encouragement throughout the research work

I find paucity of words in expressing my obligation to my friends **Mr. S. Anand, N. Rudhramurty, Raj, Anbu, Jeeva, Kabilan, Saro, Venki, Vijayabasker, Anandhan, Edwin, Mariyappan, Renjith, Suresh, Anand and Dr. Jaya**

My sincere thanks are also due to the authorities of **CMFRI** and **ICAR** for the financial assistance in the form of **Junior Research Fellowship** (JRF)

I am always grateful to all other friends and other well wishers who helped me directly or indirectly in the accomplishment of this task.

Lastly, I dedicate my success to my **Parents, Brothers, Sister and Sister in Law** and their **children** for their everlasting love, support and enthusiasm.

Cochin-14
24-07-2000

(S. PAULPANDI)

1. INTRODUCTION

1. Introduction

Indian coastal waters offer a very good potential for the culture of variety of aquatic organisms. The country possesses a long coastline of 8129 Km with a number of brackishwater lakes and the estuarine system formed by the major rivers. Indian fish production is from both sectors *viz*, the capture and culture fisheries. Capture fisheries sector constitute a highly productive sector, a source of valuable protein rich food, employment and a net contributor with the balance of payment. The catch from capture fisheries has become more or less static in several areas on account of the exploitation reaching the maximum sustainable level and reduced in some other areas due to overexploitation, environmental degradation and related factors. Therefore more and more attention is now being given to aquaculture, which offers immense scope for substantially raising the production level. With an estimated 1.2 million hectares of brackishwater area, coastal aquaculture is emerging as a major production activity. India's total estimated production potential is about 17,68,422 tons, through aquaculture.

Though traditional shrimp farming has been practiced for a long time in States like Kerala and West Bengal, modified extensive and semi - extensive type of farming started only during the last decade in the states like Andhra Pradesh, Tamil Nadu, Karnataka and Kerala. About 50 per cent of the farming area is still under extensive farming practice and the rest under modified extensive and semi - extensive farming (Murthy, 1997).

Due to very high demand in foreign market and stagnating production of shrimps from the capture fisheries, attempts were made to increase shrimp production through culture fisheries. The brackishwater area in the country is estimated at 1,19,09,000 hectares (Shaleesha, 1994). Prsently about 10 per cent of the area is under brackishwater shrimp farming with an annual production of about of 80, 000 tonnes (Rosenberry, 1999). In 1999-2000 cultured shrimp export fetched foreign exchange equivalent to Rs. 808 crores (Anon, 1999).

Aquaculture in Tamil Nadu:

In Tamil Nadu about 56,000 hectares of brackishwater area had already been identified suitable for farming. Adoption of scientific strategies and modern techniques of shrimp aquaculture in Tamil Nadu would yield about 0.61 - 0.62 metric tons of shrimp/ha worth Rs. 4 - 5 lakh annually. Shrimp aquaculture offers adequate employment opportunities to the rural fishing community. In Tamil Nadu coast the total area under culture is 984.21 ha. In Ramanathapuram and Thoothukkudi districts the total area under culture is 35.33 ha and 177.51 ha. respectively (Sukumar,1998).

Shrimp farming is mostly done by the farmers in their own land or leased in land. Traditional filtration method of farming is practiced by most of the marginal and small farmers whereas scientific shrimp farming is done by the large farmers on a commercial scale. In case of scientific farming of shrimps the pond is eradicated and then stocked with seeds collected from the hatcheries. Stocking density is maintained as per the recommendations. Feeding is an important activity in the scientific farming as it contributes a lot to the growth of

the shrimps. In addition to natural feeding farmers also use commercial feeds to harvest a better yield. Different types of commercial feeds are available in the market.

Even though quite a number of feed formulations are available, the use of a particular type of feed depends upon the farmers preference which in turn is based on their experience. The success of the feed depends upon the extent of its usage by the farming community. Perception and attitude of farmers differ from individual to individual and various factors may contribute to this difference. A few studies only have been under taken on aspects like the knowledge level of farmers about different types of feed, feeding schedule and management practices and also on the extent of adoption of different feeds by farmers. Hence the present study is undertaken with the following objectives: -

- To study the profile characteristics of the target population.
- To assess the knowledge level of shrimp farmers about the different types of feeds.
- To find out the feeding schedule and management practices adopted by shrimp farmers.
- To study the perception of the farmers towards the different types of shrimp feeds.
- To identify the problems faced by farmers regarding the feed.

Scope of the study

The proposed study is expected to generate data on the profile characteristics of the shrimp farmers, their knowledge level, feeding schedule and management practices adopted by them, perception of the farmers towards the different types of shrimp feeds, and the problem faced by farmers regarding the feed. An overall field assessment and performance of the feed could be made which may in turn contribute to the feed makers for refining their formulations. It is hoped that the results would be useful for analysing the factors influencing the feed preference and adoption of feeding schedule by the farmers which in turn will help to take suitable steps for creating better awareness about scientific feeding practice among the farmers. This will lead to the overall improvement in the area of shrimp culture, there by increasing the yield.

Limitations of the study

Since this study was undertaken as a part of the post-graduate program of the author, the limitations of time and resources could not be avoided. Hence this study was conducted only in Ramanathapuram and Thoothukkudi districts. Even then, a sincere effort was taken to the maximum extent possible to obtain better results.

Organization of the thesis

This thesis is presented in five chapters viz, Introduction given in chapter 1, Review of literature under chapter 2, Methodology under chapter 3, Results and Discussion under chapter 4, and Summary under chapter 5.

2.REVIEW OF LITERATURE

2. Review of literature

A review of the past research in this field has been done to enable a better understanding of the subject. The different aspects covered under review are presented as follows

2.1 Profile characteristics of the target population.

2.2 Knowledge level of shrimp farmers about the different types of feed.

2.3 Feeding schedule and management practices adopted by farmers.

2.4 Perception of the farmers towards the different types of shrimp feed.

2.5 Problems faced by farmers regarding feeds.

2.1 Profile characteristics of the target population:

2.1.1 Age

Pounraj (1992) while analyzing the inland fishermen co-operative societies found that most of the respondents come under middle age group (75.83%), followed by old (15%) and young (9.1%).

Perumal *et al.* (1992) reported that most of the beneficiaries of the Fish Farmers Development Agency (FFDA) were under young age category (63%), followed by middle (26%) and old age (11%).

Khan *et al.* (1997) reported that 55 per cent of the paddy farmers were of middle age, 22 per cent were of young age and 18 per cent were of old age.

Alauddin *et al.* (1998) found that nearly half of the agriculture labourers belonged to old age and a little over one third belonged to young age followed by

middle age (18%) in their study on agriculture labourers and employment opportunities.

Meeran *et al.* (1999) in their study on socio-economic and socio-psychological profile of shrimp farmers found that 50 and 42 per cent of the shrimp farmers belonged to young and middle age group respectively.

Venkattakumar (1999) while describing the profile characteristics of commercial coconut growers found that nearly half of the farmers were of middle age and one third of them were young age and the rest were old age.

Gaikwad *et al.* (2000) while studying the information seeking behaviour of Krishi Vigyan Kendra (KVK) beneficiaries in Maharashtra found that most of the beneficiaries (75%) were from middle age and old age group.

2.1.2 Education

Desai and Kaul (1984) in their study on adult education of fishermen reported that most of the fishermen were illiterate.

Sehara *et al.* (1986) studied the socio-economic conditions of fishermen in selected villages of Maharashtra and Gujarat coasts and found that most of the fishermen were illiterate (60%). Among the literate fishermen 31 per cent had education up to primary level, 4 per cent had middle level, 4 per cent had higher secondary level and remaining 1 per cent had graduate level.

Subhaschandra (1986) while studying the consequences of adoption of fish culture practices by fish farmers found that about 88 per cent of the respondents had primary to secondary level of education.

Venkatramanujam *et al.* (1987) in their study on socio-economic conditions of the chank fishermen community reported that the percentage of school attending male and female children were 57.4 per cent and 42.3 per cent respectively.

Khan *et al.* (1997) found that most (69.69%) of the paddy farmers were found to be educated between primary and higher secondary level and only 30.80 per cent had education upto college level, while studying the farmers characteristics and adoption of paddy technology in eastern Madhya Pradesh.

Immanuel (1997) while evaluating the training programme for fisher women on preparation of food from seaweeds reported that about 33 per cent of the respondents had primary level of education followed by high school education (27%), secondary education (20%) and (20%) illiterate.

Meeran *et al.* (1999) found that all shrimp farmers who were taken as respondents were literate and had acquired education beyond primary level. Among the respondents 42 per cent had undergone collegiate education and the remaining respondents had studied upto higher secondary (22%) and middle school (16%).

Venkattakumar (1999) in his study on profile characteristics of commercial coconut growers, stated that more than one third (38.05%) of the respondents possessed medium level of education followed by low (34.52%) and high (27.43%) level of education.

2.1.3 Occupational status

Subashchandra (1986) in his study on fish culture practices by fish farmers reported that more than three fourth of the respondents had fish culture as their secondary occupation.

Meeran *et al.* (1999) found that shrimp farming was considered as primary and secondary occupation by 62 per cent and 28 per cent of the respondents respectively.

2.1.4 Experience

Pounraj (1992) while analyzing the Inland fishermen co-operative society reported that nearly three fourth of the members possessed medium level of fish farming experience, less than one fifth of the members had low level and one tenth of the members had high level of experience.

Perumal *et al.* (1992) in his study on Fish Farmers Development Agency (FFDA) programme reported that most of the farmers (56%) had medium level of fish farming experience.

Alauddin *et al.* (1998) reported that 40 per cent of the agricultural labourers had high level of experience in farming activity while (50%) had low to medium level of experience.

Meeran *et al.* (1999) reported that most of the shrimp farmers (72%) had experience in shrimp farming up to three years while the rest had more than three years of experience.

Venkattakumar (1999) while analysing the profile characteristics of commercial coconut growers found that about 50 per cent of the respondents had

low level of farming experience, while 33.63 per cent of them had medium level of farming experience.

2.1.5 Annual income

Sehara *et al.* (1986) calculated that average net income per fishermen family at Rs. 5313/- while studying the socio-economic conditions of fishermen at selected villages in Maharashtra and Gujarat

Subashchandra (1986) while analysing the consequences of adoption of fish culture practices reported that most of them (95%) had medium level of annual income.

Pounraj (1992) reported that most of the respondents of the inland fishermen co-operative societies (68.32%) fall under medium to high level of income group and less than one third (31.66%) were under low income category.

Kiran (1992) in his study on effectiveness of the fisheries training programmes reported that most of the trainees belonged to low income group (72.5%) having an annual income less than Rs. 10,000/-, followed by 15.83 per cent belonged to medium income group(Rs. 10,000/- Rs.15,000/-) and 11.67 per cent belonged to high income group (> Rs. 15,000/-).

Alauddin *et al.* (1998) reported that about 54 per cent of the agriculture labourers were in low income group(< 5000 Rs) and 10 per cent high income group (> 15,000Rs), 36 per cent were in medium income group (Rs 5000 - 15000).

Venkattakumar (1999) in his study on profile characteristics of commercial coconut growers found that almost equal percentage of the

respondents (45.13%) belonged to low and medium 42.48 per cent income group and the rest 12.39per cent belonged to high- income group.

2. 1.6 Type of family

Medhanie *et al.* (1991) while studying the profile of under graduate students of agriculture in Tamil Nadu Agricultural University(TNAU) reported that about 78 per cent of the students belonged to nuclear family and the rest belonged to joint family system.

Alauddin *et al.*(1998) reported that most of the agricultural labourers (68%) had nuclear family and the rest (32%) had joint family system.

2.1.7 Size of family

Immanuel (1997) in her study on training programme for fisher women on preparation of food from seaweed reported that 70 per cent of the respondents belonged to the nuclear family with an average of five members in the family and remaining 30 per cent of the respondents belonged to joint family.

Alauddin *et al.* (1998) reported that most (78%) of the agricultural labourers belonged to small family (<5 members) and the rest belonged to big family (> 5 members).

Gaikward *et al.* (2000) while studying the information seeking behaviour of KVK beneficiaries reported that 48 per cent had small families.

2.1.8 Type of house

Venkataramanujam *et al.*, (1987) in their study on socio-economic conditions of the chank fishermen community reported that 85 per cent live in *kutcha* house and 15 per cent in *semi-pucca house.*

Pounraj (1992) in his study on critical analysis of inland fishermen co-operative societies has recorded that about 55 per cent of the respondents were living in the tiled house, followed by terraced house (25%) and thatched house (20%).

Immanuel (1997) in her study on training programme for fisher women on preparation of food from seaweeds reported that a major proportion of them owned *kutcha* house (73%) and 20 per cent had *semi-pucca house*, while only 7 per cent had pucca house.

2.1.9 Media participation

Sujath Kumar *et al.* (1992) reported that radio (10%) and newspaper (10%) were the major sources of information on improved technologies utilized by the trawl owners of the coastal regions of Ramanathapuram district in Tamil Nadu.

Kiran (1992) in his study on effectiveness of the fisheries training programme observed that for 85 percent of the respondents, daily media participation is mainly by way of reading news paper, listening to the radio programmes (77.5%) and by seeing television (7.5%).

Meeran *et al.* (1999) in his study on shrimp farmers reported that most (72%) of the respondents were found to have medium to high degree of exposure to media channels like newspaper, television, radio and magazines.

Baby Kumar *et al.* (1999) observed that all the opinion leaders used radio as the major source of information, television (80%), newspaper (60%) and magazine (50%).

2.1.10 Contact with extension personnel

Subashchandra (1986) reported that most of the fish farmers had medium to high level of contact with extension agencies.

Pounraj (1992) reported that most (83.33%) of the members in the inland fishermen's co-operative were having medium level of extension agencies contact followed by high level of contact (12%) and only very few (4.66%) respondents were having low level of extension agencies contact.

Shivalinghaian *et al.* (1996) reported that most of the small farm rural youth had low to medium extension contact whereas (84%) of big farm rural youth had medium to high level of extension contact.

Meeran *et al.* (1999) reported that most (86%) of the shrimp farmers were found to exhibit low degree of contact with extension agencies, remaining (14%) of the shrimp farmers had no contact with extension agencies.

2.1.11 Social participation

Subashchandra (1986) in his study on fish culture practices by fish farmers stated that most of them (84.14%) had medium to low level of social participation.

Shivalingaian *et al.* (1996) reported on their study on farming problem of rural youth that small farm rural youth (80%) had low to medium extension participation and a high proportion of big farm rural youth (70%) had medium to high level of participation with extension agent.

Khan *et al.* (1997) while studying the paddy farmers reported that majority of the respondents (81.81%) was found to have some extent of social participation and the rest had much extent.

Meeran *et al.* (1999) reported that most of the shrimp farmers (78%) were found to have low level of social participation and remaining (22%) had high level of social participation.

2.1.12 Training attended

Meeran *et al.* (1999) in their study on socio-personal psychological profile of shrimp farmers reported that more than half of the respondents (54%) had undergone training programme on shrimp farming and the rest (46%) had already undergone some training in shrimp farming.

2.2 Knowledge level

Pounraj (1992) studied the inland fishermen co-operative societies in Thanjavur district and found that more than three fourth (76.66%) of the members had medium level of awareness, followed by 15 per cent low and the rest 8.33 per cent had high level of awareness.

Raj *et al.* (1992) while analysing the knowledge level of farmers on Irrigation management practices of Thanjavur district in Tamil Nadu zone, reported that about 53 per cent of the trained farmers of old Delta region had high knowledge level, followed by medium (25%) and low (21.67%) knowledge level. In new Delta region nearly two third of the trained farmers (65%) had high level of knowledge followed by medium (20%) and low (15%).

Venkatapirabu *et al.* (1992) in their study on knowledge level of paddy farmers on water management practices at Modakurchi block of Periyar district in Tamil Nadu, reported that 52 per cent of the respondents possessed medium level of knowledge on water management practices and 48 per cent of the farmers had high level of knowledge.

Lakshman *et al.* (1994) in their study on training extension personnel reported that more than two third of the respondents gained medium level of knowledge followed by nearly one fifth of the respondents with high level of knowledge and only 12.5 per cent of them gained low level of knowledge.

Sudeepkumar *et al.* (1994), while studying the effectiveness of training on dairy trainees, reported that most (64.58%) of the trainees had medium level of knowledge, 22.92 per cent trainees had high knowledge level and the rest 12.5 per cent had low knowledge level.

Yogananda *et al.* (1994), while studying the knowledge level of coconut growers reported that 53.34 per cent of small coconut growers had low level of knowledge on package of practices of coconut cultivation as compared to big coconut growers, who had high level (53.34%) and medium level (41.66%) of knowledge.

Nagabhushanam (1994), while studying the knowledge and adoption of coconut cultivation practices, reported that about 50 per cent of the respondents had medium level of knowledge, 28 per cent low and 22.33 per cent high level of knowledge.

Narmatha *et al.* (1996), in their study on the knowledge level of farm women in scientific poultry farming, found that 74 per cent of the poultry farm women possessed medium level of knowledge and the rest had almost low (14%) and high (12%) level of knowledge.

Ramamurthi *et al.* (1997) found that most (56.67%) of the respondents had medium level of knowledge, 30.83 per cent had low level of knowledge and 12.50 per cent had high level of knowledge on turmeric production and processing.

Immanuel (1997), while studying the fisherwomen on preparation of food from seaweed, reported that most (97%) of the trainees came under the low level knowledge group and only 3per cent of them fell under the medium knowledge group.

Murugesan *et al.* (1998) reported that about 75 per cent of the trainees gained medium level of knowledge, 16 per cent of the trainees gained a high level of knowledge and the rest 9.68 per cent gained low level of knowledge.

Ranganathan and Somasundaram. (1998) in their study on knowledge of farmers on mushroom cultivation reported that more than two third of the respondents had medium to high level of knowledge on mushroom technologies.

Tharaneatharan *et al.* (1998) while studying the information utilizing pattern, knowledge and adoption level of agro forestry beneficiaries reported that more than one third of respondents (36.15%) were found to be in high knowledge category, followed by low (33.80%) and medium (30.30%) categories.

Vijayalakshmi *et al.* (1998) in their study on farm women in turmeric cultivation reported that most of the respondents (71.67%) had medium level of knowledge followed by low (15.83%) and high (12.5%) knowledge categories.

Subramainan (1999), while studying the knowledge level of dairy farmers, found that majority farmers of less successful milk societies possessed medium to high level of knowledge respectively.

Sheela and Sundaraswamy (1999) in their study on the knowledge level of dairy farmers reported that 62 per cent had medium knowledge level and 19 per cent of the respondents each were found to have low and high knowledge level.

Goswami *et al.* (2000) in their study on composite fish culture reported that more than three fourth of the respondents were found in the medium knowledge category followed by high(14%) and low knowledge(10%) category

2.3 Feeding schedule

Shrimps feed usually 3 - 6 times per day (Sundaraseker, (1991)); Akiyama (1993); Robertson *et al.*, (1993); Purushan, (1995); Kinkarchand (1999); Paulraj, (1999).

According to Prasad (1995) feeding was done twice daily from the third day of stocking till the end of the culture period.

2.3.1 Feeding method

Villialon (1991) while studying the practice for semi-intensive culture reported that broad casting and check tray feeding are mostly adopted in shrimp farms.

Surendran *et al.* (1991) in their study on semi-intensive shrimp farming reported that check trays were provided in the ponds (about 2-4 numbers) for strict observation on feeding.

Goddard (1996) in his study on feeding method reported that most of the farmers used 1-6 feeding trays per hectares, while Prasad (1997) in his study on the bio-economic evaluation of semi-intensive shrimp farming reported that six check trays were usually used in one hectare area of pond.

Sukumar (1998) in his study on the evaluation and comparison of shrimp farm management practices and prospects for sustainability reported that most of the farmers adopted a combination of feeding methods involving broadcasting and check trays.

2.3.2 Water stability

Desilva (1985) while studying the water stability of feed reported that shrimp feed need to be water stable for 3 - 4 hours.

Akiyama *et al.* (1995) while studying the shrimp feed requirements and feed management reported that shrimp feed need to be water stable for a minimum of two and half hours. But Sitasit (1995) while studying feed ingredients and quality control reported that the water stability upto three hours is considered satisfactory.

Cruz (1996) in his study on feed quality problem and management strategies reported that shrimps have slow feeding behaviour and hence it requires highly water stable feed and it should be stable for more than four hours.

Anon (1996) in his study on shrimp farming reported that shrimp feeds need to be water stable for 2 - 3 hours because shrimps are slow and continuos feeders.

Jain (1998) in his study on selection of ideal binder for making stable aqua feed reported that, aqua feed should have good water stability for a minimum period of two hours.

2.4 Perception

Alagesan and Sumathi (1998) while studying the awareness of bio-fertilizer and bio-control agents by farmers reported that among the bio-fertlizers, *Azospirillum* was known to majority *ie,(* 75%) of the respondents and *Rhizobium* was known to almost half (54.17%) of them, followed by blue green algae (24.17%), and Phosphobacteria (19.17%).

Murthy *et al* (1998) while studying the awareness on use of weedicides in paddy, reported that all the farmers who were using weedicides were aware of its use in paddy. About 92 per cent of farmers who were not using weedicides were also aware of its use.

Goswami *et al.* (2000), in his study on composite fish culture reported that 64 per cent have favorable attitude towards composite fish culture followed by 22 per cent and 14 per cent having unfavorable and highly favorable attitude respectively

2.5 Problems faced by farmers

Shivamurthy (1994) reported that the most important constraints in the adoption of dairy innovation as expressed by dairymen were high cost of concentrates (70.0%), followed by lack of finance (46.67%) and non-availability of fodder (38.33%).

Shivalingaian and Veerabhadraian (1996) reported that majority of small and big farm male youth expressed high cost of fertilizers and chemicals, lack of subsidies, high cost of production and lack of credit facilities as their major problems both in agriculture and horticulture. Most of the small and big farm youth perceived high cost of feeds, lack of credit and lack of training as major constraints in dairy.

Most of the small and big farm youth expressed high cost of inputs and price fluctuation for cocoons as major constraints in sericulture.

Suresha *et al* (1996) while studying the perceived problems of beneficiaries in dairy enterprises reported that most (94.73%) of the beneficiaries had stated that inability of local cows to bear calve through artificial insemination and supply of inferior cows as the major problems and some of them expressed lack of grazing facilities (89.47%), lack of extension facilities (89.7%) and neglect of animals (84.12%) as the constraints.

Ravishanker *et al* (1998) while analyzing the constraints faced by potato farmers revealed that lack of technical guidance was the major constraint

(94.16%) followed by pests (90.0%), diseases (88.33%) and high cost of fertilizers (85.0%).

The major constraints faced by the farmers in marketing of potato were high cost of transportation (I rank, 93.33%), delayed cash payment (II rank 91.66%), distance of markets (III ranks, 90.0%), high commission agent charges (IV rank, 89.16%), fluctuation in market price (V rank, 88.33%) and high labour charges (VI rank, 86.66%).

Sundarambal *et al* (1999) while studying the problems of transfer of dry land technology found that most of the respondents (53.33%) faced the problem of lack of farmers participation, about 50 per cent of the respondents stated that they were not able to effectively disseminate the technologies due to vast jurisdiction and 37 per cent due to lack of time.

3. METHODOLOGY

3. Methodology

In this chapter, the criteria adopted for selection of study area, a brief description of the study area, sampling procedure applied and the analytical tools employed have been presented under the following heads.

3.1 Selection of study area

3.2 Description of the study area

3.3 Sampling design and data collection

3.4 Selection of variables

3.5 Description about commercial and farm made feed

3.6 Analytical tools

3.1 Selection of study area:

In Tamil Nadu 56,000 ha area is available for brackish water aquaculture. Out of this 3,000 ha is currently (1999-2000) under culture. Out of the 11coastal districts, the Ramanathapuram and Thoothukkudi districts were purposively selected for the study because of the following reasons

- These two districts have the maximum area under shrimp farming.
- Majority of the farmers in these districts is involved in shrimp farming.
- Very limited studies have been carried out on shrimp farming in these two districts.
- The study area is very familiar to the student researcher and he is well versed in the local dialect of the farmers.

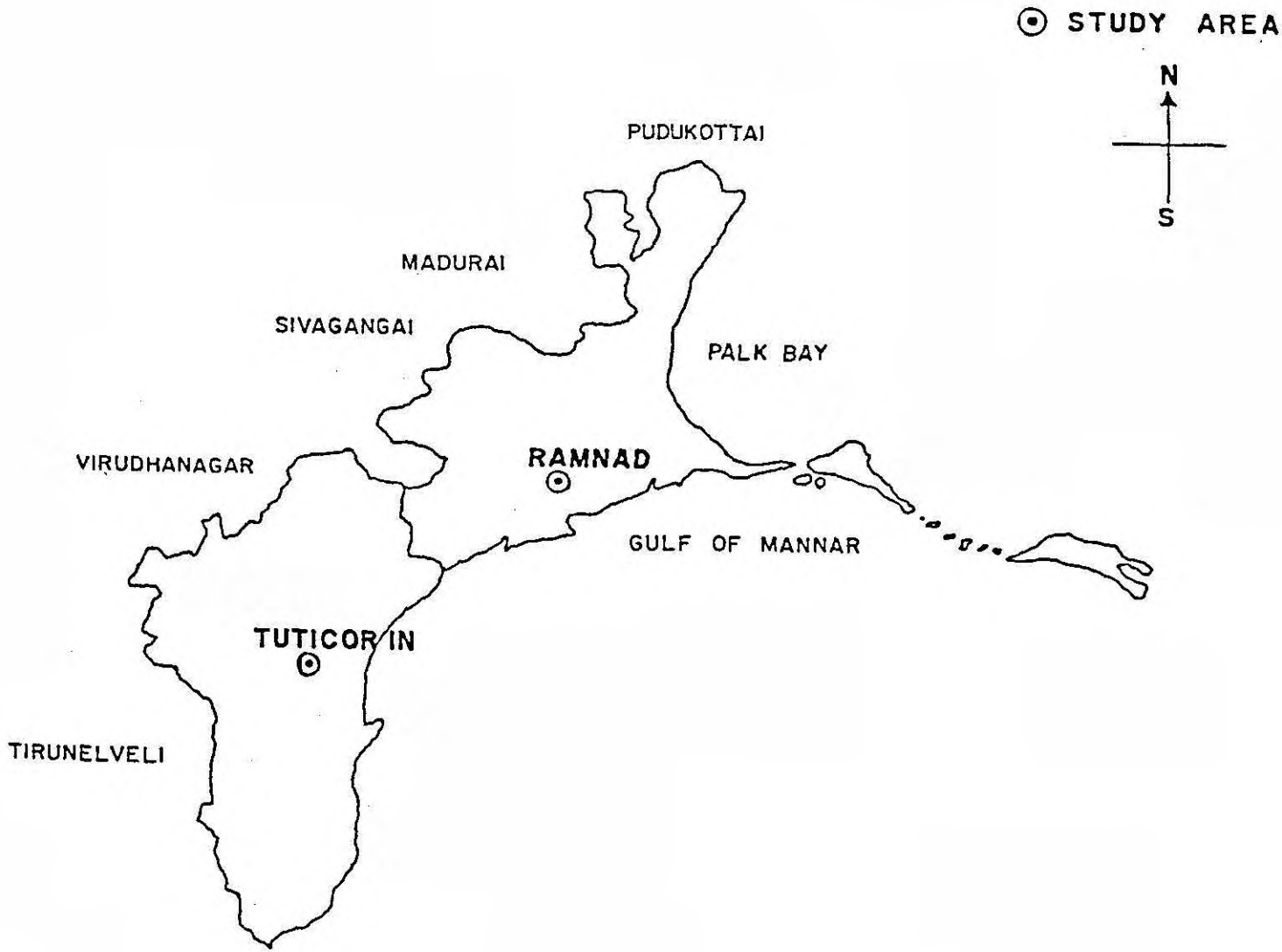
3.2 Description of study area

Tamil Nadu is the southern most maritime state of India and it is bound by Andhra Pradesh in the north, Bay of Bengal and Palk bay in the east, Gulf of Mannar in the south east and the Arabian sea in the South west, Kerala state in the west and Karnataka in the north west. The Ramanathapuram district lies between 8°5' and 13°35' North latitude and 76°15' and 80° 20' East longitude. It is bound by Pudukottai district in the north, Madurai, Sivagangai, and Virudhunagar dictricts on the west, and Thoothukkudi district on the south. The Thoothukkudi district lies between 8°10' - 9°10' north latitude and 77°50' - 78°20' eastern longitude. Its bound by Tirunelveli district on the south, Virudhunagar, Ramanathapuram on the north and Gulf of Mannar.in the south east (Fig1) .

3.2.1 Climate and rainfall

The climate prevailing in the state is tropical in nature. The maximum and minimum temperature in the study area ranges between 18°c and 43°c. The average annual rainfall in Ramanathapuram district is 900 mm and Thoothukkudi is 660 mm. The entire state received more rainfall during north-east monsoon (49.2%) compared to south-west monsoon (42.6%) in the last year. During 1996-97, the Ramanathapuram and Thoothukkudi districts received a rainfall of about 1143 mm and 913.1 mm respectively. During 1998- 99, the district received about 60 per cent of rainfall through Northeast monsoon and 40 per cent through Southwest monsoon.

MAP OF THE STUDY AREA



3.2.2 Fishermen population

In Ramanathapuram district, the total fishermen population is 77510 (1991) out of which the active fishermen population is only 45637 (58.87%) whereas in Thoothukkudi the total fishermen population is 47289 out of which the active fishermen population is 30990(65.53%).

3.2.3 Shrimp aquaculture

In Ramanathapuram district, about 35.33 hectares of brackishwater area is available for culture, out of which presently 35 per cent is utilised for shrimp aquaculture. In Thoothukkudi district, about 177.51 ha of brackishwater area is available for aquaculture. Out of which only 25 per cent is under shrimp farming. Generally shrimp farming is carried out in two seasons namely March - June and August – December

3.3 Sampling design and data collection

3.3.1 Selection of blocks

The Ramanathapuram and Ottapidaram blocks were selected purposively because, shrimp farming is carried out in larger scale in these blocks.

3.3.2 Selection of villages

Three villages namely Devipattinam and Athankarai from Ramanathapuram block and Tharuvaikullam from Ottapidaram block were selected for the study based on the proportion of shrimp farmers in these villages.

3.3. 3 Selection of respondents

The respondents were classified initially into two groups namely those using commercial feed and those using farm made feed. Based on this criteria a sample of 60 shrimp farmers were selected at random- 40 shrimp farmers using commercial feed and 20 using farm made feed.

3.3.4 Data collection

A well-structured and pre tested interview schedule was found to be an appropriate device to collect data from the respondents. A schedule was prepared based on the objectives to collect data. Necessary precautions were taken to ensure that the questions in the schedule were unambiguous, clear, complete and comprehensive.

The interview schedule was pre tested through a pilot survey and suitable modifications were carried out before it was finalized. Each respondent was met individually and a good rapport was established initially and the data were collected.

3.4 Variables and their measurement

The variables included are based on the review of literature and discussion with experts. The variables and their measurements are listed below.

a) Age

Age was operationalized as the number of completed years of the respondents at the time of enquiry. The respondents were classified into three groups namely,

Young	upto35years
Middle	35-45years
Old	>45years

b) Educational status

The educational status of the respondents was operationalized as the number of years of schooling completed and the classification of the respondents were made as furnished below,

Illiterate-No formal/informal education

Low level of education - upto primary (1 to 5th std)

Medium level of education - 6th to 10th standard.

High level of education - 11th to 12th standard-

College

c) Occupational status

Occupational status was operationalised as the extent to which the respondents are involved in shrimp farming.

Shrimp farming

Others

d) Social participation

It is the degree to which a respondent involves in organization as a member.

- Member in one Organization
- Member in more than one Organization
- No membership

e) Annual income

Annual income was operationalised in the study as the total income obtained from both shrimp culture and other activities for one year.

Low	-	Upto Rs 1 Lakh
Medium	-	Rs 1-5 Lakh
High	-	More than Rs 5 Lakh

f) Experience

Experience of the respondents in the shrimp culture activities was indicated in years.

Low	1-5 years
Medium	6-10 years
High	> 10 years

g) Type of house

The type of house was categorized as followed by Sujath Kumar, (1988).

Thatched

Tiled

Terraced

h) Media participation

Media participation in the study refers to the regularity of reading newspapers, magazines, listening to radio and viewing television.

i) Extension agency contact

This refers to the degree to which an individual contacted change agents for getting information on scientific innovations.

j) Knowledge level

Knowledge level of the farmers was assessed by giving fifteen statements about the various aspects of feed. A score of one was given to the correct answer and zero to the incorrect answer. Based on the scores obtained, the individuals were classified as follows

Knowledge level	Score
High	11-15
Medium	5-10
Low	1-5

k) Adoption

Adoption levels of the farmers was found out by giving eight statements and the farmers were classified under adopted and non-adopted category.

h) Perception

Perception was measured by giving twelve statements and the respondents were rated on a three-point continuum as low, average and high.

i) Problems

The different problems regarding shrimp feed by farmers were collected through discussion with farmers and review of literature. The lists of problems were rated in a three-point continuum and the scoring was done as shown below.

Response	Scoring
Most important	3
Important	2
Less important	1

The constraints were ranked based on a Cumulative Perception Index (CPI), which was worked out by finding out the ratio of cumulative score of each items to the total number of responses.

3.5 Description about commercial and farm made feed

Feed is an important component in shrimp culture. Feed occupies about 50 - 60 per cent of the operational cost. Generally shrimp farmers use two types of feeds as described below.

3.5.1 Commercial feed

Commercial feeds are manufactured in powdered or extruded form according to the size of the organism and their nutrient requirements. The common feed ingredients included fishmeal, soybean meal, fat, soybean meal corn, broken rice, fresh rice bran, coconut oil, meat, vitamins and minerals. Antibiotics are often added in permissible limits and this helps in developing disease resistance in shrimp. The steam used in the processing of feed cooks the carbohydrates and proteins which make them easier for the shrimp to digest. Steam cooking shortens the digestion period and also helps in better growth.

3.5.2 Farm made feed

Farmers prepare feed at their homestead locally and its ingredients vary from place to place depending upon the availability of raw materials. Generally the ingredients used are groundnut cake, rice bran, fishmeal, trash fish cooked cassava etc. Some include shrimp heads or cooked buffalo meat or clam or mussels as sources of protein.

3.6 Analytical tools

The following statistical tools were used in the analysis of the data.

- Percentage analysis.
- Mean and standard deviation.
- Cumulative Perception Index

3.6.1 Percentage analysis

Percentage analysis was used for simple comparison and inferences.

3.6.2 Mean and standard deviation

In this method mean and standard deviation were used to classify the respondents into various categories as high, medium, and low.

3.6.3 Cumulative Perception Index (CPI)

Cumulative Perception Index was used to rank the problems.

4. RESULTS AND DISCUSSION

4. Results and Discussion

In this chapter the results are presented in accordance with the objectives of the study and are discussed in the following order.

4.1 Profile characteristics of the target group

2.5 Knowledge level of shrimp farmers about commercial feed

2.6 Feeding schedule and management

4.4 Perceptions of shrimp farmers towards different types of feeds

4.5 Problems faced by shrimp farmers in using commercial and farm made feed

4.1 Profile characteristics

The profile characteristics of the target group were analysed and the results are presented in Table 1and Fig 2.

It is seen from the table that most (45%) of the respondents belonged to middle age group, 28.33 per cent to old age group and 26.66 per cent to young age group. The results are in conformity with the results of Meeran (1999), Venkattakumar (1999) and Gaikward *et al* (2000).

Most (43.34%) of the shrimp farmers belonged to the medium category with respect to education followed by high education category (20%), college category (18.33%), low category (15%) and illiterates (3.33%).

Majority (88.3%) had shrimp farming as their main occupation and only 1.7 per cent had shrimp farming as secondary occupation.

It is observed that most (51.66 %) of the farmers had low level of experience (<5 years) 30 per cent had medium level of experience (5-10 years).

The Profile characteristics of Shrimp farmers

Table 1

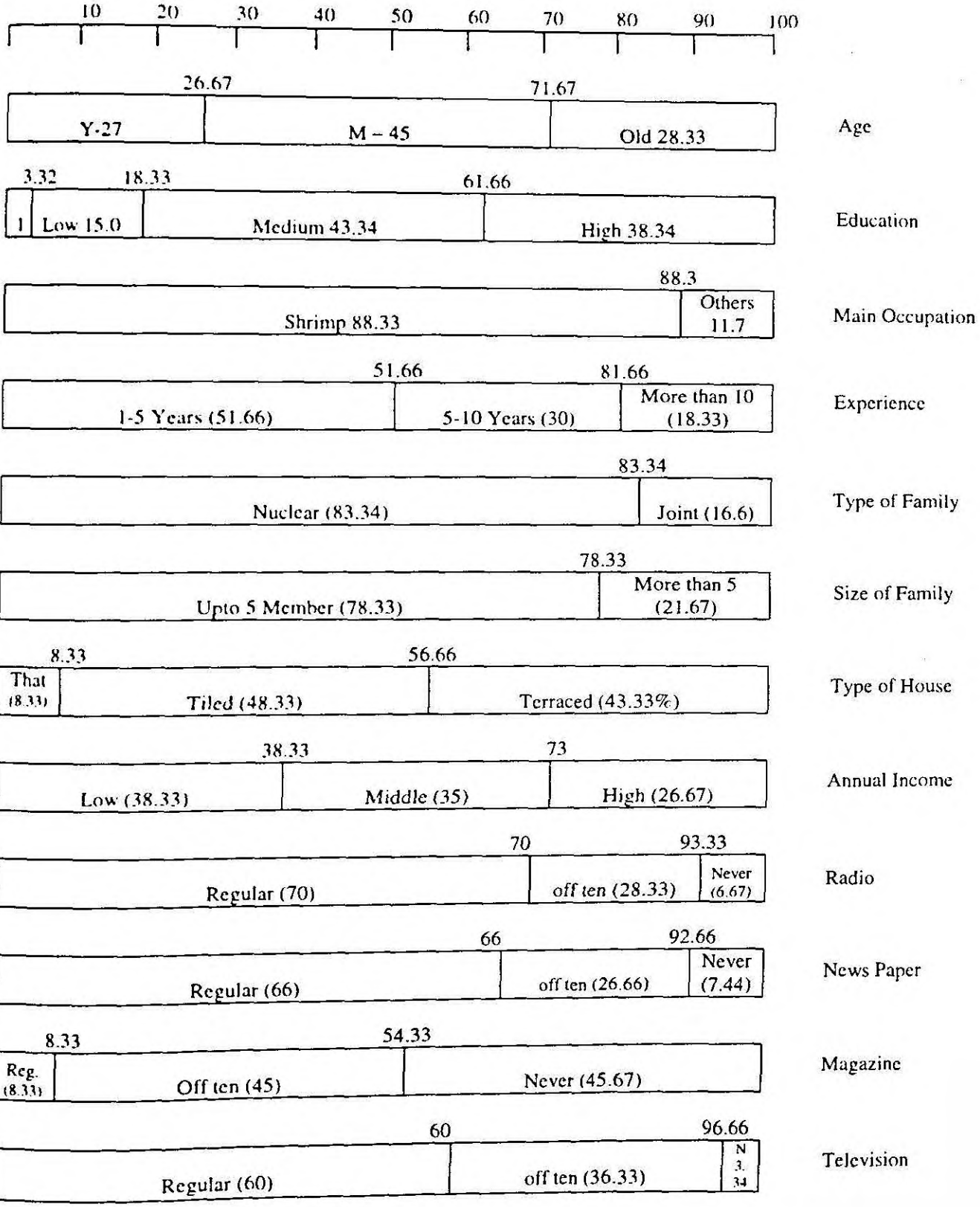
N=60

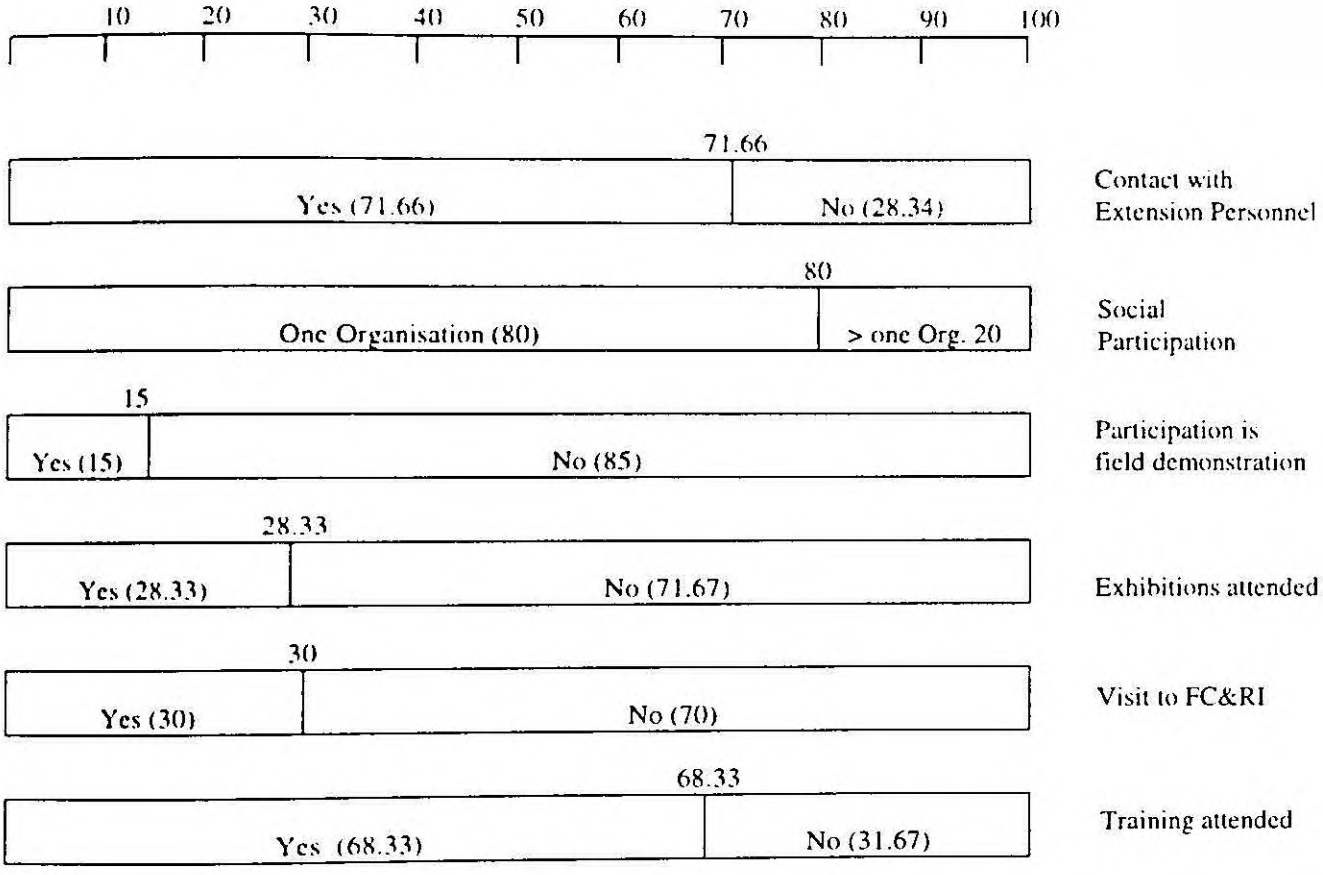
Sl No.	Particulars	Frequency	Percentage
1	**Age**		
	Upto 35 (Young)	16	26.66
	35 to 45 (Middle)	27	45.
	Above 45 (Old)	17	28.34
2	**Education**		
	Illiterate	2	3.33
	Low	9	15
	Medium	26	43.34
	Higher	12	20
	College	11	18.33
3	**Main Occupation**		
	Shrimp Culture	53	88.3
	Others	7	11.7
4	**Experience**		
	1- 5 years	31	51.66
	6 - 10 Years	18	30
	Above 10 Years	11	18.34
5	**Family Type**		
	Nuclear	50	83.34
	Joint	10	16.66
6	**Size of the family**		
	Upto 5 members	47	78.34
	more than 5 members	13	21.66
7	**Type of House**		
	Thatched	5	8.33
	Tiled	29	48.33
	Terraced	26	43.33
8	**Annual Income**		
	Low-upto1Lakh	23	38.33
	Middle-1-5 lakh	21	35
	High-more than 5lakh	16	26.67

Table - 1 Contd.....

9	**Media Participation**		
	Radio		
	Regular	42	70.00
	Often	14	23.33
	Never	4	6.67
	T.V.		
	Regular	36	60.00
	Often	22	36.66
	Never	2	3.34
	News paper		
	Regular	40	66.66
	Often	16	26.66
	Never	6	6.68
	Magazine		
	Regular	5	8.33
	Often	27	45
	Never	28	46.67
10	**Extension contacts**		
	Contact with extension personal		
	Yes	43	71.67
	No	17	28.33
11	**Social participation**		
	Membership in one Organization	48	80
	Member ship More than One organization	12	20
12	**Participations in the field**		
	Demonstration		
	Yes	9	15
	No	51	85
13	**Attending Exhibitions**		
	Yes	17	28.33
	No	43	71.67
14	**Visit to Fisheries College and Research Institute**		
	Yes	18	30
	No	42	70
15	**Training Attended**		
	Yes	41	68.33
	No	19	31.67

Fig. 2. Profile Characteristics of the target population





Y - Young

M - Middle

O - Old

I - Illiterate

That - Thatched

N - Never

J - Joint

Reg. - Regular

and only 18.34 per cent of them had high level of experience. (>10 years). This result supports the result of Venkattakumar. (1999).

Most of the farmers(83.3%) had nuclear family, and very few (16.71%) had joint family system. Medhaine et al (1991) and Gaikward (2000) had also reported similar results..

Most of the respondents (78.33%) had small family with an average of five members, and the remaining (21.66%) had more than five members. Sheela (1997) and Alauddin et al. (1998) had also reported the same

It is evident from the table that nearly fifty (48.33%) per cent of the respondents are living in tiled houses, 43 per cent in terraced houses and 8.33 per cent in thatched houses. The result was in conformity with the findings of Sujath Kumar (1988).

The table clearly indicated that more than thirty eight per cent of the farmers had low income (upto one lakh rupees per annum). Remaining (35 %) and (26.66%) of the respondents had middle income and high income respectively. Similar result was reported by Alauddin et al. (1998).

Seventy per cent of the farmers are regularly listening to radio and sixty per cent are viewing television regularly. Nearly sixty seven per cent are reading newspaper regularly. About forty seven per cent of the shrimp farmers are not reading any magazines. Immanuel (1997) had also reported results on the same line.

Seventy two per cent of the respondents were found to have high level of contact with extension agencies like the Marine Product Export Development Authority (MPEDA) and the Brackishwater Fish Farmers Development Agency

(BFFDA) and other fisheries organization. Rest (28 %) of the farmers had no contact with extension agencies.

With regard to social participation most of the respondents (80 %) were found to be members in one organization and very few (20 %) of them were members in more than one organization

Only few farmers (15%) had participated in the field demonstrations and majority (85%) reported that they had not participated in any demonstrations / meetings.

A good majority (72%) reported that they had not attended any exhibition and a very few (28%) of the respondents reported that they had attended some exhibitions.

The study clearly indicated that majority (70 %) had not visited the Fisheries College and Research Institute (FC&RI) while the rest had visited

Nearly seventy per cent (68.33%) of the respondents had reported that they had attended fisheries training program. Remaining (31.66 %) of the respondent had not attended any fisheries training programmes.

4.2 Knowledge level of shrimp farmers about different types Of feed

The Knowledge level of farmers on different types of feeds was analysed and the results are presented in table's 2,3,4and figures3and4.

Table 2. Knowledge level of shrimp farmers about different types of feed.

	Commercial feed (n=40)		Farm made feed (n=20)	
Knowledge level	No.of farmer	Percentage	No.of farmers	Percentage
Low	5	12.5	5	25
Medium	29	72.5	11	55
High	6	15	4	20

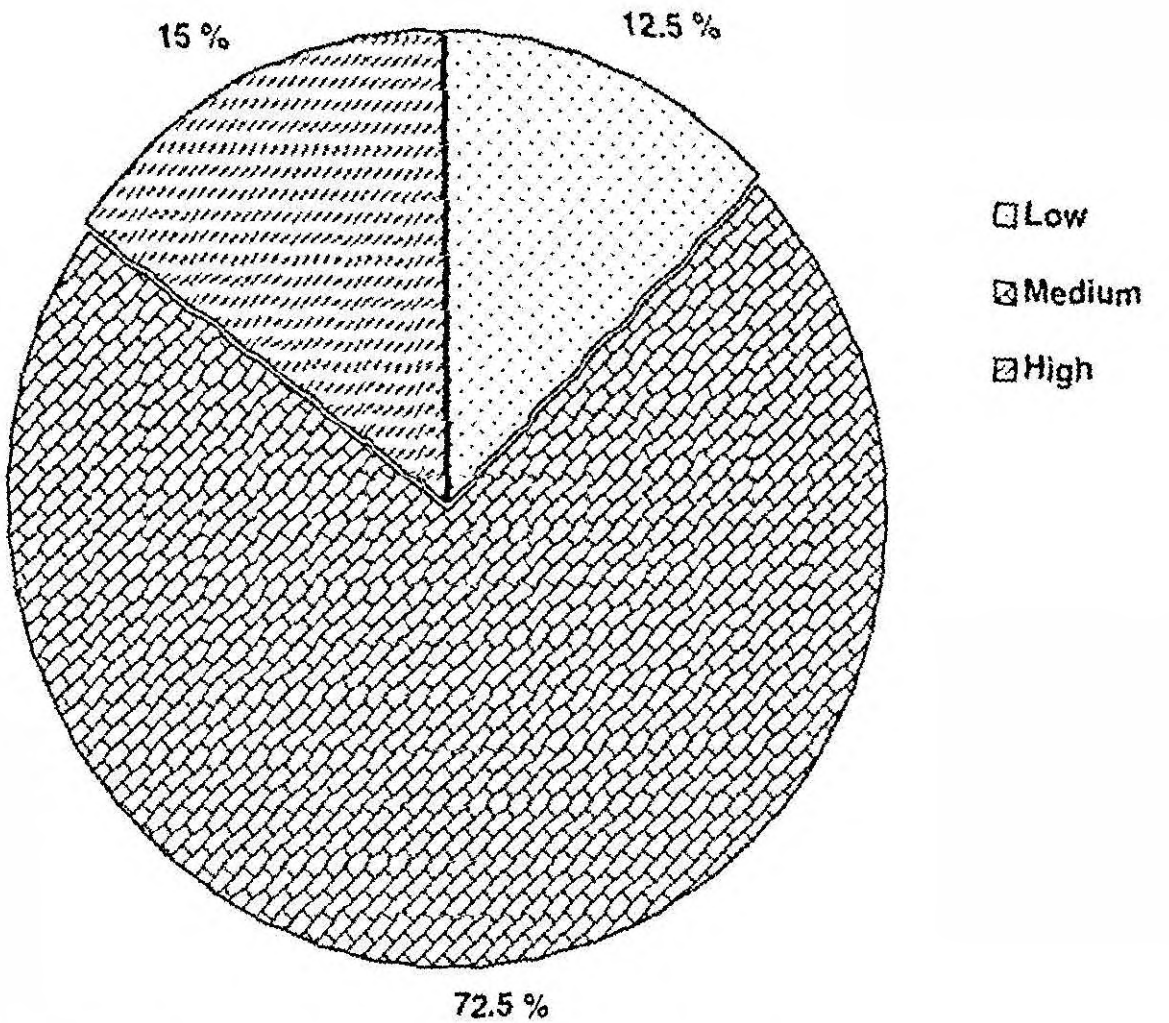


Fig.No. 3 Knowledge about commercial feed

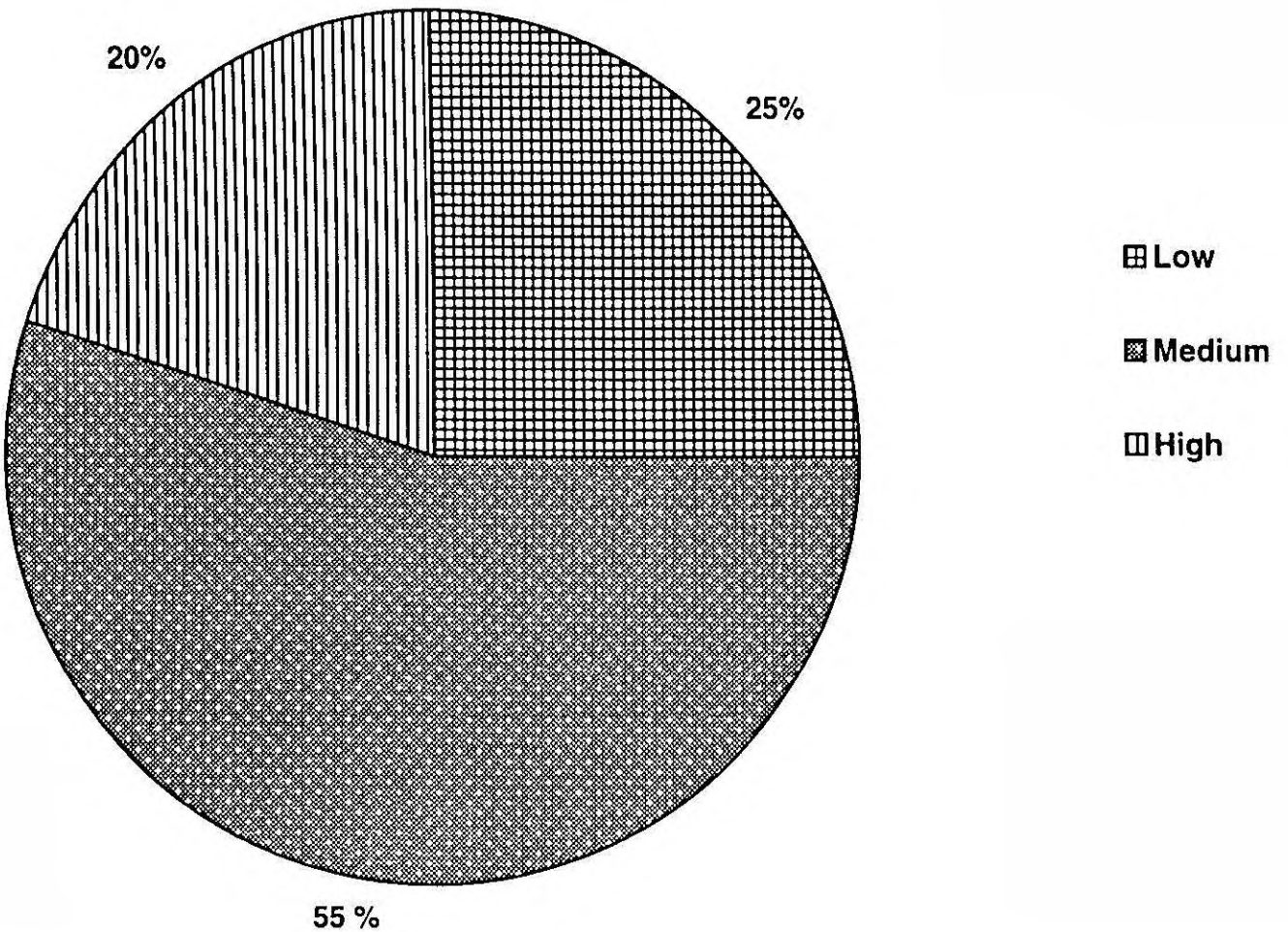


Fig No. 4 Knowledge about farm made feed

Commercial Feed

It is seen from the table 2 that (72.5%) of the farmers possessed medium level of knowledge about the shrimp feeds, and (15%) of the farmers possessed high level of knowledge

Farm made Feed

It is clear from table 2 that fifty five per cent of farmers had medium level of knowledge about the farm made feeds, and twenty per cent of them had high level of knowledge.

Knowledge level of farmers about the commercial feed -practices wise

Nearly eighty per cent of commercial feed using farmers found to posses correct knowledge on the practices of decreasing feed during moulting time. This may be due to the reason that farmers are aware of the fact that the in take of feed during the moulting time will be less and hence in order to avoid the wastage the quantity is reduced.

Most (97.5%) of them were having good knowledge on the effect of low dissolved oxygen and about the need for regular water exchange at times of over feeding. This clearly indicates that farmers are aware of the fact that dissolved oxygen play a vital role in the survival of shrimp and proper water exchange will reduce the chances of disease occurrence.

It is clear from the table that ninety five per cent of the commercial feed users were found to possess correct knowledge about the different measures

Table 3 Knowledge level of farmers about the commercial feed

n = 40

Statement	Correct		Incorrect	
	No	%	No	%
1. How will you visually identify the quality of feed?	26	65	14	35
2. Which quality of the feed should be preferred?	34	85	6	15
3. How long the feed could be stored?	27	67.5	13	32.5
4. Which FCR should be preferred?	15	37.5	25	62.5
5. What are the measures adopted for checking the quality of feed?	38	95	2	5
6. Mention the important additives	4	10	36	90
7. How excess feeding is checked usually?	37	92.5	3	7.5
8. How long feeding is monitored?	6	15	34	85
9. Is it necessary to decrease feeding during moulting time?	40	100	0	0
10. Is it necessary to decrease feeding during disease time?	31	77.5	9	22.5
11. Is it necessary to decrease the feeding during plankton bloom?	37	92.5	3	7.5
12. Will the low dissolved oxygen affect the feeding?	39	97.5	1	2.5
13. Is it necessary to do water exchange when over feeding is done?	39	97.5	1	2.5
14. Will you prefer separate feed for low saline and high saline shrimp culture?	38	95	2	5
15. Will you feed intensive feed to low stocking density culture?	38	95	2	5

adopted for checking the quality of feed. Most (85%) of the farmers determine the quality of the feed by checking its water stability and floating stability for 2-3 hrs. Similar opinion was reported by Sitasit, (1995).

Most (92.5%) of the commercial feed users were found to have correct knowledge about the method of checking excess feeding and also the necessity to decrease the feeding during plankton bloom. This may be due to the fact that the farmers are providing the feed in the trays and hence they are able to identify the feed intake and thereby check excess feeding. They are also aware of the fact that during plankton bloom period the feed in take is less, since the bloom acts as a natural feed and hence to avoid wastage it is felt necessary to decrease feed during plankton bloom.

Most (85%) of the commercial feed users does not found to possess correct knowledge about the feed monitoring, and this may be due to the fact that they are not aware about the importance of monitoring

Ninety per cent of the shrimp farmers does not have knowledge about the important additives in the feed and this may be due to the reason that since they are purchasing the ready to use commercial feed they are not aware about the important additives, and they are not paying interest to know about the additives

Farm made feed-practise wise

The farmers usually check excess feeding by using check tray method and majority (95%) of the farmers possessed enough knowledge about this. Wastage of feed is avoided due to checking and hence farmers have gained knowledge in this aspect.

Table 4 knowledge level of farmers about the farm made feed

n = 20

Statement	Correct		Incorrect	
	No	%	No	%
1. How will you visually identify the quality of feed?	14	70	6	30
2. Which quality of the feed should be preferred?	16	80	4	20
3. How long the feed could be stored?	11	55	9	45
4. Which FCR should be preferred?	0	0	20	100
5. What are the measures adopted for checking the Quality of feed?	17	85	3	15
6. Mention the important additives	18	90	2	10
7. How excess feeding is checked usually?	19	95	1	5
8. How long feeding is monitored?	9	45	11	55
9. Is it necessary to decrease feeding during moulting time?	16	80	4	20
10. Is it necessary to decrease feeding during disease time?	15	75	5	25
11. Is it necessary to decrease the feeding during plankton bloom?	17	85	3	15
12. Will the low dissolved oxygen affect the feeding?	17	85	3	15
13. Is it necessary to do water exchange when over feeding done?	18	90	2	10
14.Will you prefer separate feed for low saline and high saline shrimp culture?	16	80	4	20
15. Will you feed intensive feed to low stocking density culture?	16	80	4	20

Ninety per cent of farm made feed users is thorough about the important additives added in the feed. Since the farmers themselves are preparing the feed they know the exact additives added in the feed and its proportions

In the case of ninety per cent of farm made feed users much preference was given to check tray monitoring which showed their knowledge in food allocation.

Ninety per cent of the farm made feed users had adequate knowledge on the exchange of water during overfeeding, and this indicated their thorough knowledge on the vital role of water quality in the health and survival of shrimps.

The farm made feed using farmers had poor knowledge on the Feed Conversion Ratio (FCR) of the feed, which shows they are not aware of the relationships between FCR and growth.

The table showed that 90 per cent and 85 per cent of the farmers had the knowledge on the effect of low dissolved oxygen and high plankton growth decreases the feed intake respectively, which again indicated their awareness about avoiding artificial feeding. Some had even knowledge on the quality of the feed.

4.3 Feeding schedule and management

The feeding schedule and management practices adopted by farmers using commercial feed and farm made feed were analyzed and the results are presented in table 5and6

Commercial Feed

It is seen from the table that (82.5%) of the shrimp farmers using commercial feed had adopted the correct method of feeding, i.e. check tray method. In this method feeding is done in a particular place and hence the feed uptake by the shrimps could be assessed and wastage of feed could be reduced. Excess or reduced feeding can be avoided by this method. Similar opinion has also been reported by Sundaraseker, (1991); Akiyama, (1993); Paulraj, (1993); Robertsen et al., (1993) and kinkar Chand,(1999.)

Seventy per cent of the farmers had adequate knowledge on the biomass and based on the biomass feeding was done. This also helps to assess the required quantity of feed thereby avoiding excess or reduced feeding.

Majority (55%) reported that they feed the shrimps initially with the starter feed, immediately after stocking. This shows that farmers are aware of the fact that immediately after stocking the shrimps prefer starter feed rather than grower feed

Forty five per cent of the shrimp farmers were adopting the correct frequency and timings of feeding schedule which indicates their awareness on the importance of feeding time and frequency (Paulraj, (1999;) Sanhotra, (1994)and Prasad, (1995)

The table revealed that more than 60 per cent of the shrimp farmers had not adopted the recommended allocation and quantity of feed per day. This may be due to the reason that they may not be aware of the importance of recommended feeding quantity per unit area.

Table: 5 Feeding schedule and management practices adopted by farmers using Commercial feed

N = 40

Statements	Adopted		Not adopted	
	No	%	No	%
1. Frequency of feeding	18	45	22	55
2. Timings /intervals of feeding	18	45	22	55
3. Method of feeding	33	82.5	7	17.5
4. Number of feeding locations/unit area	21	52.5	19	47.5
5. Allocation of feed /day	13	32.5	27	67.5
6. Quantity of feed Kg/day	16	40	24	60
7. Starter feeds are given immediately after stocking	22	55	18	45
8. Checking the biomass daily	28	70	12	30

Nearly fifty per cent were not found to adopt the recommended number of feeding locations per unit area because they may be adopting the broad casting method rather than tray method of feeding according to their farm area.

Farm made feed

From table it could be seen that 70 per cent of the shrimp farmers using farm made feed had adopted the recommended number of feeding locations per unit area whereas 30 per cent were not adopting this recommendation. This may be because of the difference in the feeding method they are practicing i.e. check tray method or broadcasting. Only in check tray method of feeding the number of locations are given due consideration whereas in broadcasting the locations of feed supply are not specific.

More than 80 per cent were found to adopt the recommended quantity of feed, and providing starter feed after stocking and this may be due to the reason that the farmers themselves are preparing the feed and hence they use the quantity as per recommendations and there is no paucity of feed and if they need any additional quantity they themselves can prepare it.

Seventy per cent of them are not adopting the recommended allocation of feed per day and this shows that the farmers are not giving much importance to this aspect.

Forty five per cent of them were found to adopt the frequency of feeding, timings of feeding and method of feeding and this shows that they are aware about these practices.

Table: 6 Feeding schedule and management practices adopted by farmers using farm made feed

N = 20

Statements	Adopted		Not adopted	
	No	%	No	%
1. Frequency of feeding	9	45	11	55
2. Timings /intervals of feeding	9	45	11	55
3. Method of feeding	9	45	11	55
4. Number of feeding locations/unit area	14	70	6	30
5. Allocation of feed /day	6	30	14	70
6. Quantity of feed Kg/day	17	85	3	15
7.Starter feeds are given immediately after stocking	16	80	4	20
8. Checking the biomass daily	18	90	2	10

4.4 perception of Shrimp farmers towards different types of feeds

The perception of shrimp farmers towards different types of feeds was analysed and results are presented in tables7 (Commercial feed)and 8 (farm made feed)

4.4.1 Commercial feed

It is seen from the table 7 that the reason for farmer's preference to commercial feed was due to its easy availability in the market, which was reported by 85 percentage of the farmers. The easy availability in turn reduces their time and labour cost.

Sixty five per cent of the farmers found that the commercial feed have good attractibility which is preferred by the shrimps and there by the consumption increased and hence the growth.

About 63 per cent of the farmers opined that water stability was another character which adds to the advantage of the commercial feed and since the shrimps are slow feeders this characteristics or quality of feed is important.

The farmers are living in the rural areas with no advanced facility for storage and hence preference was given to the storage life of the feed by 62.5per cent of the respondent.

Before each farming they will stock the feed for the entire farming operation. Color (60 %) smell (57.5%) growth rate (57.5%) and texture (52.5%) were in the descending order of preferred qualities by the farmers. The feed was

Table 7. Perception of shrimp farmers towards commercial feed

Statement	Commercial feed (40)					
	Low		Average		High	
	No	%	No	%	No	%
Market availability of feed	4	10	34	85	2	5
Cost of the feed	19	47.5	7	17.5	14	35
Uniform size	12	30	16	40	12	30
Texture	15	37.5	21	52.5	4	10
Colour preference	5	12.5	24	60	11	27.5
Smell	5	12.5	23	57.5	12	30
Food Conversation Ratio	7	17.5	18	45	15	37.5
Growth Rate	3	7.5	23	57.5	14	35
Storage life	2	5	25	62.5	13	32.5
Quality of feed	6	15	22	55	12	30
Water stability	7	17.5	25	62.5	8	20
Attractibility	4	10	26	65	10	25

Table 8. Perception of shrimp farmers towards farm made feed

Statement	Farm made feed (20)					
	Low		Average		High	
	No	%	No	%	No	%
Market availability of feed	8	40	11	55	1	5
Cost of the feed	2	10	14	70	4	20
Uniform size	9	45	7	35	4	20
Texture	3	15	15	75	2	10
Colour preference	8	40	10	50	2	10
Smell	6	30	12	60	2	10
Food Conversion Ratio	16	80	2	10	2	10
Growth Rate	11	55	6	30	3	15
Storage life	10	50	9	45	1	5
Quality of feed	9	45	8	40	3	15
Water stability	14	70	4	20	2	10
Attractibility	12	60	6	30	2	10

Given on credit by sellers and payment was done after harvesting which reduced their financial pressure at the beginning. Even the farmers were not satisfied with the cost component (47.5%) of the feed

4.4.2 Farm made feed

In the case of farm made feed using farmers their primary problem was the low feed conversion ratio of the feed. Eighty per cent of the farmers indicated this as a vital problem(Table8) When more food was consumed the conversion to body weight was very less. Seventy five per cent of the farmers felt that texture of feed remained good when compared to the commercial feed.

According to 70 per cent of the farmers the feed was affordable when compared to the commercial feed. Farmers have to purchase and procure the raw materials for the feed preparation but they were not having credit access.

4.5 Problems faced by shrimp farmers regarding commercial feed and farm made feed

The problems faced by the farmers regarding commercial feed and farm made feed were ranked and the result are presented in tables 9 and 10.

4.5.1 Commercial feed

In the present study the various problems faced by the shrimp farmers regarding commercial feed and farm made feed were assessed and results are given in Table 9 and Figure 5. The prime problem experienced by the farmers was the fungal infection in the feed (Rank I). This may be caused by the improper storage of the feed that is the unopened bags of feed are not stored in a proper

Table 9 Problems faced by shrimp farmers using commercial feed

Sl.No.	Problem	CPI *	Rank
1	Lack of availability of commercial feed	1.60	XI
2	High cost of feed	1.92	IX
3	Poor growth rate	2.13	VII
4	Poor shelf life	2.27	V
5	Poor quality of feed	2.30	IV
6	Poor feed intake by shrimp	2.05	VIII
7	Poor water stability	1.40	XII
8	Unevensize	1.67	X
9	Hardness	2.15	VI
10	Loss of stability upon storage	2.27	III
11	Fungal infection	2.80	I
12	Overcooking	2.50	II

* *Cumulative perception index*

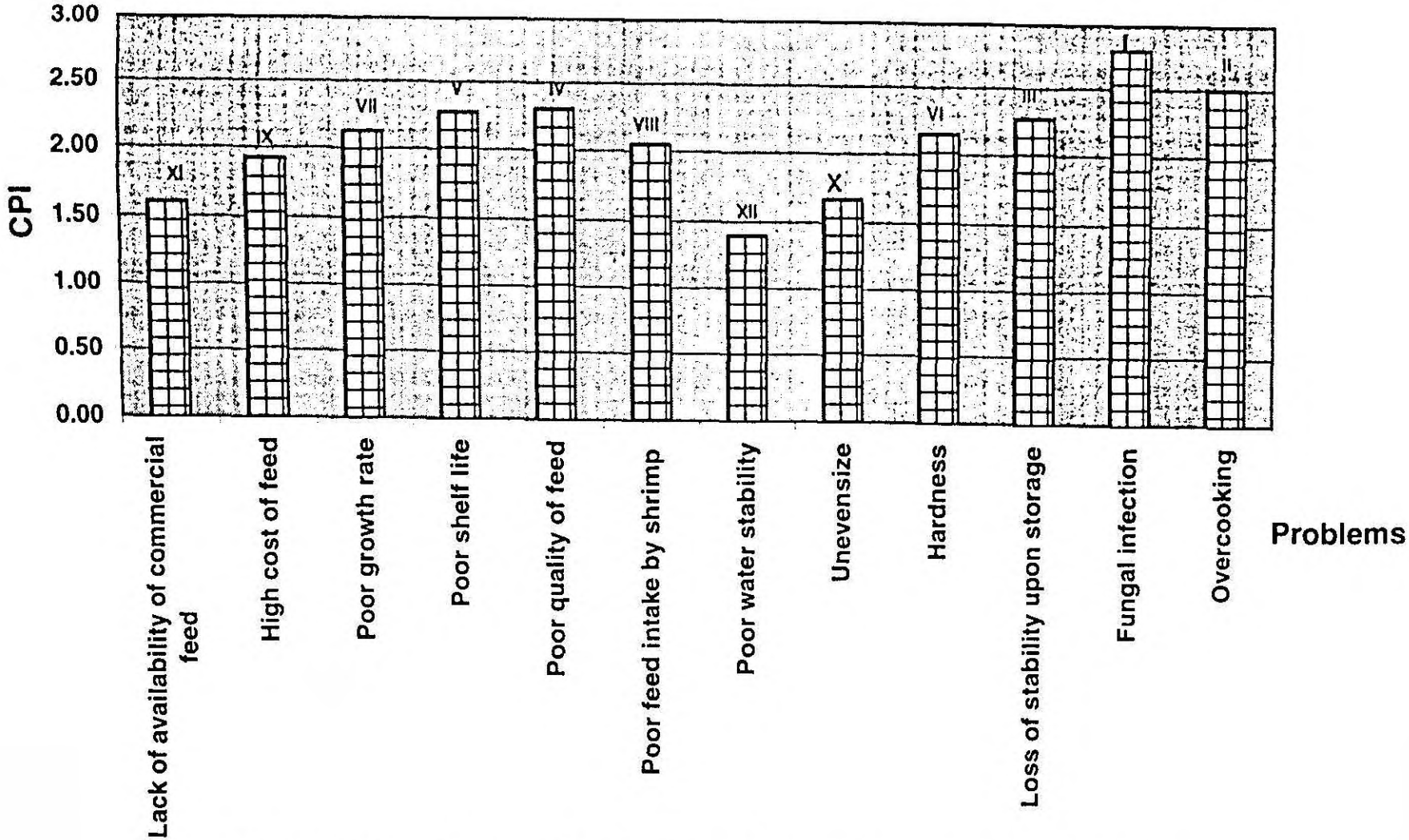


Fig.No.5 Problems faced by shrimp farmers regarding commercial feed

way. Moreover the storage of feed is done on wooden racks as per the recommendations of the distributors. Proper ventilation was not provided which in turn enhances fungal infection of the feed.

The second problem was over cooking. Sometimes over cooked feed will be mixed with good quality feed and this result in high wastage, which leads to pollution.

The commercial feed losses stability upon storage was ranked third. As a result the granular shape is lost and the feed becomes powdery. This again leads to reduced consumption by shrimp, loss of water quality and finally economic loss to the farmers.

The poor quality and poor shelf life were perceived as the next important problems (Rank IV &V). Lack of awareness about the concept of feeding rate and proper storage on the part of the farmers can be very important reason behind this problem.

Transferring appropriate knowledge and skill to the farmers in these aspects can solve this. Farmers were found to be more or less satisfied with the water stability of the feed (Rank XII).

4.5.2 Farm made feed

The foremost problem faced by the shrimp farmers using farm made feed is the lack of availability of raw materials (Rank I). All the ingredients necessary for the feed preparation are not readily available in the local market. Since all the

Table:10 The Problems faced by Shrimp farmers using farm made feed

Sl.No.		CPI *	Rank
1	Lack of availability of raw material	2.80	I
2	High cost of raw material	2.55	IV
3	Poor growth rate	2.70	II
4	Poor shelf life	2.60	III
5	Poor quality of feed	2.40	V
6	Poor feed intake by shrimp	2.20	VII
7	Poor water stability	2.30	VI
8	Unevensize	2.05	VIII
9	Hardness	1.70	X
10	Loss of stability upon storage	1.80	IX
11	Fungal infestation	1.70	X
12	Overcooking	1.50	XII

* Cumulative perception index

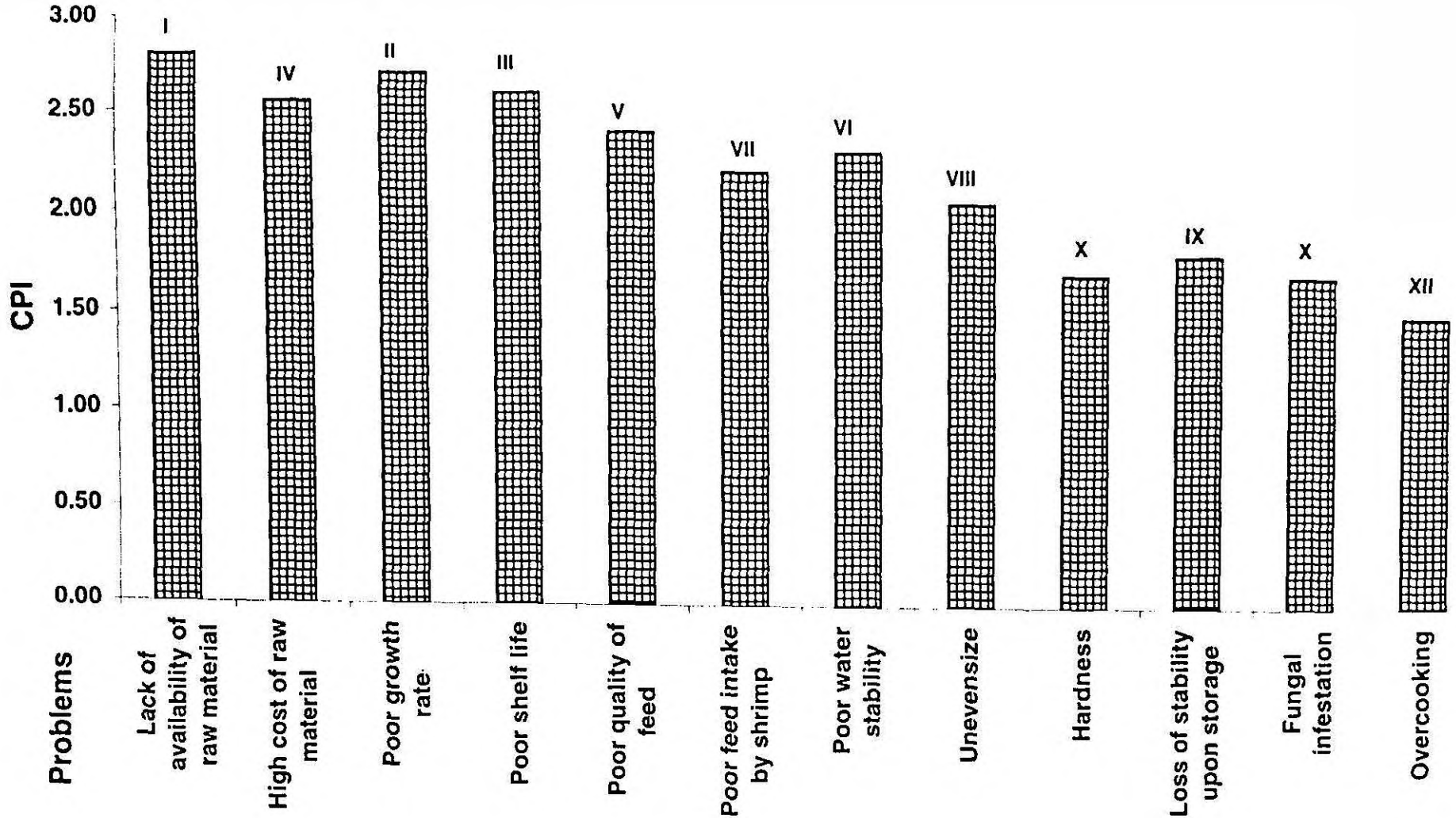


Fig. No. 6 Problems faced by Shrimp farmers regarding farm made feed

ingredients are not added to the feed there is a reduction in the growth rate (Rank II) of the shrimp.

The farm made feed was having low shelf life (Rank III) and hence the storage for long time becomes a problem. High cost of the raw materials (Rank IV) was also an important problem as reported by the farmers. Poor storage life of the feed is the fifth problem faced by the farmers. They prepare the feed for their immediate use and hence by any means if it is stored, the quality is affected.

The next important problem was the poor water stability (Rank VI) which naturally reduces the intake and affects the water quality. The farm made feed is of uneven size (RankVIII) when compared to the commercial feed.

The less important problems faced by farm made feed using farmers were hardness of the feed (Rank X), fungal infection (Rank X) and overcooking (Rank XII) .

5. SUMMARY

5. Summary

India has a coastline of 8129 Km and the coastal waters are very productive and offer a wide scope for culture of marine organisms. In India fish production is realised from both sectors *viz*, the capture and culture fisheries. Capture fisheries sector constitute a highly productive sector, a source of valuable protein rich food and employment and a net contributor with the balance of payment. The catch from capture fisheries production has become more or less static in several areas on account of the exploitation reaching the maximum sustainable level. Aquaculture offers immense scope for substantially raising the production level. With an estimated 1.2 million hectares of brackishwater area, coastal aquaculture is emerging as a major production activity.

Though traditional shrimp farming has been practiced for a long time in States like Kerala and West Bengal, modified extensive and semi - extensive type of farming started only during the last decade in the states like Andhra Pradesh, Tamil Nadu , Karnataka and Kerala.

Due to high demand in foreign market and stagnating production of shrimps from the capture fisheries, attempts were made to increase shrimp production through culture fisheries. In Tamil Nadu a potential area of about 56,000 hectares of brackishwater have already been identified suitable for farming. Shrimp aquaculture offers adequate employment opportunities to the rural fishing community.

Shrimp farming is mostly done by the farmers in their own land or leased in land. Traditional filtration method of farming is practiced by most of the marginal and small farmers where as scientific shrimp farming is done by the large farmers on a commercial scale. Feeding is an important activity in the scientific farming as it contributes a lot to the growth of the shrimps. In addition to natural feeding farmers also use commercial feeds to harvest a better yield.

The success of the feed depends upon the extent of its usage by the farming community. Perception and attitude of farmers differ from individual to individual and various factors may contribute to this difference. Only a very limited studies have been under taken on aspects like the knowledge level of farmers about different types of feed, feeding schedule and management practice and also on the extent of adoption of different feeds by farmers. Hence the present study is undertaken with the following objectives: -

- To study the profile characteristics of the target population.
- To assess the knowledge level of shrimp farmers about the different types of feeds.
- To find out the feeding schedule and management practices adopted by shrimp farmers.
- To study the perception of the farmers towards the different types of shrimp feeds.
- To identify the problems faced by farmers regarding the feed.

This study was conducted in the Ramanathapuram and Ottapidaram blocks of Ramanathapuram and Thoothukudi districts respectively in Tamil

Nadu. Three villages namely Devipattinam and Athankarai from Ramanathapuram block and Tharuvaikullam from Ottapidaram block were selected for the study .A sample of 60 respondents were selected comprising 40 using commercial feed and 20 using farm made feed .

5.1 Salient findings of the study

(a) Profile characteristics

It was observed that most (45%) of the respondents belonged to middle age group, 28.33 percent to old age group and 26.66 percent to young age group..

Most (43.34%) of the shrimp farmers belonged to the medium category with respect to education and majority (88.3%) had shrimp farming as their main occupation with low experience of less than 5 years .

Most (83.3%) of the farmers had nuclear family, with an average of five members. Nearly fifty percent of the respondents were living in tiled house and more than thirty eight percent of the farmers had an annual income of upto one lakh rupees.

Majorities of the respondents (60 %) were found to have medium to high degree of exposure to mass media channels and 72 per cent of the respondents were found to have high level of contact with extension agencies..

About 70 per cent of the respondents had reported that they had attended fisheries training programme and the rest had not attended any fisheries training programme.

(b) Knowledge level of shrimp farmers about commercial feed

(i) Commercial feed

About 85 per cent of commercial feed using farmers were found to posses correct knowledge on the practices of decreasing feed during moulting time.

Most (97.5%) of them were having good knowledge on the effect of low dissolved oxygen and about the need for regular water exchange at time of over feeding. About 95 per cent of the commercial feed users were found to possess correct knowledge about the different measures adopted for checking the quality of feed.

Most (92.5%) of the commercial feed users was found to have correct knowledge about the method of checking excess feeding and also the necessity to decrease the feeding during plankton bloom.

Majority (85%) of the commercial feed users was not found to possess correct knowledge about the feed monitoring, and about the important additives in the feed.

ii) Farm made feed

Excess feeding is usually checked by the farmers by using check tray method and majority (95%) of the farmers possessed enough knowledge about this. Ninety percent of farms made feed users are thorough about the important additives added in the feed.

In the case of 90 per cent of farm made feed users much preference was given to check tray monitoring which showed their knowledge in food allocation.

Ninety percent of the farm made feed users had adequate knowledge on the exchange of water during overfeeding.

The farm made feed using farmers had poor knowledge on the Feed Conversion Ratio of the feed which shows they were not aware of the relationships between FCR and growth.

Ninety per cent and eighty five per cent of the farmers had the knowledge on the effect of low dissolved oxygen and high plankton growth decrease the feed intake. Some had even knowledge on the quality of the feed.

C) Feeding schedule and management:

(i) Commercial Feed

About 83 per cent of the shrimp farmers using commercial feed had adopted the correct method of feeding, i.e. check tray method.

Seventy percent of the farmers had adequate knowledge on the biomass and based on the biomass feeding was done.

Majority (55%) of them reported that they feed the shrimps initially with the starter feed, after stocking.

Forty five percent of the shrimp farmers were adopting the correct frequency and timings of feeding schedule.

Sixty per cent of the shrimp farmers had not adopted the recommended allocation and quantity of feed per day and nearly fifty percent were not found to adopt the recommended number of feeding location per unit area.

(ii) Farm made feed

Seventy per cent of the shrimp farmers using farm made feed had adopted the recommended number of feeding locations per unit area whereas 30 per cent were not adopting these recommendations.

More than 80 per cent were found to adopt the recommended quantity of feed, and providing starter feed after stocking.

Seventy percent of them are not adopting the suggested allocation of feed per day and this show that the farmers are not giving much importance to this aspect.

Forty five percent of them were found to adopt the frequency of feeding, timings of feeding and method of feeding and this shows that the are aware about these practices

(d) Perception of shrimp farmers towards different types of Feeds

(i) Commercial Feed

The reason for farmers' preference to commercial feed was due to its easy availability in the market, which was reported by from 85 per cent of the farmers. Sixty five per cent of the farmers found that the commercial feed have good attractibility About 63 per cent of the farmers responded water stability was another important characteristic of the feed .

Color (60 %) smell (57.5%) growth rate (57.5%) and texture (52.5%) were in the descending order of preferred qualities. In the case of farm made feed

using farmers their primary problem was the low feed conversion ratio of the feed. Eighty percent of the farmers indicated this as a vital problem. When more feed was consumed the conversion to body weight was very less

Seventy five percent of the farmers felt that texture of feed remained good when compared to the commercial feed.

According to 70 percent of the farmers the feed was affordable when compared to the commercial feed.

(e) Problems faced by shrimp farmers regarding the feed

(i) Commercial feed

. The prime problem experienced by the farmers was the fungal infection in the feed (Rank I).The second problem (Rank II) was over cooking and loss of stability upon storage which ranked third (Rank III).

The poor quality and poor shelf life were perceived as the next important problems (Ranks IV &V). Farmers were found to be more or less satisfied with the quality of water stability of the feed (Rank XII)

(ii) Farm made feed

The foremost problem faced by the shrimp farmers using farm made feed is the lack of availability of the raw materials (Rank I) and reduction in growth rate (Rank II) low shelf life (Rank III), high cost of the raw material (Rank IV) and poor storage life of the feed(Rank V). The next important problem was the poor water stability (Rank VI) and uneven size (Rank VIII).

The less problem faced by these farm made feed using farmers were hardness of the feed (Rank X) fungal infection (Rank X) and the overcooking (Rank XII).

Policy implications:

Farmers perception on feed implies that the performance of commercial feed is good but wherever the raw materials and resources are available preparation and subsequent use of farm made feed should also be encouraged.

Knowledge level of the farmers about the feed , feeding frequency, method and timing could be improved by way of creating awareness, through various extension programmes.

Level of adoption of scientific feeding method could be enhanced through extension efforts.

6.REFERENCES

REFERENCES

Akiyama .D.M ,1993 . Semi-extensive shrimp farm management . *American Soyabean Association*, Singapore.Technical Bulletin **38** :1-20.

Akiyama . D.M and Norman L.M. Chwang , 1995. Shrimp Feed Requirement and Feed Management . *Aqua. International* , August - September.

Alagesan and Sumathi,1998. Awareness of Biofertilizer and Bio-control agents by farmers. *J.Extension Education* . **9** (4): 2205-2209.

Alauddin. A. , G. Perumal and C. Karthikegayan ,1998. Agricultural Lobours and their Employment Opportunities an Analysis. *J. Extension Education* . **9** (2): 1995 -2000.

Anon,1996. *Manual of Shrimp Farming* . Marine Products Exports Development Authority, Cochin. p.104.

Anon, (1999). Indian aqua products exports. *Fishing Chimes.* **19** (6): 1

Babykumari.P., K.Nanjaiyan , K.Chandrakand and Seetharaman, 1999. Communication Behaviour of Opinion Leaders. *J. Extension Education.* **10**(3) : 2462-65.

Cruz .S, 1996. Feed quality problems and management strategies. *Feed for small scale aquaculture.* 64-73.

Desai.G.R. and P.N.Kaul, 1984. Adult Educaton for Fishermen Some Spcical Problems. *Ind. J.Adult Education* .**45**(6) 15-85.

Gaikwad.B.H. and S.S.Gunjal, 2000. Information Seeking Behaviour of KVK Beneficiaries in Maharastra. *J. Extension Education.* **11** (1): 2672-76.

Girija. P.R., M.Shivamurthy and B.S Niranjan,1994. Job satisfaction and Job Stress of Agricultural Graduates of Karnataka. *J. Extension Education.* **5**(4) : 946 -955.

Goddard .S., 1996 . Feeding Method . *Feed management in Intensive Aquaculture*: 117-158

Goswami.M , Bharat , S.Sontakki and Anitha , 2000 . Extent of Adoption of composite Fish Culture (CFC) Practices by the Fish Farmers of Parrany District of Assam in Relation to their Knowledge and Attitude .In Abstrscts, National Conferance on Fisheries Economics, Extension and Management, CIFE, Mumbai.

Immanuel .S.,1997. Training programme for fisher women on preparation of food from seaweeds- and Evaluation study. *Mar. Fish. Infor. serv.T. & E. Ser..*

Jain. K.K.,1998. Selection of Ideal Binder for Making Stable Aquafeed . Training Manual Modern Approach to Aquafeed Formulation and On-Farm Feed management. 109 -111.

Khan.M.A. , R.C Sharma and P.N Sharma ,1997 . Farmers Characteristics and Adoption of Paddy Technology in Eastern M.P: A Path Analysis . *J. Extension Education.* **8** (4):1800-1807

Kinkar Chand .B. , 1999. Feed management in fresh water prawn farming. *Fishing chimes.* **18** (2):39-49.

Kiran, 1992 . Effectiveness of Fisheries Training Conducted by Fisheries College & Research Institute. **Unpub. M.F.Sc,Thesis**.TANUVAS, Thoothukkudi.

Lakshmanan.K., S. Somasundram and A. Palaniswamy,1994. Training Extension Personal- An Analysis. *J. Extension Education* . **5** (4): 1009-1010.

Medhanie.E.N. , G.Perumal and Ravikumar Theodore, 1991.Undergradudate Students of Agriculture-A Profile. *Tamilnadu Journal of Extension Education*. **2** (3): 314 -318.

Murgasan, (1998). Impact of training on Mushrom cultivation *J.Extension Education* **9**(1):15-18

Murthy. K.S. ,1997. The collapse of shrimp farming in India an analysis. *Info fish international*. **1**: 34 - 40.

Murthy. K.B, M.L. Narayan, M.J. Lakshmyrayan and B.N. Manjunath, 1998. Awareness on use of weedicides and perception of farmers association with adoption non- adoption of weedcides in paddy. *J.Extension Education*. **9** (3):2249 - 2250.

Nagabhushanam . K. and T.R . Guruprasad,1994. Knowledge and Adoption of Coconut Cultivation Practices. *J. Extension Education*. **5** (3) : 918 - 20.

Nagoor Meeran.M. and M.J.Prince Jayaseelan , 1999. Socio Personal, Socio-Economic and Socio-Psychological Profile of Shrimp Farmers. *J. Extension Education*. **10** (2): 45-48.

Narmatha. N. , R. Subramanian and Peru Mathiyalagan,1996. Knowledge Level of Farm Women in Scientific Poultry Farming . *J. Extension Education* . **7** (2 & 3): 1454 -56.

Paulraj.R., 1999. Eco-Friendly Feed and Management System for Sustainable shrimp Culture. *Fisheries World* . January:13 -18.

Perumal . G., Paliniswamy .S. and Ponnappan .C. , 1992. Socio- Economic Status of the Fish Farmers And Impact of the Fish Farmers Development Agency Programme. *J. Extension Education* . **3** (3): 515 -518.

Pounraj. A., 1992. Inland Fishermen Co-operative Societies A Critical Analysis . **Unpub. M.Sc (Agr.) Thesis**: TNAU, Coimbatore.

Prasad .G, 1995 . Bio-Economic Evaluation of Semi Intensive Shrimp Farming in Kerala . **Unpub.(Ph.D)Thesis**: CUSAT, Cochin.

Purushan.K.S ,1995. Adoptive Farming Technology : A Boon to Sustainable shrimp production from Kerala . *Sea Food Export Journal.* **26** (12): 5-11.

Raj . R . J., Somasundram anb M. Muthiah, 1992. Knowledge of Farmers on Irrigation Management practices in paddy . A diagnosis Study. *J. Extension Education* . **3** (3): 543-545.

Ramamurthi.K, Santha Govind and J.Vasanthakumar,1997. Knowledge Level of Farm Women in Turmeric Production and processing . *J. Extension Education.* **8** (4): 1832-1835.

Ranganathan . G. and Somasundaram. 1998. Knowledge on Mushroom Cultivation Technologies. *J.Extension Education.* **9** (4): 2257-2258.

Ravishankar . R.L. and Y.Katteppa. 1994 . Constraints Analysis of Potato Farmers. *J. Extension Education* . **9** (4): 2201-2204.

Robertion , A.L. Lawrece and F.L. Castille,1993 . Effect of Feeding Frequency and Feeding time on Growth on *Penaeus vannamei* (Boone) *Aquaculture and Fisheries Management.* **24:**1-6

Rosenberry, (1999). World Shrimp Farming. *Annual Shrimp News International.* **12**:91-92.

Sanshastra and Peer Mohamed, 1994. Status of feed Management . *Fisheries World* . (July):20-24.

Seena S. Desilva ,1995. Water Stability of Feeds . *Feeds Nutrition in Aquaculture.* 196.

Sehara . D.B. , J.P. Karbhari and R . Sathidhas . 1986. A Study on the Socio Economic Conditions of Fishermen In Some Selected Villages of Maharastra and Gujarat Coast . *Mar. Fish. Infor. Serv. T & E. Serv..* **69:** 1-18.

Shaleesha, 1994. Extension education for sustainable shrimp farming.*Proc. of National workshop on sustainable aquaculture for 2000 A.D.* 56 - 59.

Sheela . B. & B.Sundaraswamy, 1999 . Knowledge Level of Dairy Practicing Women . *J. Extension Education* **10**(2): 2448-50.

Shivalingaian. Y.N and V. Veerabhadraiah , 1996. Farming Problems of rural youth. *J. Extension Education* . **7** (2&3): 1431-35.

Shivalingaian . Y.N. ,V.Veerabhadraiah and S.V.Suresha , 1996. Socio-Economic Characteristics of Rural Youth and their Participation in Farm Activities . *J. Extension Education.* **7** (2&3): 1460-63 .

Shivamurthy. M and M.S Nataraju , 1994. Adoption pattern of dairy innovation. *J. Extension Education.* **5** (4): 82-83.

Sitasit . P., 1995. Feed Ingredients and Quality Control. P. 75 -86 . In **M.B. New** , A.G.J . Tacon and Csavas (Eds.) Farm Made Aquafeeds. Proceeding of the FAO /AADCP Regional Expert Consultation on Farm-Made Aquafeeds , 14-18 December 1992. Bangkok, Thailand. FAO-RAPA AADCP , Bangkok , Thailand ,43 P.

Subhashchandra. R ., 1986 . Consequences of Adoption of Fish Culture Practices by Fish Farmers **Unpub. M.Sc (Agr.) Thesis**; TNAU,Coimbatore.

Subramanian .R. and R.L. Kherde,1999. Knowledge of Dairy Farmers of Tamilnadu . *J.Extension Education.* **2** (23): 314-316.

Sudeepkumari .N.K. and S. R . Subramanian , 1994. Training Effectiveness an Analysis On Dairy Traineers . *J. Extension Education.* **5** (4): 985 - 991.

Sujathkumar . N.V. , K.B. Sirpal and Philip ,1992. Sources of Information for Trawler Owners About Improved Fishing Technologies . *J. Extesion Education* . **3** (3):546-548.

Sujathkumar. N.V., 1988. Adoption Behaviour of Traditional Fishermen and Trawler Owners -A Comparative Analysis. **Unpub. M.Sc (Agr.) Thesis:** TNAU, Coimbatore.

Sukumar .D, 1998 .Evaluation and Comparison of shrimp farm Management Practices Prospects for Sustainability. **Unpub (Ph.D) Thesis,** FC&RI , TANUVAS, Thoothukkudi.

Sundarambal .P and R.Annamalai ,1999. Problems in Transfer of Dryland Technology. *J. Extension Education.* **10**(10): 2382 -2385 .

Sundaraseker .K,1991. Field Problems and Aquaculture Needs Of Shrimp Farmers in Thanjavur and Chidambaranar District. **Unpub. (M.F.Sc), Thesis.** FC&RI, TANUVAS, Tuticorin . P.1-96.

Surendran .V.K ., K. Madhusudhan Reddy and V. Subbu Rao, 1991 . Semi -Intensive Shrimp Farming . *Fishing Chimes.* **10** (11) : 23 - 29 .

Suresha . S.V , K.M. Jayaramaiah , Y.N. Shivalingaian and M.Shivamurthy ,1996. Problems as Perceived by Tribal Farmers on the Programmers of Tribal development. *J. Extension Education* .**7**(2&3): 1436-39.

Tharaneatharan .K., V. Ravichandran and Rathakrishnan ,1998. Information Source Utilization Pattern Knowledge and Adoption Level of Agro forestry Beneficiaries Technology. *J. Extension Education* . **9** (4): 2257-2258.

Venkata Pirabu. J. and A.G. Ranganathan , 1992. Knowledge Level Paddy Growers on Water Management Practices . *J. Extension Education* . **3**(3): 540 -542.

Venkataramanujam , K. , N. Sukumaran and G.Sanjeeviraj , 1987 .Socio Econmic Conditions of the Chank Fishermen Community In Thoothukkudi (S.India). *Rural Development Review* . **6** (3&4): 605-609.

Venkattakumar . R . and K. Nanjaiyan, 1999 . Profile characteristics of commercial coconut growers. *Indian Journal of Extension Education.* **10** (3) : 2529 -31.

Vijaya Lakshmi . P. , M.Veeraraghava Reddy and P. Punnarao, 1988. Knowledge of farm Women in Turmeric Cultivation . *J. Extension Education.* **9**(4): 2255-57.

Villalon . R. Jose , 1991 . Practical for semi-Intensive commercial Production of marine Shrimp .Texas A&M University Sea Grant College Program 102 Pages. Aquaculture Development In India from A Global Perspective. *Science* . **76** (3):10 .

Yogananda . H.G. , K.T. Ramachandra and N.Manjula,1994 . Knowledge Level Of Coconut Growers. *J. Extension Education.* **5** (5): 921-923.